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To Know is to Be: Three Perspectives on the Codification of Knowledge

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Abstract

This paper presents three perspectives on the codification of knowledge. These perspectives are formed by recent contributions in the fields of economics, business and management studies and of a group of writers who have a 'relational' perspective from the field of organisational behaviour. A comparison of these differing views highlights not only epistemological boundaries between different approaches but can also lead to the novel approach to studying knowledge codification presented in this paper. This approach is based on the knowledge topography of Cowan et al. (2000). This paper also develops a research approach for examining the situated intricacies of knowledge sharing in group activities as a means for identifying opportunities for knowledge codification in settings where, so far, only tacit knowledge has been seen as the major focus. Such research may enable us to bridge the dichotomy of explicit versus tacit knowledge and the three perspectives on knowledge codification presented. Moreover, in-depth case studies on the possibilities for knowledge codification can advance both the academic and practical debate.

(Cowan, R., David, P.A. and Foray, D. (2000) 'The explicit economics of knowledge codification and tacitness', *Industrial and Corporate Change*, 9(2), 211-254.)

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'Reports that say that something hasn't happened are always interesting to me, because as we know, there are ***known knowns***; there are things we know we know. We also know there are ***known unknowns***; that is to say we know there are some things we do not know. But there are also ***unknown unknowns*** - the ones we don't know we don't know.'

(Donald Rumsfeld, US Secretary of Defense, 2003, emphasis mine)

Introduction

The three knowledge categories in Mr Rumsfeld's quote (see above) that won him the 'Foot in Mouth Award' by the Plain English Campaign in 2003 (www 1) correspond to three academic perspectives on the codification of knowledge. The main aims of this paper are to highlight similarities and differences in terms of the epistemological approach of these three perspectives as well as to analyse their specific treatment of the concept of codification. This in turn will enable us to propose a method for conducting in-depth case studies on the possibilities for knowledge codification, which can advance both the academic and practical debate.

The particular usefulness of reviewing different perspectives on knowledge codification lies in the possibilities for leveraging concepts and approaches of one perspective by combining it with those from another. In doing so, such a review can further our understanding of the broader concept of knowledge. It can thus raise the awareness of other views on knowledge codification and widen one's perspectives. In short, such an approach helps to avoid intellectual monism in the knowledge debate (cf. Orlikowski and Baroudi, 1991 and Schultze and Leidner, 2002).

The three perspectives that this paper will review entail the recent treatment of knowledge codification by

a) a particular stream of the economics literature – to stay within the introduced knowledge categories, dealing with the 'known knowns'

b) the business studies and management literature on knowledge management – focussing on the 'known unknowns'

and

c) a critical perspective that consists of scholars from the field of organisational behaviour and information systems – emphasising the 'unknown unknowns'.

A brief review of the three perspectives, key contributors and research studies follows in the first part of this paper. The second part will then analyse the presented perspectives along the lines of the model of knowledge topography proposed by Cowan et al. (2000). In the concluding part of the paper, limitations of the chosen approach will be outlined and possibilities for future research will be discussed.

A brief review of three perspectives on knowledge codification

In this part, three perspectives on knowledge codification will be presented emphasising some of the main theories and concepts and highlighting some examples of applied research that are informed by each perspective.

Preamble: The concept of tacit knowledge

At the heart of the debate about the codification of knowledge lies the distinction between tacit and explicit knowledge. This is due to the fact that the ability to express one's knowledge is commonly understood to be the prerequisite for its codification. Conversely, some argue that tacit knowledge cannot be codified. All of the three perspectives claim that this distinction is rooted in the writings of Michael Polanyi (1958, 1967, 1969). Polanyi was the first scholar to introduce the concept of tacit knowledge into the social science debate. Polanyi (1967:4) starts his conceptualisations with the simple idea that "*we can know more than we can tell*" (original emphasis). By that he means that there can be more to knowledge than what we are able to articulate. This is due to the fact that knowledge is often bound to usage and bodily experience. The creation of tacit knowledge for Polanyi (1967) requires a deliberate indwelling in and interiorisation of particular experiences and skills in practical situations. Tacit knowledge therefore is highly individual and personal. According to the author, it is this tacit knowledge that is produced first and that might later become more structured and externalised. Nevertheless, the author claims that the tacit dimension remains an indispensable part of all knowledge. Explicit knowledge cannot be separated from individual tacit knowing, as Polanyi (1969:195) describes.

> The ideal of a strictly explicit knowledge is indeed self-contradictory; deprived of their tacit coefficients, all spoken words, all formulae, all maps and graphs, are strictly meaningless. An exact mathematical theory means nothing unless we recognise an inexact non-mathematical knowledge on which it bears and a person whose judgement upholds this bearing.

Taking this claim to its extreme, this implies that an elimination of all personal elements of knowledge would destroy all knowledge itself.

To illustrate the concept of tacit knowledge, Polanyi (1967) gives the example of recognising a characteristic physiognomy. He argues that while we can recognise a familiar face among a large group of people, we are unable to express in detail what it is about a particular face that lets us achieve this recognition. However, with the help of technology, a person is now able to reconstruct a face that is close to the original by choosing and combining visual representations of single elements such as nose, mouth and so forth. This method is for example applied by police forces in the search for offenders. The example shows that instances exist where it is possible to make tacit knowledge explicit. Such transfers from tacit to explicit knowledge, with a closer look at the borders for codification of knowledge will be the main focus of this paper.

The concept of tacit knowledge has been widely used within the social sciences arena and has often been appropriated to fit into a particular research agenda (Latour, 1987). In the context of organisational knowledge, one such account is given by Spender (1996), who distinguishes three types of tacit knowledge. He claims that Polanyi's treatment of tacit knowledge is too narrow and extends the concept through

the dimensions of explicit versus implicit and individual versus social knowledge. He thus arrives at a table of four types of organisational knowledge.

	Individual	**Social**
Explicit	Conscious	Objectified
Implicit	Automatic	Collective

Table 1: Types of organizational knowledge (Spender, 1996:64)

To the upper right is objectified knowledge, which is the only type of knowledge that is well known and understood by everybody in an organisation. The three others, namely the conscious, the automatic and collective knowledge are less easily understood and are tacit, in the literal sense of the word. Spender further adds that these three other, tacit knowledge types are all practical and claims that each of these can potentially provide the basis for competitive advantage. However, as he argues in this model, the presented knowledge types are ideal types and any real organisation will encounter all of them to a different extent and in different forms.

In line with Latour (1987), Hedesstrom and Whitley (2000) take a very critical view on the wide and diverse adoption of the concept of tacit knowledge in their review of the knowledge management literature.[1] They compare the ways in which the term tacit knowledge has been used with the initial proposal made by Polanyi. As a result of their review, they propose a new vocabulary and conceptual framework for addressing the issues of tacit and explicit knowledge. The main finding of their literature review is that the usage of tacit knowledge occurs in two main 'schools', the 'difficulty' and the 'de facto' school. The 'difficulty' school, on the one hand, maintains that tacit knowledge is difficult to articulate or formalise. In the 'de facto' school, on the other hand, all knowledge is tacit as long as it has not yet de facto been articulated or formalised (Hedesstrom and Whitley, 2000:5). However, they stress that, in order to be true to Polanyi's original intention, any treatment of explicit knowledge must include tacit knowing as one important element and precondition. According to the authors, a sharp division between tacit and explicit knowledge, as displayed in much of the knowledge management literature, is therefore impossible, unsound and not meaningful.

Although Polanyi's idea of tacit knowledge found widespread acceptance through being prominently drawn upon in subsequent writings of Nonaka et al. (Nonaka, 1994; Nonaka and Takeuchi, 1995), it was not without critics. Some authors may find his tacit dimension too narrow (Spender, 1996) and more recently some have even doubted the relevancy of his concept to understand organisational tacit knowledge (Gourlay, 2004 and Tsoukas, 2003).

After we have briefly touched upon the background of the concept of tacit knowledge, let us now turn to codified knowledge. Before we can analyse and compare how the three perspectives treat knowledge codification, we will need to review in more detail contributions of economists, management scholars and a critical group of relational authors from the field of organisational behaviour and information systems. This will

[1] The term knowledge management refers to organisational efforts since the late 1990s to implement technological solutions for the creation, storage and distribution of organisational knowledge (cf. Wiig, 1997; Prusak, 2001). The literature in this area forms one part of the business studies and management perspective on knowledge codification that will be outlined later on in this paper.

be achieved by a categorisation along the metaphors of 'known knowns', 'known unknowns' and 'unknown unknowns'.

The economist perspective - the 'known knowns'

The subscribers to this particular perspective draw a distinction between the realm of codified knowledge and that of tacit knowledge. They particularly emphasise the importance and potential of codified knowledge. In other words, they concentrate on the 'known knowns'. Historically, knowledge in the field of economics was equated with the concept of information and both terms were used interchangeably without clear distinction (cf. Arrow, 1962 and Nelson, 1959). Such a simplified approach led to the view that knowledge would have the properties of a true non-rivalry good. By this it was meant that once information (which is taken to be equivalent to knowledge) is created, its value does not depreciate nor is it diluted or dissipated through use. In other words, despite already being applied in the solution of a practical problem, knowledge can still provide the same benefit to other users who encounter a similar problem. Moreover, within this perspective it is argued that information (and hence knowledge) can be comparatively easily (i.e. with modest cost) stored, transferred and distributed. This in turn led to the conclusion that more information or knowledge means more economic benefits.

Since this early treatment of knowledge within economics however, a range of more differentiated arguments than the simple equation of knowledge as information have appeared. These include the acknowledgement of the importance of tacit knowledge as a source of growth of capabilities for the organisation (cf. Nelson and Winter, 1982) within the stream of evolutionary economics. Nelson and Winter argue that the workforce itself holds amounts of knowledge that are kept within themselves and could potentially have a significant impact on organisational performance.

More recently, however, a strand of theorising has emerged within the economics literature, which recognises the grown importance of knowledge related research in other fields and adds a distinct perspective on the particular subject of knowledge codification. These authors complement the previously two-sided split of knowledge into tacit and codified types with the addition of a third, the 'unarticulated', or 'not yet codified' type. They contrast the dichotomy between tacit knowledge and codified knowledge by an extension to Polanyi's original view.

Contrary to the somewhat overly inclusive interpretation of Polanyi's statement that tacit knowledge is a component of any knowledge that other authors hold, they do not assume that the receiver of knowledge has no previous knowledge to build upon. Authors of this strand rather differentiate between tacit and explicit knowledge by rephrasing and rearranging the terms, i.e. by using tacit as unarticulated knowledge and explicit as codified or articulated knowledge. With that distinction a formula can be devised that reads: information = codified knowledge and knowledge = tacit knowledge + information. Now a third category, that of 'not-yet-codified', still unarticulated knowledge is introduced (Cowan et al., 2000). It is interesting to note here that questions might still be raised about the possibilities of what and to what degree of completeness it exactly is that knowledge can be potentially articulated, i.e. is it possible at all to fully articulate certain 'experiential' forms of knowledge such as sensory events that make use of taste or sounds? However, the most important aspect of this addition of unarticulated, not yet codified knowledge is that the immutably opposed position of tacit vs. explicit is extended and in concentrating on what is

articulable but not yet codified, this economist perspective provides a new framework for treating the previous divide. Through the introduction of this new category, the focus of analysis is shifted towards the potential articulability of knowledge and thus increases the sphere for possible codification. For an economist it is very difficult to say much about unarticulable (and tacit in its literal sense) knowledge, since there is no way of making decisions about whether to codify it or not.

The workings of this 'unarticulated' knowledge category are explained with the idea of a codebook. That concept is based on the assumption that any codification requires a set of codes that can be assembled in a codebook. Such a codebook does not have to be manifest but must be in place for both the production and interpretation of codified knowledge. The codebook is a metaphor which can be taken as being similar to a dictionary translating between two different languages.

The emphasis of the model by Cowan et al. (2000) is on the articulated, i.e. codified, and unarticulated parts. Here, a codebook is the major means of knowledge codification. In the case of articulated knowledge, the codebook clearly exists, otherwise the knowledge could not be identified as being codified. Unarticulated knowledge, however, is principally divided into two subgroups, which deal with the location of the codebook. In the one group, unarticulated knowledge is not yet codified, hence no codebook exists. In the other group, a codebook might exist but might not be actively referred to, for example by members of a closely interacting community. Cowan et al. (2000), call this case the displaced codebook. They suggest that this codebook will be difficult to locate within the group and no outside and occasional observer would be able to easily recognise it. An observer without the knowledge of codebooks would rather stipulate that such a group appears to be using large amounts of tacit knowledge. One reason that this could seem so would be the kind of language and jargon used within the group or epistemic community[2]. The idea of the displaced codebook and the focus on de-codification and usage of that codified knowledge by others makes it clear that codified knowledge cannot be usefully discussed without consideration of its temporal, spatial, cultural and social context (Cowan et al., 2000). In summary, Figure 1 shows the simplified version of the model by Cowan et al. (2000) described in this paper.

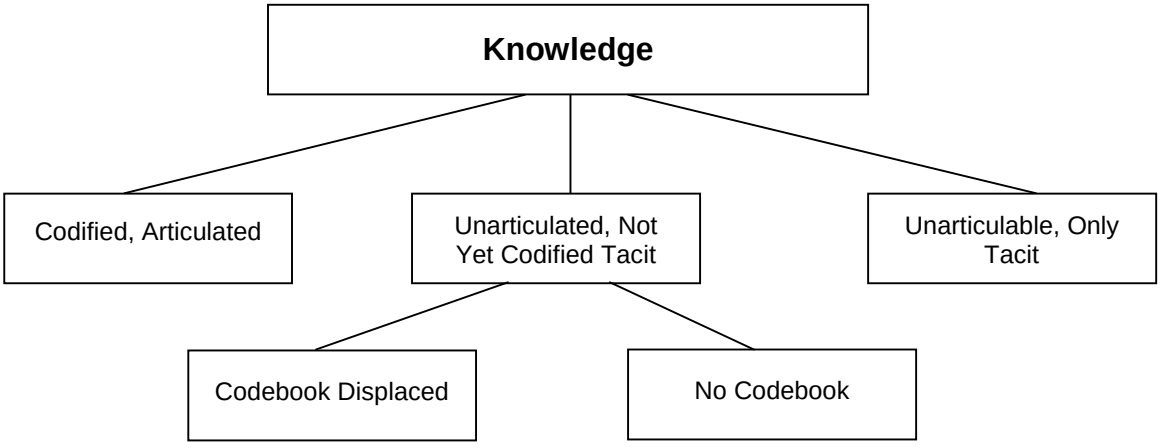

Figure 1: Topography of knowledge types (adapted from Cowan et al. 2000:231)

[2] The term epistemic community already points to an interesting link to the literature on communities of practice that forms part of the organisational behaviourist perspective which will be introduced in the analysis.

Although their model might be a good starting point to explain the reproduction of articulated and unarticulated knowledge, there is still a gap which was not addressed in this paper. One criticism could be that it fails to consider possible means for reproduction of tacit knowledge as proposed for example by Lave & Wenger (1991) or Brown and Duguid (1991), which is closer elaborated in the section on the critical perspective, on the 'unknown unknowns'.

In another account of this specific strand of economics, Foray and Steinmueller (2003) provide a scenario on the future of knowledge codification with the introduction of the idea of inscription. In opposition to Nelson and Winter's (1982) original focus they "maintain an agnostic position regarding tacit knowledge, which we regard as no more fundamental or essential in the reproduction of human expression or works than other mechanisms." (Foray and Steinmueller, 2003:302). Contrary to the common portrayal that tacit knowledge is the only mechanism for the individuation of skills and organizational routines, they argue that the absence of scripts and inscription does not necessarily demonstrate their total impossibility. Although they recognise the difficulty of making knowledge explicit and reproducible, they argue that "new opportunities are emerging for scripting, the reproduction of human expression and works, with the potential for transforming the rate and direction of both variety production and selection" (Foray and Steinmueller, 2003:303). This very much follows the idea that technology provides new possibilities for the explication of tacit knowledge, similar to Polanyi's (1967) example of face recognition described earlier. Foray and Steinmueller (2003) argue that this change of perspective on knowledge codification holds the potential for a paradigm shift away from our current literate culture much in a similar vein as the difference from today to the oral cultures of pre-literate societies.

Despite its theoretical appeal, applied or practical research in this area is still relatively scarce. This is because the theory is relatively recent and people have literally just begun to explore cases with this framework.

To summarise, recent subscribers to the economic perspective on knowledge codification try to better understand the processes to transform tacit knowledge to explicit knowledge in order to question whether what has been included in the tacit dimension is too broad (e.g. language), incorrectly allocated (as in the displaced codebook), or allocated without consideration of feasibility if cost conditions or incentives change (articulable knowledge). These authors focus on the known knowns, i.e. on codified or codifiable knowledge.

The knowledge management perspective - the 'known unknowns'

This perspective does not propose an explicit literature on knowledge codification, but focuses on how tacit knowledge can be made explicit as well as how the location and diffusion of knowledge in a universal and codified sense can increase a firm's competitiveness. Starting from a concentration on the core competencies of the firm (cf. Prahalad and Hamel, 1990), a knowledge-based view of the firm has developed within the mainstream business and management literature. Within this perspective, whilst drawing heavily on the concept of tacit knowledge by Polanyi, models of a 'knowledge spiral' and later of 'knowledge assets' have found wide recognition (Nonaka, 1994; Nonaka and Takeuchi, 1995; Boisot, 1998). As these models deal openly with the transformation from tacit to codified knowledge, the term 'known unknowns' could be used as a metaphor for this perspective.

Nonaka (1994) suggests a new framework for organisational knowledge creation, which he calls the 'knowledge spiral'. Briefly summarised, the way in which knowledge is created within organizations is through a constant dialogue between tacit and explicit knowledge in relation to the different knowledge levels growing from the individual over the group and organisational to the inter-organisational level. Nonaka (1994) claims that existing knowledge can be transformed into new knowledge through the four different modes of socialisation, combination, externalisation and internalisation. These modes of knowledge creation can occur at all knowledge levels; but moving beyond the individual level requires deliberate management to form a continual cycle that expands organisational knowledge.

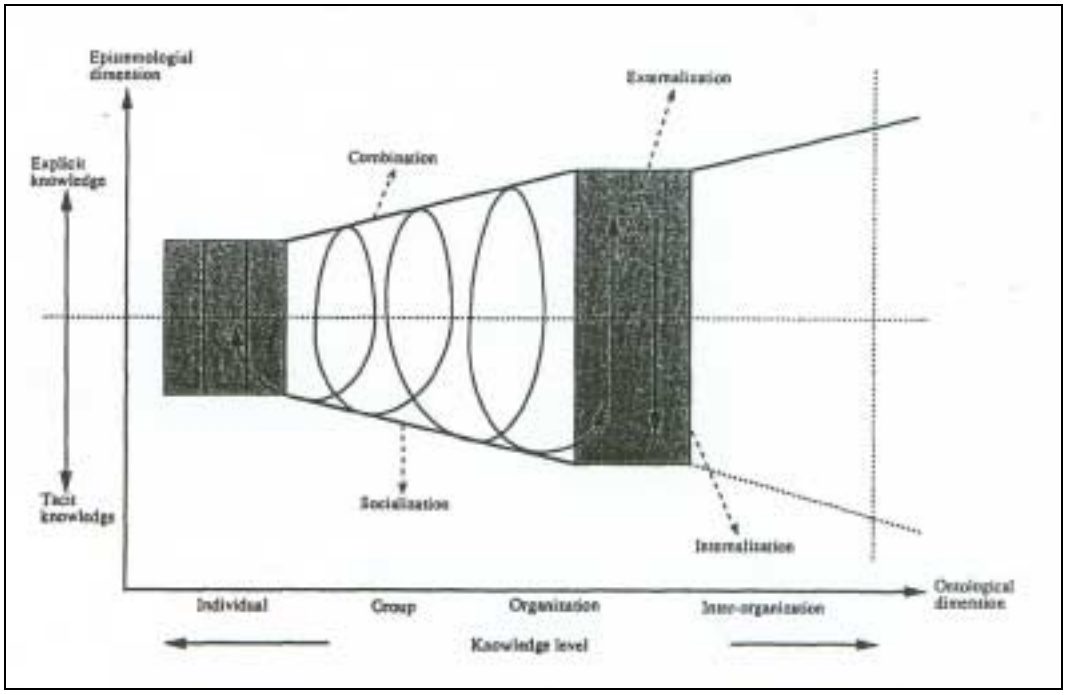

Figure 2: The spiral of organizational knowledge creation (Nonaka, 1994:20)
(original published text)

Through socialisation, tacit knowledge is passed on between the different knowledge levels, while combination relates to the exchange, reconfiguration and re-contextualisation of explicit knowledge. Internalisation, as the third mode, describes the transfer from explicit to tacit knowledge and is similar to the familiar concept of learning. Nonaka's (1994) focus lies on externalisation as a means of transforming tacit into explicit knowledge since this is the least understood and theoretically developed of all the four processes. Focussing on this mode of externalisation, the author provides guidelines for organisations as to how they can mobilise the tacit knowledge resources held by their individual employees and work groups. Suggestions include particular organisational forms and management styles, facilitating the formation of self-organised teams, the possibility of sharing experiences and establishing dialogue, the creation of creative chaos and the necessity of establishing standards for evaluating the quality of knowledge. The 'knowledge spiral' with its four modes of knowledge creation has been referred to in many contributions in the business and management literature (e.g. Davenport and Prusak, 1998; Earl, 2001).

While many authors in the management literature propose a range of different taxonomies of knowledge, detailed epistemological questions are mostly avoided.

This means that the distinction between tacit and explicit knowledge is briefly referred to but never further elaborated. Those authors that actually attempt to define knowledge remain rather vague and unspecific. For example, Davenport and Prusak (1998:5) propose a definition of knowledge that confuses more than it explains:

> Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it is often embedded not only in documents or repositories but also in organisational routines, processes, practices, and norms.

After reading such a definition, it remains rather unclear what is actually meant by knowledge. To explain knowledge by referring to both 'contextualised' information and experiences cannot lead to clearer understanding.

Recognising the value of capabilities and their contribution to the competitive position of firms has led to a growing literature and development of IT systems in the area of 'knowledge management'[3] The idea of being able to manage what an organisation knows has encouraged many organisations to implement projects labelled 'knowledge management systems' of which a number of successful cases have been described (Davenport et al., 1998; Davenport and Prusak, 1998; Earl, 2001). For example, Davenport et al. (1998:43) present eight key factors that they claim can "help a company create, share and use knowledge effectively". Despite being aware of the ambiguity of the terms success and failure, they report on a study of 31 'knowledge management' projects in 24 companies, which was used to determine a typology of eight success factors. For Davenport et al. (1998:50), these success factors are:

- Link to economic performance or industry value
- Technical and organizational infrastructure
- Standard, flexible knowledge structure
- Knowledge-friendly culture
- Clear purpose and language
- Change in motivational practices
- Multiple channels for knowledge transfer
- Senior management support

In addition, the question of storage of organisational knowledge is also addressed as one of the primary objectives of the studied projects by Davenport et al. (1998). The creation of knowledge repositories is distinguished into three types. Organisations store

1) external knowledge such as competitive intelligence
2) structured internal knowledge such as research reports, product-oriented marketing materials, and techniques and methods, and
3) informal internal knowledge such as discussion databases for easy retrieval.

Davenport et al. (1998:45) use the term knowledge and information rather interchangeably when explaining the content of these three repositories. Informal internal knowledge repositories are those where reference is made to the tacit knowledge in "the minds of people" as opposed to explicit knowledge. In order to

[3] The inverted commas here are due to my rather critical position towards the manageability of knowledge, especially all organisational knowledge, with a project under such a label. My view is in line with Alvesson and Kärreman (2001), that both terms are rather contradictory in their literal sense which is why the combination of these terms should be used with great caution.

transfer tacit knowledge from individuals, "organizations usually use some sort of community-based electronic discussion" (Davenport et al., 1998:45). Other primary objectives of 'knowledge management' projects were identified, such as improving knowledge access, enhancing the knowledge environment, and managing knowledge as an asset.

Earl (2001:217) also reviews a number of 'knowledge management' cases in order to map these in what he calls an "early classification or typology of 'schools' of knowledge management". Writing from a strategic point of view, a clear definition of knowledge is avoided[4] "because many knowledge management endeavours are concerned with both explicit and tacit knowledge and with both internal and external knowledge.[...]" and further "(m)any CKOs[5] and CEOs (chief executive officers) interviewed for this research are not overly concerned about the distinctions between data, information and knowledge" (Earl, 2001:218). With the differentiation of three 'schools of knowledge management' into technocratic, economic and behavioural schools, the main focus of Earl's paper (2001) is on the practical implementation and use for managers in providing an overview on the different choices and approaches organisations have available.

In brief, the concept of knowledge has been treated in a rather undifferentiated and uncritical fashion by authors writing from this perspective. The classification of this perspective as 'known unknowns' is meant to emphasise the organisational procedures for diffusing important knowledge and for making tacit knowledge explicit, i.e. the process of translating known unknowns into knowns. Some of the more critical organisational issues raised by the knowledge debate are central to the third perspective that will be examined in the following section.

[4] Although mentioned as one of the keywords of the article.
[5] Chief Knowledge Officers

The critical perspective - the 'unknown unknowns'

This perspective holds a rather negative view on the codification of knowledge and 'knowledge management', due to the fundamental perception that knowledge can only be held within people and their communities. The rejection of codified knowledge is based on the assumption that codification means standardisation and objectification of knowledge. For example, following a social constructionist epistemology Berger and Luckmann, 1967) argue that all knowledge is constructed for use in particular groups or communities and hence cannot be objective or universally applicable. According to this argument, codification of knowledge is therefore neither desirable nor possible. If knowledge cannot be separated from the people that create, hold and use it, this also implies that it can never be simply transferred to others through an IT system. The critical stance towards knowledge codification is further explained by the perspective's call for a clear distinction of the terms data, information and knowledge. For example, Checkland and Holwell (1998:90) illustrate this distinction along a continuum from data over capta and information to knowledge, as illustrated below.

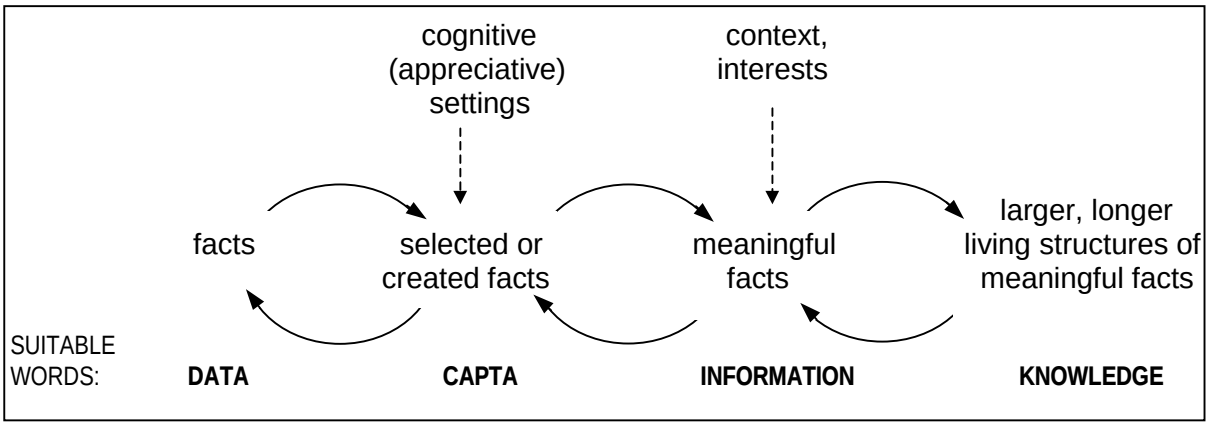

Figure 3: From data to knowledge (Checkland and Holwell, 1998:90)

According to the authors, data[6] can be understood as the plethora of facts about the world, which can be expressed in symbolic representations of observations or measurements. However, out of this mass of data only a small fraction is known, paid attention to or created by us. This sub-set, which is derived through selecting and categorising data, is what Checkland and Holwell (1998) call capta[7]. Once we have arrived at capta, we can enrich them by setting them into context. This means that as we begin to appreciate those chosen facts as parts of a larger whole, we give meaning and significance to them and thus transform them into information. This transformation process can be individual or collective depending on whether the context is unique to an individual or shared by several people. What the authors emphasise, however, is that attributing meaning is an inherently human act that a machine can never accomplish. Even if the designer of a computer system aims at processing capta into a more useful form, it is highly unlikely that the presented output will yield the same information to every user. Terms such as 'management information systems' are thus already a misnomer if not an oxymoron. If the creation of information is already uniquely human, this is even more so for knowledge. In other words, what can be transferred and shared using IT is "not knowledge, not even information, but data" (Galliers and Newell, 2000:4). In Checkland and Holwell's

[6] Coming from the Latin word 'dare', which means 'to give'.
[7] Relating it to the Latin word 'capere', which means 'to take'.

(1998) continuum of increased semantics, knowledge, as the last stage, is the nexus of related information into larger structures of greater density and longevity. Using this distinction, a book or a patent would at most contain information on a particular subject but could never be regarded as knowledge.

The debate among organisational behaviourists also includes other sceptical positions towards knowledge management systems as seeking to embrace new tools, techniques and technology at the expense of human beings (cf. Scarbrough et al., 1999) as well as labelling the rise of knowledge management literature yet another management fad (Scarbrough and Swan, 2001).

A particular group of critical writers in this field takes a human-centred view of knowledge. Authors of this research stream have called themselves 'relational writers' (Hayes and Walsham, 2000). This group emphasises that knowledge is neither a commodity, nor a "quantifiable trade asset" (Walsham, 2001:600, also Hayes, 2001 and Schultze, 2003). Sceptical comments such as those made by McDermott (1999), who early on addresses the limitations of information technology in knowledge management are taken up by these authors and are further developed. For example, Walsham (2001) sees no automatic benefits for human communication and action from the improvements and capabilities that new Information and Communication Technologies (ICTs) offer. He is suspicious of claims of successful 'knowledge management initiatives' which rely solely on the use of ICTs to leverage organisational knowledge and argues that ICTs do "not replicate or replace the deep tacit knowledge of human beings which lies at the heart of all human thought and action" (Walsham, 2001:607). Walsham (2001) further argues that electronic media cannot replace the need for personal relationships due to their lack of means to develop and maintain these effectively. However, he acknowledges that computer-based systems might be able to enhance human activities if they can support the communication of meanings and ideas.

Some examples of research studies using this critical approach are on the impact of 'knowledge management' initiatives on people in organisations such as banks (Newell et al., 2000), pharmaceutical companies (Hayes and Walsham, 2000) or manufacturers (Schultze, 2000; Schultze and Boland, 2000). Newell et al. (2000) studied the introduction of an intranet at a large bank and found that instead of increasing the global network and interconnection, in this particular case, the opposite outcome was achieved – electronic fences were created. Hayes and Walsham (2000) documented the potential for conflict that arose when sales representatives were introduced to Lotus Notes databases and were forced to enter sales information and leads into a portal with shared access. They describe the new technology as simultaneously enabling and constraining knowledge work. Not only did the political dimension of constant monitoring by superiors prevent usage in an effective way, but also on a day-to-day basis sales leads would not be entered until well after the closure of a deal because people feared negative consequences for income and status. The database, Hayes and Walsham (2000) argue, created political and social enclaves, which were not present before the introduction of the technology. These two studies echo Zuboff's (1988) idea of the 'information panopticon', which draws on the idea of constant workforce surveillance through technology and the interplay between those observed and the observing organisation.

Schultze and Boland (2000) and Schultze (2000) research the introduction of a knowledge management system and the change involved in the work practices of knowledge worker groups. For these authors, the technological limitations of the new

system reinforced the barriers to knowledge sharing within the studied organisation and eventually contributed to the failure of the whole knowledge management project. This is one of the rare researched and documented cases on a failed systems introduction particularly in knowledge work.

In brief, the outlined perspective concentrates on the social and contextual processes that surround the knowledge work of people and their tacit knowledge. Due to the perspective's rejection of the usefulness and possibility to codify knowledge, codification as a topic is completely disregarded. The only focus lies on tacit knowing, as for these authors knowledge is inseparably bound to practice and context. As already described above, tacit knowledge in Polanyi's sense involves its incommunicability. Therefore, the appropriate metaphor for this strand of theorising and research is the 'unknown unknowns'.

A comparison of the three perspectives on knowledge codification

After having presented three different perspectives on knowledge codification, let us now compare and contrast these views in more detail. This comparison will be undertaken using the previously described model on the topography of knowledge by Cowan et al. (2000). This is done in order to clarify the 'lines of demarcation' between the perspectives along the different categories of knowledge from codified over codifiable to tacit. Using this topography of knowledge, the boundaries between codified/unarticulated and unarticulated/tacit can be related to the three academic perspectives.

Economist versus business perspective

This comparison can be held along the lines of codified versus unarticulated knowledge. While the availability and value of codified knowledge is of major importance from an economist point of view, the presented accounts in the management field are mostly situated within the 'unarticulated' or 'not yet articulated' domain. This is because of the attempt to build models of best practice in organisational knowledge generation (Nonaka, 1994, Nonaka and Takeuchi 1995 and Boisot, 1998) which try to transform tacit knowledge into codified knowledge. In contrast to this, for example Foray and Steinmueller (2003), in line with their economic perspective, remain agnostic about the importance on tacit knowledge. For them emerging technologies for inscription open new approaches to codification of the 'affective' or 'evocative' character of the learning process which underlies the acquisition or internalisation of knowledge. For them, the absence of codification is not evidence for the impossibility for knowledge to be codified but a failure of imagination or will (or a lack of resources) to create an effective script. While both sides acknowledge the inherent difficulties to achieve the codification of knowledge, much of the management literature stays rather vague on clear definitions and implementation advice. While some studies have focussed on exemplary success stories (Davenport et al., 1998 and Davenport and Prusak, 1998) and strategy recommendations (Earl, 2001), there is no clear applied research that proves the developed transformational models. A lot of proof is left to anecdotal evidence with the sole focus on the cases that have been successful.

Business versus relational perspective

In a similar vein to the codified knowledge approach by economists, relational writers also criticise the approaches offered by mainstream business and management literature. The relational writers have rejected the treatment of knowledge as an entity and as an economically valuable trade asset as they contend the separation of knowledge from its owners and the possibility of transformation of tacit to codified knowledge. For them knowledge is inseparably bound to knowing, i.e. its owners or the group of owners and is therefore highly context dependent and practice specific. Views that suggest the simple transmission of knowledge with the help of technology are simply rejected as impossibilities. Much of this very critical perspective can be attributed to the apparent agnosticism towards the 'management hype' of the knowledge concept, for example through the growing literature on knowledge management (cf. Scarbrough and Swan, 2001). From a relational point of view, exaggerated expectations on gains in competitive advantage by leveraging organisational knowledge did not come to bear any fruit, neither in theory nor in practice. Fine grained research insights into the work practices and routines of 'knowledge workers' demonstrate the difficulty of mainstream business approaches.

Economist versus critical perspective

By and large, economists regard knowledge as an objective commodity, whereas organisational behaviourists look at knowledge as particular and only of value to specific groups or individuals. The most profound contrast on the concept of codified knowledge can be found between the two extreme positions held by the emerging group of economists and the relational writers. This is because both perspectives do not recognise each other's most valuable contribution. On the one hand, relational authors contest the ability to codify knowledge at all; on the other hand, economists reject the usefulness of the discussion of unarticulable knowledge in the social sciences (Cowan et al., 2000:230). This extreme positioning simulates the dichotomised view of the traditional divide between tacit and explicit knowledge. After all, would it not be helpful to consider strengths and insights of one view in advancement of the other? How this might be achieved will be outlined below. However, before moving on to a possible way of bridging these two extreme positions, let us contrast and summarise the three perspectives, emphasising the three types of knowledge, the economic properties, problem areas and some technologies that would be useful to be considered in this domain.

	Codified Knowledge the 'known knowns'	Unarticulated Knowledge the 'known unknowns'	Tacit Knowledge the 'unknown unknowns'
Economic properties	Non-rival good, Quasi equals information, Easy to store & transmit, Needs codebook	Potential value if known how to articulate & cost of articulation is clear	Idiosyncratic to owner or community Economic value rather difficult to assess
Problem areas	• Codebook - transformation & appropriation • More codified knowledge is not always positive but equals information 'flux'/overload, • Owner/Context specific – for interpretation and usage as well as creation • Most information/knowledge cannot/will not be used	• Codebook is displaced or needs to be invented/created, • At what cost? • Potential trouble with languages • Political reasons for 'unarticulated' states • If articulated, might lose history, hierarchy and tradition	• No quality assessment / measurement possible • Misuse with 'all or nothing' meaning of concept, • What cannot be articulated cannot be known to exist (for self and others), • Neglects business interests and potential economic benefits • Difficult to make decisions on possible transition to other knowledge type • Forecloses any further exploration in direction of codification
Tools of knowledge creation	Portals and Databases, WWW, books, networks	Inscription tools (recording of film and sound), Human mind and group/community interaction	Human mind and group/community interaction

Table 2: Analysis of properties, problems and tools of different knowledge types

The economic properties of each knowledge type emphasise the earlier categorisation into 'known knowns', 'known unknowns' and 'unknown unknowns'. We can observe a decreasing economic value from codified knowledge as non-rival good over the potential value of unarticulated knowledge to the non-apparent value of tacit knowledge due to its connection to its owner or community. Some problem areas for the discussion are identified for each perspective. For codified knowledge, the codebook is an important means to transformation and appropriation. Given a working codebook in place, the unlimited growth of codified knowledge would lead to problems for later retrieval and reuse. In the case of unarticulated knowledge, the location or creation of a codebook is of main importance. Should the codebook be displaced, difficulties can arise in locating it, associated with potentially large costs for the creation of a new one. For tacit knowledge, the assessment of its value remains problematic. In the most extreme case one could argue that what cannot be articulated cannot be known to exist. Further, all tacit knowledge that potentially could be articulated in this model is treated in the unarticulated category. The different forms for articulation are not yet fully researched and understood and, as technology evolves, will need further exploration and adaptation. Finally, we point at some tools that could be used for the facilitation of storage and transfer of the different knowledge types. Codified knowledge can be accessed through portals and databases, the World Wide Web, books and networks. Inscription tools for the recording of film and sound hold the potential for further codification of previously only tacit knowledge. Tacit knowledge is seen as bound to the human mind and interaction in groups or communities.

Call for situated studies

Cowan et al. (2000) called for in-depth case studies to reassess the validity of the ('displaced' or 'too costly to be produced') codebook argument. Such studies would involve an initiation process into the group or community that would be studied. As a result, direct participatory research is suggested in order to immerse into the specific language of the community and to directly observe day-to-day knowledge work practice and routine. However, such situated study needs a conscious approach to the subjectivity/objectivity issues of a participating researcher and would hence require a constant reflexive process to make sense of events on and off the field.

From a theoretical side, research into groups and communities could be informed by looking at the concepts of legitimate peripheral participation by Lave and Wenger (1991) or communities of practice by Brown and Duguid (1991). Although studies of organisational behaviourists have employed these theories for their purpose, they could similarly facilitate an active and structured search for codebooks within communities. A revisit to studies of the kind referred to in the relational perspective equipped with Cowan et al.'s (2000) theory can potentially produce detailed results on the mechanisms of how to uncover a codebook within a community. Situatedness in the field or within a group would allow a researcher to become a 'fully initiated insider' who might be able to reveal some of the contextual factors that allow codebooks to be created in the first place, to be displaced or recreated. Without the outright rejection of the codification argument in such studies, a closer look at the role that ICTs play in these work settings could prove to be valuable. In this direction situated studies seem to suggest a way forward but must be carefully set up and arranged so that they do not try to claim to stand for more than they potentially can provide, i.e. on matters of idiosyncrasy versus generalisation or policy recommendation. For theory building, however, it has been shown elsewhere that qualitative and situated studies do have validity and can provide a useful contribution to theoretical and empirical sense making in technology adoption and evolution (D'Adderio, 2001).

Limitations and conclusions

To conclude this paper, a number of limitations need to be pointed out. Firstly, it must be stated that the selected examples from the literature are far from being an inclusive sample. This is because the paper concentrated on presenting some of the key authors and research studies at the expense of a comprehensive review of each perspective. This was done in order to give a flavour of each perspective, its foci and ways of thinking. Secondly, although the main contributors were presented and categorised, objections might be raised on the appropriateness of their classification. Every classification necessitates simplification, and so areas of overlap between the three perspectives are as unavoidable as is variation and disagreement within one perspective. The three categories should therefore not be taken to imply that every economist, every management theorist and every organisational behaviourist has to agree with the described view on knowledge codification. Thirdly, in a rigid academic setting within any single one of the disciplines, some of the highlighted differences and similarities might not be taken as valid points due to the inherent disciplinary structures of thought. For example, both the extreme positions of economists and organisational behaviourists do not recognise each other's contribution in the first place, when rejecting unarticulable knowledge as a worthwhile research ground, or similarly disregarding the potential economic value of codified knowledge.

With the introduction of the codebook, Cowan et al. (2000) have provided an intriguing model that has the potential to shed light and fresh insight on the classic dichotomy between tacit and explicit knowledge. The application of the model on the three presented perspectives has revealed that apart from semantic differences, epistemological boundaries are hard to bridge. There are three main conclusions that can be drawn from this comparison. First, when the focus of research shifts away from the sometimes rigid academic straightjacket of any particular discipline and looks at other disciplines, interesting cross-applications might be revealed. Although not entirely practical in outlook and appeal, the review and comparison of the perspectives has highlighted insights into what might be overlooked when considering only one stream of research. In addition, the empirical research into the contextual elements that constitute boundaries between codified/unarticulated knowledge or the 'known knowns' and the 'known unknowns' in search for a codebook within specific communities has the potential to provide valuable contributions to the codification debate. Moreover, further advancement of general qualitative research methodology might be achieved. To this extent, further situated studies might provide a better understanding on the general usefulness of these approaches in the field of information systems and knowledge research and might reveal clear cut-off points for questions of accountability and generalisation.

References

Alvesson, M. and Kärreman, D. (2001) 'Odd couple: Making sense of the curious concept of knowledge management', *Journal of Management Studies*, 38(7), 995-1018.

Arrow, K.J. (1962) 'Economic welfare and the allocation of resources for invention', in Nelson, R. (Ed.) *The Rate and Direction of Inventive Activity*, Princeton: Princeton University Press, 609-625.

Berger, P. and Luckmann, T. (1967) *The Social Construction of Reality: A Treatise in the Sociology of Knowledge*, Harmondsworth: Penguin.

Boisot, M. (1998) *Knowledge Assets: Securing Competitive Advantage in the Information Economy*, Oxford: Oxford University Press.

Brown, J.S. and Duguid, P. (1991) 'Organizational learning and communities of practice: Towards a unified view of working, learning and innovation', *Organization Science*, 2(1), 40-57.

Checkland, P. and Holwell, S. (1998) *Information, Systems and Information Systems - Making Sense of the Field*. Chichester: John Wiley & Sons.

Cowan, R., David, P.A. and Foray, D. (2000) 'The explicit economics of knowledge codification and tacitness', *Industrial and Corporate Change*, 9(2), 211-254.

D'Adderio, L. (2001) *Inside the virtual product: The influence of integrated software systems on organisational knowledge dynamics*, Unpublished DPhil Thesis, Brighton: University of Sussex, SPRU.

Davenport, T.H. and Prusak, L. (1998) *Working Knowledge: How Organizations Manage What They Know*, Boston, MA: Harvard Business School Press.

Davenport, T.H., De Long, D.W. and Beers, M.C. (1998) 'Successful knowledge management projects', *Sloan Management Review*, 39(2), 43-57.

Earl, M. (2001) 'Knowledge management strategies: Towards a taxonomy', *Journal of Management Information Systems*, 18(1), 215-233.

Foray, D. and Steinmueller, W.E. (2003) 'The economics of knowledge reproduction by inscription', *Industrial and Corporate Change*, 12(2), 299-319.

Galliers, R.D. and Newell, S. (2000) 'Back to the future: From knowledge management to data management', *Working Paper Series*, 92, London: London School of Economics and Political Science, Department of Information Systems.

Gourlay, S.N. (2004), 'Knowing as semiosis: steps towards a reconceptualization of tacit knowledge', in Tsoukas, H. & Mylonopoulos, N. (Eds), *Organizations as Knowledge Systems*, London: Palgrave Macmillan, 86-105.

Hayes, N. (2001) 'Boundless and bounded interactions in the knowledge work process: The role of groupware technologies', *Information and Organization*, 11(2), 79-101.

Hayes, N. and Walsham, G. (2000) 'Safe enclaves, political enclaves and knowledge working', in Prichard, C., Hull, R., Chumer, M. and Willmott, H. (Eds) *Managing Knowledge: Critical Investigations of Work and Learning*, London: Macmillan, 69-87.

Hedesstrom, T. and Whitley, E.A. (2000) 'What is meant by tacit knowledge? Towards a better understanding of the shape of actions', *Working Paper Series*, 87, London: London School of Economics and Political Science, Department of Information Systems.

Lave, J. and Wenger, E. (1991) *Situated Learning: Legitimate Peripheral Participation*. Cambridge: Cambridge University Press.

Latour, B. (1987) *Science in Action: How to Follow Scientists and Engineers Through Society*, Cambridge, MA: Harvard University Press.

McDermott, R. (1999) 'Why information technology inspired but cannot deliver knowledge management', *California Management Review*, 41(4), 103-117.

Nelson, R.R. (1959) 'The simple economics of basic scientific research', *Journal of Political Economy*, 67, 323-348.

Nelson, R.R. and Winter, S.G. (1982) *An Evolutionary Theory of Economical Change*, Cambridge, MA and London: Harvard University Press.

Newell, S., Scarbrough, H., Swan, J. and Hislop, D. (2000) 'Intranets and knowledge management: De-centred technologies and the limitations of technological discourse', in Prichard, C., Hull, R., Chumer, M. and Willmott, H. (Eds) *Managing Knowledge: Critical Investigations of Work and Learning*, London: Macmillan, 88-106.

Nonaka, I. (1994) 'A dynamic theory of organizational knowledge creation', *Organization Science*, 5(1), 14-37.

Nonaka, I. and Takeuchi, H. (1995) *The Knowledge-Creating Company*, Oxford: Oxford University Press.

Orlikowski, W.J. and Baroudi, J.J. (1991) 'Studying information technology in organization: Research approaches and assumptions', *Information Systems Research*, 2(1), 1-28.

Polanyi, M. (1958) *Personal Knowledge: Towards a Post-Critical Philosophy*, London: Routledge & Keagan Paul.

Polanyi, M. (1967) *The Tacit Dimension*, London: Routledge & Keagan Paul.

Polanyi, M. (1969) *Knowing and Being*, London: Routledge & Keagan Paul.

Prahalad, C.K. and Hamel, G. (1990) 'The core competence of the corporation', *Harvard Business Review*, May-June, 79-90.

Prusak, L. (2001) 'Where did knowledge management come from?', *IBM Systems Journal*, 40(4), 1002-1007.

Schultze, U. (2000) 'A confessional account of an ethnography about knowledge work', *MIS Quarterly*, 24(1), 3-41.

Schultze, U. (2003) 'On knowledge work', in Holsapple, C.W. (Ed.) *Handbook on Knowledge Management*, Berlin: Springer, 43-58.

Schultze, U. and Boland, R.J. Jr. (2000) 'Knowledge management technology and the reproduction of knowledge work practices', *Journal of Strategic Information Systems*, 9, 193-212.

Schultze, U. and Leidner, D.E. (2002) 'Studying knowledge management in information systems research: Discourses and theoretical assumptions', *MIS Quarterly*, 26(3), 213-242.

Spender, J.-C. (1996) 'Competitive advantage from tacit knowledge? Unpacking the concept and its strategic implications', in Moingeon, B. and Edmondson, A. (Eds) *Organisational Learning and Competitive Advantage*, London: Sage, 56-73.

Scarbrough, H., Swan, J. and Preston, J. (1999) *Knowledge Management: A Review of the Literature*, Institute of Personnel and Development, London.

Scarbrough, H. and Swan, J. (2001) 'Explaining the diffusion of knowledge management: The role of fashion', *British Journal of Management*, 12, 3-12.

Tsoukas, H. (2003), 'Do we really understand tacit knowledge?', in Easterby-Smith, M. & Lyles, M.A. (Eds), *The Blackwell Handbook of Organizational Learning and Knowledge Management*, Malden, MA & Oxford: Blackwell Publishing Ltd, 410-427.

Walsham, G. (2001) 'Knowledge management: The benefits and limitations of computer systems', *European Management Journal*, 19(6), 599-608.

Wiig, K.M. (1997) 'Knowledge management: Where did it come from and where will it go?', *Expert Systems With Applications*, 13(1), 1-14.

www 1, Plain English Campaign Foot in Mouth Award 2003, http://www.plainenglish.co.uk/footinmouth.html accessed 20 February 2004.

Zuboff, S. (1988) *In the Age of the Smart Machine: The Future of Work and Power*, New York: Basic Books.