

Knowledge Architecture and Knowledge Flows



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INTRODUCTION

Modern society is increasingly seen as a knowledge economy; institutions, firms and individuals progressively rely on knowledge as a key component for individual and collective growth. This calls for a clear understanding of knowledge and its sharing patterns. This article has a two-fold aim: on the one hand, it aims at reviewing some of the most common *definitions of knowledge* provided in the economic and science and technology literature; on the other hand, it aims at providing a taxonomy of *knowledge flows* which should help scholars in distinguishing among various forms of knowledge sharing. Subsequently, we shall present a description of future trends and put forward some possible extensions of knowledge literature. Finally, our concluding remarks will be presented in the last section of the article.

BACKGROUND

The growing information flow which characterises the so-called “information society” has made organisations increasingly concerned with the problem of selecting and organising information in a cost-efficient manner. However, it would be incorrect to refer to the learning activity simply as the accumulation of information. In fact, firms are increasingly concerned with the acquisition of knowledge which, as recognised by many scholars (see among many others: Foray, 2004; Steinmueller, 2002), differs substantially from information.

Knowledge and Information

This leads us to the core distinction between information and knowledge. Ancori, Bureth, and Chohendet observed how the classical approach of economics adopts a vision that “allows the reduction of knowledge to information, or more precisely allows knowledge to be considered a stock accumulated from interaction with an information flux” (2000, p. 259). However, this view has recently come under criticism as knowledge and information should be considered as two distinct concepts: the latter taking the form of structured data which can be easily transferred through physical supports,

and the former involving cognition (see e.g., Tsoukas, 2005; Steinmueller, 2002). To clarify this distinction, we could analyse the differences between the reproduction processes of knowledge and information: While cost of reproducing information amounts solely to the physical cost of making a copy (e.g., the cost of a photocopy, the cost of duplicating an electronic file), the cost of reproducing knowledge is much higher as it involves a cognitive process required to disarticulate knowledge, transfer it to someone else, and rearticulate it for further use (Foray, 2004). Hence, reproducing knowledge involves an intellectual activity, whereas reproducing information simply involves duplication.

Tacit and Codified Knowledge

After having assessed the existence of a clear distinction between information and knowledge, we shall now turn our attention to the definition of knowledge itself. As mentioned above, knowledge has to be articulated in order to be transferred. This is because knowledge is, in its original form, completely embedded in the mind of the person who first developed it. In other words, we could say that knowledge is originally created as tacit and subsequently codified by means of a cognitive process which involves its articulation.

Before reasoning on the codification process, we need to better clarify what is tacit knowledge. The tacit dimension of knowledge corresponds, in the view of Polanyi (1967), to the form or component of human knowledge distinct from, but complementary to, the knowledge explicit in conscious cognitive processes. In the Hungarian polymath view, we know more than we can tell, where the portion of knowledge possessed and not communicable is the essence of tacitness.

In different moments in time and across different individuals, a different proportion of knowledge will be tacit and a different proportion will be codified. Hence, tacitness is a contextual rather than an absolute situation, this depending explicitly on the process of codification, which should be seen as a convergence process of tacit to codified knowledge. Cowan and Foray noted how “as the new knowledge ages, it goes through a process whereby it becomes more codified. As it is explored, used and better understood [...] more of it is transformed into some systematic form that can be communicated at low cost” (1997, p. 595).

The relevance of codification for economic purposes has been largely debated. The core argument put forward is that codified knowledge, when compared to tacit, can be transferred more easily, more quickly, and at lower costs. Cowan, David, and Foray (2000) argued in favour of codification stating that an uncodifiable (unarticulable) knowledge is not very interesting for social science. This stance is criticised by Johnson, Lundvall, and Lorenz (2002) who contest the view that codification always represents progress. According to these authors, tacit knowledge is a relevant component in human training, including the kind of training provided in institutions such as schools, universities and research institutes.

Knowledge Flows: Tacit vs. Codified

This argument (Johnson et al., 2002) introduces a key point for us in the debate: Tacit and codified knowledge flow in very different ways. Specifically, once codified, knowledge can be stored in a mechanical or technological way, like in manuals, textbooks or digital supports; it can be transferred from one person to another relatively easily, incurring the effort of getting access to the source of codified knowledge and decoding it for further use. In this respect, as observed by Steinmueller (2000), the context and intended recipient of the decoded knowledge makes a great deal of difference to the costs and feasibility of the initial codification. However, if appropriately codified (i.e., codified keeping in mind the intended recipient), knowledge can be easily transferred, taking also great advantage of modern information and communication technologies.

On the contrary, “[d]ifferent methods like apprenticeship, direct interaction, networking and action learning that include face-to-face social interaction and practical experiences are more suitable for supporting the sharing of tacit knowledge” (Haldin-Herrgard, 2000). Haldin-Herrgard identifies five main difficulties associated with tacit knowledge flows, related to perception, language, time, value, and distance. Perception refers to the characteristic of unconsciousness which entails a problem of people not being aware of the full range of their knowledge; difficulties with language lie in the fact that tacit knowledge is held in a nonverbal form and hence involves extra efforts to be shared; the time issue refers to the fact that the internalization of tacit knowledge takes a long time as it involves direct experience and reflection on these experiences; value is a problem as many forms of tacit knowledge, like intuition and rule-of-thumb, have not been considered valuable, lacking the status of “indisputable methods;” finally, the issue of distance relates to the need for face-to-face interaction for the diffusion of tacit knowledge.

This last point brings us back to the tacit/codified distinction: As already observed, modern information technology can play a major role in diffusing codified knowledge,

but tacitness is hard to diffuse technologically. Perhaps, as observed by Haldin-Herrgard (2000), today and in the future high technology will facilitate this diffusion in artificial face-to-face interaction, through different forms of meetings in real-time, using, for instance, audio and video conferences. This perspective is shared by other scholars; in a recent paper Brökel and Binder stated, for instance, that “[n]ew information technologies, for example, video conferences, cast doubt on the advantages of face-to-face contacts” (2007, p. 154).

PROPOSING A TAXONOMY OF KNOWLEDGE FLOWS

The discussed distinction between tacit and codified knowledge is at the heart of the problem of understanding knowledge flows. However, in our view, the existing literature has neglected to classify the different ways in which knowledge can flow among agents. This has created some confusion and has generated a misuse of specific concepts. In this section, we propose a taxonomy of knowledge flows which should help in clarifying the different forms of flow patterns.

Knowledge Gain vs. Knowledge Diffusion

We start our analysis distinguishing between the two broad concepts of *knowledge gain* and *knowledge diffusion*. The first relates, in our view, solely to those processes of knowledge flows which deliberately involve a barter among subjects: A portion of subject’s A knowledge flows to subject B, who pays subject A back either with a portion of his or her knowledge or with a different coin.

We shall refer to the first of these two options (i.e., knowledge is paid back with other knowledge) as *knowledge exchange*, and to the second option (i.e., knowledge is paid back with a different coin) as *knowledge trade*. An example of knowledge exchange has been used by Cowan and Jonard who define a model in which knowledge flows “through barter exchange among pairs of agents” (2004, p. 1558). Patterns of knowledge trade, on the other hand, relate, for instance, to those cases where disembodied knowledge flows through technology and patent trade (Arora, Fosfuri, & Gambardella, 2002).

Note that knowledge gain relates to both tacit and codified knowledge. Codified knowledge can flow among distant agents, whereas tacit knowledge gains require always a direct interaction (i.e., face-to-face) among agents.

Substantially different is the concept of knowledge diffusion. Here, knowledge is no longer traded on a voluntary basis (*quid pro quo*), but freely flows while agents interact. Several scholars have referred to this process as knowledge

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