

Making Sense of Sense Making: On Kidd's 'The Marks are on the Knowledge Worker'

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Introduction

This is a quirky, stimulating, original and wide-ranging paper. It challenges critical assumptions about the functions of computers, the nature of information and work (there are three types: knowledge, communication and clerical); the utility of PDAs (their small displays limit them to being memory prostheses); and about the fit between work type and system. The presentation is eclectic; mixing philosophy, Gibsonian psychology, and ethnographic user data to generate some provocative design and organizational implications. To cite just one: 'Don't encourage organizations to think that storing information is an alternative to being informed by it'.

The paper makes two important claims about the use of computers, which I will review - with the benefit of twelve years' hindsight. But before starting, I need to make a clarification. In one way the paper is anachronistic because it

predates the Web, blind-sighting some of its claims. However this shouldn't deflect us from Kidd's main arguments, because *public data* (like the Web) isn't the paper's central focus. It is concerned with *personal* use of information, where the two claims it makes are profound and still highly relevant.

(1) *Memory Prosthesis*: Computers are mainly used for (and good at) passive storage of information, but this type of information is not particularly useful (certainly to the knowledge workers who are Kidd's central interest).

(2) *Sense-Making*: Computers aren't very good at the important process of making sense of the information we encounter, and a radical new 'perceptual' approach is needed to tackle this, relying on large displays and spatial layout. Current techniques based on folders or future AI techniques will not solve this sense-making problem.

These were important claims because in 1994 the uncontested view was that storing lots of long-term information was a Good Thing. Hot research topics at that time presupposed the need to create large archives for Organizational Memory, Meetings data and Personal Information. And while not causing that approach to stop dead in its tracks, Kidd at least made researchers pause to consider their central premise. At that time, too, there was little HCI interest in SenseMaking – an area previously dominated by AI - so that Kidd's work created a new focus inspired by human-centric concerns rather than AI technologies. On a personal note, it caused me to rethink my research to focus more on what people

did when encountering and working with information and less on how they organized information long-term.

Computers as (Useless) Memory Prostheses

Kidd's claim (based on observation of knowledge workers) is that there is little value to passively stored information, because information is only useful during the act of informing. Once understood and integrated into the user's mental structures, it has little value, and is seldom accessed.

If this is true, it's an important and radical claim, because current research is directing massive efforts at helping users to construct huge collections of personal data, e.g. Microsoft's influential Memex initiative (Gemmell et al., 2006). Reductions in the cost of storage make it possible to 'keep everything', and users are amassing large collections of personal digital information including photos, music, as well as documents. New tools (e.g. GoogleDesktop, and Microsoft Desktop Search) aim to help access this data - inspired by research prototypes such as Stuff I've Seen (Dumais et al., 2003).

Although we can dismiss as rhetoric Kidd's assertions that digital collections are fundamentally useless (after all we do peruse old digital photos and access old tax returns), it's clear that we need to know more about exactly *when* and *why* long-term information is accessed. And Kidd's argument is more subtle than a blanket rejection of digital memory. She claims that the *process* of

constructing a digital memory store is costly and error prone, which in turn compromises the utility of the stored information. Errors creep in because the main tools we have for organizing digital memories are folders. Folders force *classification* - a cognitively difficult task – requiring users to predict the future context of retrieval. Such prediction is hard. There may be fundamental shifts in the ways that users construe certain information (as work or interests change), rendering old folder labels useless. Folders also *hide information*; once an email message or document is filed, I may never think to look for it again, because it is ‘out of sight and out of mind’. Finally ‘premature filing’ occurs - where users’ anxiety to keep their workspace clear for future information processing leads current information to be filed in inappropriate places. These claims about the problematic nature of categorization are now well demonstrated (Boardman and Sasse, 2004, Whittaker and Hirschberg, 2001). And though some have touted desktop search as the antidote to folders, there are strong reasons to believe that organization and access problems will not disappear with greater use of search (Whittaker et al., in press).

The Lack of Support for Sense-Making

Kidd’s arguments aren’t restricted to attacking digital memory, in fact her real focus is on managing new information, a process which she calls sense-making. Changes in the digital landscape relating to increased connectivity mean that we

are inundated by large amounts of information. But much of this information is of unclear value. According to Kidd, we need more support for *making sense* of it. And strikingly, dedicated support for sense-making hasn't changed much in the last 30 years. Computers still provide 'the desktop' along with ways for people to file information into folders, and email has its inbox with similar folders.

Kidd is absolutely correct that we lack good tools for processing new information. Email is the main conduit for new work information, and it's currently a disaster. Our inboxes bulge with huge amounts of ill-structured, outdated and irrelevant information. But this may not be a problem of sense-making. Contrary to Kidd, users aren't complaining that they can't *make sense* of this information, rather that they can't *manage tasks* involving this information. So, how is sense-making different from task management? Sense-making implies a cognitive act of imposing understanding on information, creating new relations between formerly disparate information. Task management instead demands a more lightweight form of organization, requiring information to be available and invoked at the appropriate time (Whittaker et al., in press).

Leaving open for the moment whether the key issue is sense-making or task management, let us return to Kidd's more detailed claims about processing new information:

(1) *Perceptual and Spatial Processes are Crucial*. Contrary to the current classification-oriented approach, Kidd states key processes in understanding new

information are visual, spatial and context-sensitive. Her study looks at how users make sense of physical documents – finding that they rely on ‘pre-linguistic, perceptual and visual’ processes to mediate understanding. For example, users organize paper documents into piles in space to understand complex connections between them. Their physical workspace becomes an external representation that retains and mediates users’ understanding. It also holds context, allowing them to defer judgments about where a specific piece of information belongs, allowing better judgments to be made.

(2) *AI Won’t Help*. The above characterization motivates another of Kidd’s assertions. Processing complex information is a specifically human activity that cannot be helped by machine surrogates or artificial intelligence.

So how true are these assertions? Studies show how users organize paper documents spatially into desktop ‘piles’ to avoid premature classification and to keep working information more available (Whittaker and Hirschberg, 2001). Email, too, is an excellent case of perceptual processing; studies reveal that users routinely keep over 1400 messages in the inbox (Whittaker et al., in press). They do this to exploit visual processes: users know they will return to the inbox to process new messages when they will *see* and be *reminded* about these outstanding messages. Just as Kidd says, the inbox functions as an attentional space which serves to hold context, being used to collate and organize information about ongoing tasks. And retaining messages in the inbox allows a

user to defer judgments about their value until their utility is clear. But the same studies also reveal the limitations of perceptual processes. Spatial strategies rely on visually scanning to ‘see’ connections and be reminded about outstanding information. But scanning does not scale well for vast amounts of heterogeneous information (and let’s face it 1400 messages is a large amount of information). As a result, important messages and documents get overlooked as spatial collections become unwieldy.

And while the ‘AI won’t save us’ claim may apply to the complex synthetic and subjective area of sense-making, AI techniques do seem to be highly promising for task management. For example, spam filtering is a successful AI technique that prevents irrelevant information from entering the users’ workspace. Other new AI methods may help users identify important messages, collate related information, or recreate the context of a current task (Whittaker et al., in press). Although there are obvious issues concerning user trust of automatic processes, these AI techniques may soon support important information processing problems.

So where does this leave us? It’s clear that Kidd’s observations still represent a major challenge to HCI. Even though they haven’t emerged in quite the way she characterized them, there are still key issues surrounding her two claims.

Memory Prosthesis: Although it's a useful strawman, the strong hypothesis (Digital Memories are Useless), is clearly wrong, but we definitely need more studies to determine how, when, and why digital memories are useful. We know that people want to keep music and photos as mementos, but what are the uses of work-oriented memorabilia? We also need to understand how the landscape will be changed by new tools such as search. Let's state these issues as follows:

1. What are the uses of digital memories? (An empirical question).
2. Once we know the answer to this, we can ask other questions that have technical ramifications. How can we help people create useful archives? How effective are current tools for accessing archives? In particular, is search sufficient?

Support for Sense-Making: Again, there's a crucial issue here, but not exactly the one that Kidd identified. Like Kidd says, people have major problems in processing *working* information, although it seems that the key problem is task management rather than sense-making. (This isn't to say that sense-making is unimportant, it's just that it's not as critical as task management). The second crucial conclusion supports Kidd - that managing working information involves perceptual processes of reminding and organization. The outstanding questions then are:

1. What processes are involved in handling working information? (Again an empirical question).
2. How can we better support these processes? Will Kidd's perceptual techniques involving large displays help? At the same time, we shouldn't neglect other philosophically different approaches. Can AI-based techniques of filtering, collation help with task management?

To conclude, Kidd's arguments are highly relevant today. We are now in a digital era when we are inundated by increasing amounts of information, but in a situation where we can 'keep everything'. In this context it is even more vital to address her main questions of how we *process new information* as well as the *value of stored information*.

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