Knowledge, IT, and the Firm

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INTRODUCTION

No company has ever existed or will ever exist without knowledge. Still, it was only recently that knowledge started being heralded as the way forward (Drucker, 1993; Itami, 1987; Toffler, 1990). This may explain why in the business world, knowledge management (KM) is still perceived in two substantially different senses: (a) as synonymous to information management (e.g., Dempsey, 1999; Vernon, 1999) and (b) as a distinct area of study and practice dealing with the management of knowledge (e.g., Newing, 1999; Zack, 2003). In contrast, the academic world sees knowledge and information as related but fundamentally distinct. Furthermore, the vast majority of both of these communities has focused on the managerial or social aspect of KM (see, for example, Birkinshaw & Sheehan, 2002; Davenport & Glaser, 2002; Davenport, Thomas, & Cantrell, 2002; Gupta & Govindarjan, 2000). The *nature* of knowledge and its implications for management have been largely ignored. The limited work considering knowledge issues falls into the four categories below.

1. Knowledge is self-explainable and, therefore, in need of no further consideration (e.g., Newing, 1999).
2. Knowledge is self-explainable and classifiable into several commonsense categories (see, e.g., Quinn, Baruch, & Zien, 1997; Savage as cited in Skyrme, 1999).
3. Knowledge is attempted to be explained or defined without taking into account the vast relevant work done in epistemology and cognitive science. Primary examples are Borghoff and Pareschi (1998) and Davenport and Prusak (1998).
4. Organisational knowledge creation is a social interaction between tacit knowledge and explicit knowledge (Nonaka, 1991; Nonaka & Takeuchi, 1995).

The first three attempt to deal with the nature of knowledge and give the impression that there are no problems in an area beset with significant issues, whereas the fourth pays serious attention to the fundamental issue of knowledge creation.

Nonaka and Takeuchi's (1995) theory consists of two interacting knowledge spirals. The epistemological one is based on the distinction between tacit and explicit knowledge; the ontological one is based on the widely accepted distinction between the individual and the organisation. Their important contribution is an excellently written expansion of their working hypothesis called "knowledge conversion," namely, "human knowledge is created and expanded through social interaction between tacit knowledge and explicit knowledge" (p. 61). This important "dichotomy" is one of seven that form the basis of their theory, specifically, (a) tacit/explicit, (b) body/mind, (c) individual/organisation, (d) top-down/bottom-up, (e) bureaucracy/task force, (f) relay/rugby, and (g) East/West. Knowledge conversion comprises four modes: socialization (from tacit to tacit), externalisation (from tacit to explicit), combination (from explicit to explicit), and internalisation (from explicit to tacit). These four modes "constitute the 'engine' of the entire knowledge-creation process" (p. 57).

There are four weaknesses in their approach. First, their working hypothesis is characterised by a coarse grain size: Tacit and explicit knowledge are left unanalysed. As a consequence, no actual mechanisms for knowledge creation are proposed. Second, despite an impressively long index on knowledge, the issue of the *nature* of knowledge is ignored. Third, their synthesis of the seven dichotomies, although a highly welcome attempt in bridging unnecessary gaps, it is still biased since their underlying "model of knowledge creation favors the Japanese view" (Nonaka & Takeuchi, 1995, p. 237). Finally, their wide-ranging literature review fails to take into account—or refute—the most widely accepted metaphysical position, namely, physicalism.

The next section presents the results of a unified theory of mind (Gelepithis, 1984, 1989, 1991, 1997, 2002, 2004, in press) that are relevant to the issues of knowledge creation and the nature of knowledge, and form the background to the future-trends section.

BACKGROUND

In accordance with contemporary physicalism (a position accepted by the majority of scientists and philosophers), individual human knowledge should, primarily, be seen as neurally realisable. When externalised, in the form of written language, individual human knowledge becomes

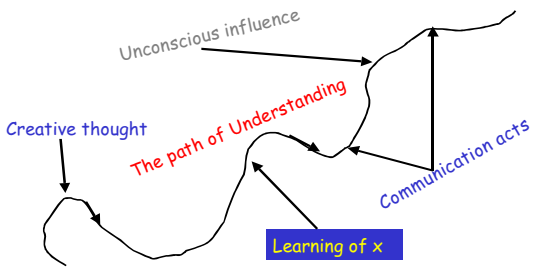
fossilised. It becomes a snapshot and loses its capacity to initiate near-immediate action. Furthermore, and most crucially, it may be entirely meaningless to virtually all other humans. As a matter of fact, after the passage of some time, it may become unintelligible even to the very human who first externalised it. In other words, externally represented human knowledge becomes information.

It follows that organisational knowledge (sometimes known as organisational memory) may refer to either knowledge or information. Specifically, it may refer to employed people and their individual knowledge, or it may refer to an organisation's information. The latter needs to be interpreted by a human to be useful in any way. Interpreted information becomes internalised, possibly assimilated, and subsequently may trigger, or be involved in, knowledge creation. The central mechanism responsible for human knowledge creation is the process of understanding. It is an invariant neurophysiological process with many significant contributors to its cause as the Figure 1 illustrates. This complex system of interacting processes I call the knowledge nexus.

Through successive instantiations of the process of understanding over a period of time—quite often on the same topic—humans accumulate knowledge. The end result of understanding embodies aspects of individual human knowledge. The knowledge of human H at time t is the *system of understandings* that H has reached by that time. Eventually, an overall complex system of premises and primitives is developed comprising the axiomatic base of H's knowledge-based action. To move away from the subjectivity of individual human knowledge, communication is required. It contributes the component of breadth and intersubjective agreement characterising collective human knowledge.

Because the knowledge nexus is neurally realisable, it is opaque and most likely never fully presentable. Nevertheless, through language, the axiomatic base is externally representable and potentially formalisable. This interdependence and foregoing analysis should have made clear the inseparable link between biology and human language, that is, the inseparability of the subjective and the objective.

Figure 1. Aspects of the proces of understanding



The next section draws upon the background already presented to outline two major directions concerning (a) information and communication technologies (ICT) and (b) the economy.

FUTURE TRENDS

Before embarking on a sketch of the two major future trends, it is worth emphasising that it is the development of the appropriate environment that would nurture employees' knowledge nexus, which is important for business innovation. Successful management will be that which can realise both the near-unlimited scope and the fundamental limits of that nexus. It is in this respect the management of a company that is significant rather than futile attempts to manage knowledge.

ICT and, increasingly, artificial intelligence (AI) are at the forefront of developments providing aids for addressing problems associated with the knowledge nexus. The majority of such problems include the identification, acquisition, and sharing of information, as well as the creation of knowledge. Books and edited collections addressing aspects of information-related or knowledge nexus problems abound (e.g., Borghoff & Pareschi, 1998; Hlupic, 2003; Quinn et al., 1997; Skyrme, 1999). What is much less widely available is discussion of the scope and limits of technology.

The scope of AI and ICT technology is enormous. The following three types of problems cover an extremely large space with far-reaching potential consequences for our society.

- Overall integration of information sources and tools.
- Identification of appropriately specified information through the use of search engines.
- Formalisation of certain aspects of human knowledge through R&D in knowledge representation and reasoning.

In all these cases, advanced technology can be a very significant help. It has to be realised, though, that AI and ICT systems cannot, on their own, either create or share knowledge. This is a point that is very often overlooked with serious negative consequences. Several people have noted that despite the increasing use of artificial aids, the human remains in the loop (see, for instance, Cross & Baird, 2000; Senge & Carstedt, 2001). Actually, no future technology can possibly take the human(s) out of the loop of human knowledge creation. Let us briefly see the reason for this intrinsic limit.