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Taking steps towards the knowledge society

reflections on the process of knowledge development

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Barry Nyhan (ed.)

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Executive summary

This book examines ways in which professional and vocational education and training can contribute towards building the emerging ‘knowledge society’. In particular, it explores ways in which education and training can support the generation of the ‘action-oriented’ and social knowledge that people require for living and working in today’s world. A special focus of the book is on the distinctive role and contribution of the research and development community in taking proactive steps to shape the form of the ‘knowledge society’ coming into being.

The book contains a number of reflections and illustrations by those engaged in research and development work concerning the knowledge development strategies to be employed today. One of the key challenges highlighted by many of the authors is the need for researchers to adopt more ‘action-oriented’ approaches. This entails working closely with practitioners in ‘collaborative learning networks’ for the co-development of knowledge.

The book sets out to elucidate the meaning of knowledge development by looking at it from three different perspectives:

- providing illustrations of knowledge development actions in addressing ‘real’ problems;
- examining how information and communication technologies (ICT) can support knowledge development;
- analysing a number of theoretical and conceptual issues regarding knowledge development.

The book has been produced in the framework of the Cedefop research arena (Cedra), one of whose main objectives is to explore innovative research methodologies to support collaborative knowledge development.

Preface

The development of the knowledge society was declared to be one of the key goals of the European Union at the Lisbon EU summit of 2000. This entails both economic and social objectives, according to which Europe seeks 'to become the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion'.

The vocational education and training sector has a major role to play in the realisation of both of these dimensions of the knowledge society. Existing knowledge has to be constantly revitalised and made available to each new generation. But, also, and perhaps more importantly, new knowledge must be continuously developed. As the knowledge content of work increases, the manner in which people carry out their work is transformed and the issue of how to equip people with the necessary knowledge becomes a critical one. Indeed, today's knowledge workers must also contribute actively to the development of new knowledge. In the fields of working life and vocational education and training we are not talking about abstract or theoretical knowledge but rather knowledge about how to live and work in society. This calls for a rethink of every aspect of education and training activities.

In furthering its aim to be a 'European reference centre', Cedefop is carrying out analyses and undertaking studies related to new ways of thinking about education and training. Its work on lifelong learning, in support of the European Commission, examines the issue of how knowledge is continuously developed throughout one's life in contexts in which learning is embedded in everyday activities. This is closely related to another activity of Cedefop concerned with the identification, assessment and recognition of non-formal learning. Cedefop is also undertaking work related to quality assurance and benchmarking in vocational education and training.

This publication has its origin in work undertaken in the framework of the 'Cedefop research arena' (Cedra). The main aim of Cedra is to provide opportunities for researchers to collaborate in sharing and developing knowledge about vocational education and training. In pursuing the above goal, Cedra is following experimental pathways and pilot testing new methodologies, both real and web-based, for the development and sharing of knowledge. An overarching aim of Cedra is to maximise synergy between different research networks.

More specifically, Cedra sets out firstly, to provide a web-based platform for the research community to share information about research projects, resources, activities and events by means of the 'European research overview' (ERO). Cedra is also attempting to capitalise and build on knowledge that has been generated in European research programmes. The initial focus of this work is on learning in organisational and work-based contexts. In addition, Cedra is examining and promoting innovative research strategies in the context of the emerging knowledge society.

This publication relates to the last of these objectives. Although it is targeted at a research community audience, it has relevance for a wider readership in that it argues that knowledge for living and working today can only be developed through a close partnership between action-oriented researchers, creative policy makers and innovative practitioners.

In fact, a *leitmotiv* of the book is that knowledge development is a collaborative learning process that takes place in the context of active (but often informal) networks. The book itself is a product of a 'knowledge-sharing network' comprising internal Cedefop staff and external researchers who are involved with Cedefop in the development of Cedra.

Cedefop would like to take this opportunity to thank all of those who have been involved in the production of this volume, which it is hoped will stimulate further reflections and concrete actions concerning the manner in which the vocational education and training sector, and in particular the research community, can contribute towards the development of the knowledge society in Europe.

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Part One

Promoting knowledge development

CHAPTER 1

Introduction

Barry Nyhan

There are paradoxes about the use of the word ‘knowledge’. Even though the word is used frequently in everyday conversation, the notion of ‘developing knowledge’ appears to be a very esoteric activity undertaken by scientists or experts in research laboratories.

Similarly, even though the terms ‘knowledge society’ or ‘knowledge economy’ are used regularly in political discourse at European and national level, and are put forward as matters affecting everybody, when attempts are made to decipher what these terms really mean, they are often described in relation to advances in science and technology, and in particular information and communication technologies such as the world-wide web (www). In fact, the knowledge society is sometimes equated with the ‘digital society’ that is characterised by advances in electronic communication such as e-commerce.

1.1. Purpose of the book

The purpose of this book is to explore many of the different dimensions of the ‘knowledge society’. In particular, the contributors to this book examine ways in which those involved in research in the field of vocational education and training (VET) can contribute towards the shaping and building of the ‘knowledge society’. The kind of knowledge that vocational education and training is concerned with developing is ‘knowledge for working life’, that is, ‘practical’ knowledge about how to live and work in a way that enables society (and the individuals in society) to achieve political, economic and social goals. In other words, the aim of VET is to assist in the generation of collective and individual ‘practical knowledge’ or *know-how* that is necessary to manage today’s complex world - a world that is characterised by globalisation and an explosion in the development of information and communication technologies such as the world-wide web.

1.2. The changing role of research in the emerging knowledge society

The VET research community has a major role to play in the development of knowledge but, in today's context of the emerging knowledge society, researchers are being challenged to look anew at how they carry out their work. This book contains a number of reflections by researchers about the nature of research and the methodologies to be employed in today's context. The book has been produced in the framework of the Cedefop research arena (Cedra), one of whose main objectives is to explore innovative research methodologies that support collaborative and action-oriented knowledge development strategies ([1]). The papers in this volume are, in fact, the fruits of the reflection activities of those who have participated in the initial development phase of Cedra and can be seen as a kind of 'accompanying research' action.

One of the key challenges for researchers highlighted by many of the authors in this volume relates to the capacity of researchers to contribute to collaborative network-based knowledge development activities. In recognition of the fact that there are many sources of knowledge from the world of practice as well as the world of academia, the 'linear' and top-down thinking about the knowledge development process is being questioned and giving way to collaborative and interactive models (see Gibbons, 2000). In education and training this entails fostering close collaboration between researchers and practitioners in the development of a new knowledge base that will have a real as distinct from 'hoped-for' impact on the educational and learning policies being implemented in schools, colleges and workplaces (OECD, 2000).

([1]) The main aim of the Cedefop research arena (Cedra) is to promote opportunities for researchers to collaborate in sharing and developing knowledge about vocational education and training. It has three strands concerned with: sharing information and resources; thematic knowledge development; and reflecting on research and knowledge development methodologies. For further information go to the Cedefop website: http://www2.trainingvillage.gr/etv/cedra. Many of the papers in this book are based on presentations made at a Cedra colloquium which took place in Thessaloniki in May 2000 while others have been written especially for the volume.

1.3. What is in this book

This book sets out to discuss knowledge development from three different perspectives:

(a) a portrayal of knowledge development actions in addressing 'real' problems;
(b) an examination of how information and communication technologies (ICT) can support knowledge development;
(c) an analysis of theoretical and conceptual issues regarding knowledge development.

The chapters dealing with the theoretical issues have deliberately been placed in the last section of the book because of the fact that they may appeal only to specialist readers.

The book is divided into four parts.

1.3.1. **Part One - Promoting knowledge development**

Part One has two chapters including this short introductory chapter. The second chapter by Barry Nyhan, which is entitled 'Knowledge development, research and collaborative learning' sets out to provide an overview framework regarding the subject of the book and discusses many of the issues raised in the other chapters ([2]). It argues that knowledge development comes about through a process of interactive and collaborative learning between different institutions and actors. It points out that, while the education and training sector is dedicated to learning and knowledge development, very little collaborative knowledge development at a systems (or even organisational) level tends to take place because of the individualised and dispersed nature of the teaching, training and learning activities. This can only be addressed through developing a shared vocabulary between researchers and practitioners concerning the knowledge base that shapes educational practice.

([2]) An earlier version of this paper was published in Fischer, M. et al. (Hrsg.), *Gestalten statt Anpassen in Arbeit, Technik und Beruf*. Bielefeld: W. Bertelsmann Verlag, 2001.

1.3.2. Part Two - Illustrations of knowledge development actions

The four papers in Part Two discuss knowledge development strategies as a means to resolve the following problematic issues:

(a) clarifying the 'research promotion' strategies to be adopted by a European agency;
(b) finding a way to handle a contentious 'political' issue in European vocational education and training;
(c) designing and implementing development programmes to deal with the modernisation of a national economy;
(d) initiating a knowledge development exercise in relation to European vocational education and training mobility projects.

The first paper in this section by Pekka Kämäräinen entitled 'Supporting European research cooperation - reflections from a Cedefop perspective' presents a personal reflection of a Cedefop staff member on the rethinking of Cedefop's role *vis-à-vis* European research. It lays out the different options for Cedefop to consider, and stresses the importance of active-monitoring activities, community-building measures and the capitalisation of results.

The paper by Sten Pettersson 'Knowledge development and deliberative reasoning - the European forum of transparency of vocational qualifications', looks at how a complex and contentious European 'political' issue in vocational education and training, concerning the relationship between the qualification profiles in different European countries, was tackled by means of adopting a bottom-up 'deliberative reasoning' process implemented through a specially designed forum. It discusses the two 'knowledge development' approaches that formed the basis for the work of the forum. The first of these has its roots in the theory of 'deliberative democracy' while the second has to do with the exploitation of existing dormant knowledge.

The next paper by Bernd Hofmaier entitled 'Building arenas for collaborative development in a Swedish context' looks at the strategies adopted by the Swedish government and social partners in facing the challenge of modernisation. Hofmaier examines how a number of development programmes were implemented based on the concept of 'democratic dialogue' which entailed the use of 'search conference methodologies' and the formation of clusters and networks made up of enterprises and academic institutions.

The final chapter in Part Two by Søren Kristensen entitled 'Making sense of mobility projects as vehicles for learning' takes up the issue of how knowledge development work can be initiated on an issue that previously has been bereft of substantial qualitative analysis. It_outlines, from the perspective of a 'reflective practitioner', the current state of play in the implementation of mobility projects in the field of vocational education and training, pointing out the need to build in 'spaces' for reflection and learning in an area that is dominated by logistical considerations. These 'spaces' are necessary in the first case for the organisers of mobility projects so that they can design and build frameworks to exploit learning possibilities.

1.3.3. Part Three - Information and communication technologies and knowledge development

The two papers in Part Three draw on the experiences of the authors in working on the development of ICT tools and e-technologies to support research activities in the context of the Cedefop research arena.

The contribution of Alan Brown and Graham Attwell, entitled 'Creating spaces for knowledge development - reflections on ICT support for the Cedefop research arena' begins by examining a theoretical framework for knowledge development before going on to discuss basic principles concerning how ICT (and in particular web-based systems) can be integrated as a support for research and learning processes in Cedra. It goes on to elaborate on new ways in which computers can mediate communication and how the Cedra web-based 'research resource bases' (RRBs) were constructed.

The paper of Sabine Manning, entitled 'Web-based support for collaborative research' is based on her extensive personal experience in designing web-based support systems for research, including the 'European research overview' part of Cedra. It discusses how the interface between the information-provision and knowledge-development dimensions can be managed in the framework of an integrated web-support system to accompany all stages of the research process.

1.3.4. Part Four - 'Reflections on theories, frameworks and conceptual issues

This final part of the book has three chapters, which provide:

(a) an overview of research relating to theories of knowledge and knowledge development;
(b) an introductory exploration of the notion of the 'classical concept of practice' and a discussion on research methodologies suited to 'practice-oriented' or 'action-research';
(c) an examination of the role of computers in knowledge management.

The chapter by Massimo Tomassini, entitled 'Theories of knowledge and knowledge management - a preliminary overview' argues that education and training needs to broaden its perspective to take into consideration recent thinking about how knowledge is generated in the knowledge economy. It examines the links between economic and management oriented theories of knowledge in the context of a renewed interest in the epistemological dimensions of organisational knowledge.

The paper by Barry Nyhan entitled 'Capturing the knowledge embedded in practice through action research' begins by giving a brief overview of the classical notion of 'practice' which is very different to the common-sense notions of this term. It is argued that the dominant positivistic research methodologies are not adequate to exploit the contextual and tacit knowledge which is embedded in 'practice'. Appropriate 'action-oriented' research strategies, which enable researchers to engage with practitioners in common endeavours, are discussed.

The final paper, written by Tryggvi Thayer, is entitled ‘The limitation of computers in the management of knowledge’. This short exploratory paper written by an expert in the design of web-based tools examines the strengths and weaknesses of modern computer systems. It argues that while computers excel at things like storing information, managing relationships between different information bases and doing what they are told, it does not make sense to call them ‘knowledgeable’ in the sense they can engage in creative reasoning and knowledge development activities similar to human beings.

CHAPTER 2

Knowledge development, research and collaborative learning

Barry Nyhan

2.1. Introduction

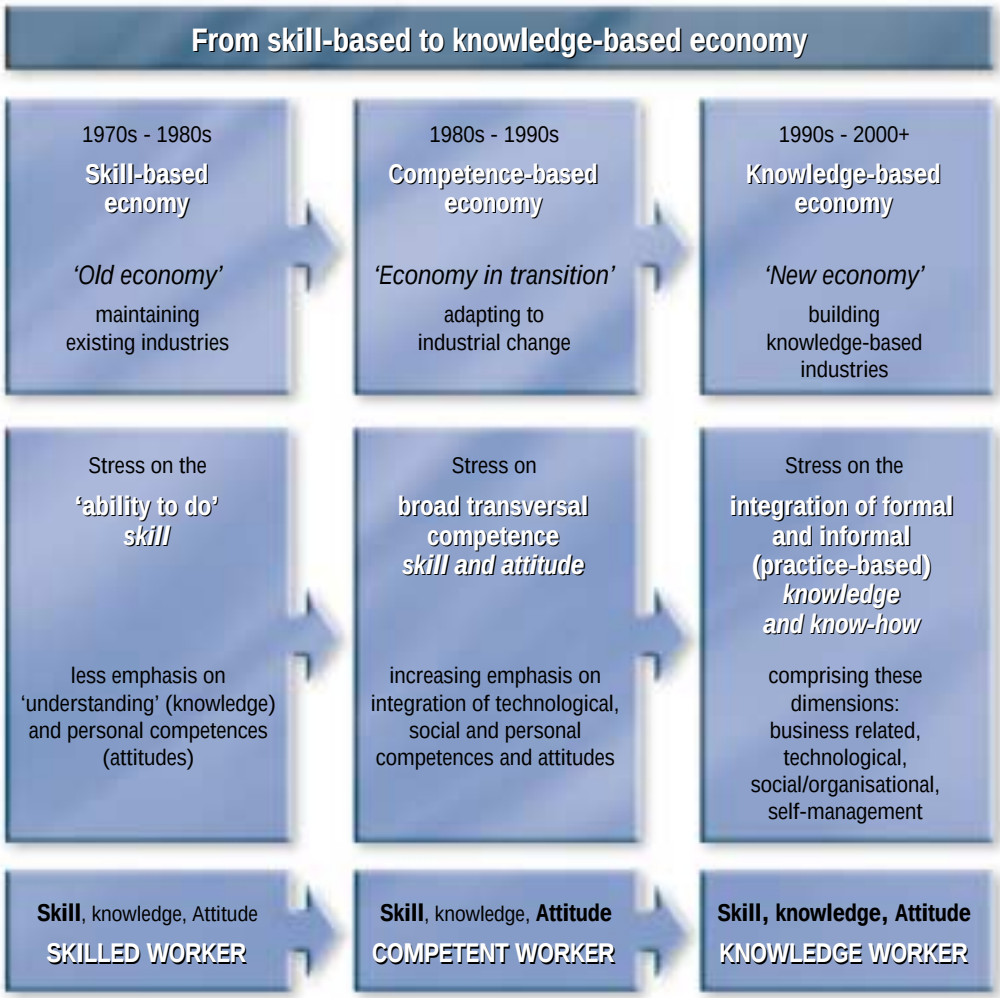
2.1.1. Knowledge development for the knowledge society

The word ‘knowledge’ is used in many different contexts today to capture what is distinctive about modern society, which is often referred to as the ‘knowledge society’. An education and training policy document of the European Commission published in 1997 was entitled ‘Towards a Europe of knowledge’. The Lisbon Summit of the European Council in March 2000 outlined a strategic goal for the European Union for the next decade as: ‘to become the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion’. The term ‘knowledge economy’ or ‘knowledge-based economy’ was coined by economists to describe the characteristics of the so-called post-industrial advanced economy. In a human resource management and development context the term ‘knowledge management’ has come into being to describe the processes through which companies develop, mediate and use knowledge.

But ‘knowledge’ is not a new word. Why, therefore, has it become central to contemporary discourse and what are the deeper meanings that it conveys about the nature of modern day work activities? People are entitled to ask if these newly coined terms are just jargon thought up by academics in university business faculties to sell their books or just marketing ploys of management consultants or information and communication technology companies to promote their goods and services. Or, do the various knowledge-related concepts offer us useful new insights?

While knowledge has always been a prerequisite for progress and all great civilisations have been built on it, today it appears to be required on a very different and larger scale. This is due to the complexities of living in an open, liberal, deregulated and highly competitive world market where the speed of business transactions is facilitated by advanced information and communication technologies. The innovative and intangible dimensions of goods and services -

Figure 1. **Transition process from skill-based to knowledge-based economy**



those adding value or providing distinctive or 'clever' features - are, therefore, the crucial ones in gaining competitive advantage in winning new markets. In our modern society, products and services and the work processes needed to produce or deliver them, therefore, have to become more knowledge-intensive. This entails 'physical-labour-intensive' industries being replaced by 'knowledge-labour-intensive' industries. The transition from what can be called a 'skill-based' to a 'knowledge-based economy' entails the emergence of 'knowledge workers' as key players in modern economies. Figure 1 shows the transition process since the 1970s from the stable context of the 'old economy' in which a high level of skill sufficed, through the transition period in the 1980s where broader and deeper levels

of competence came to the fore before finally arriving in the knowledge-based economy at the turn of the 21st Century. The knowledge required by the knowledge worker, however, must not be seen as purely theoretical knowledge but as an integration and transformation of a range of different kinds of understanding, *know-how* and personal attributes, including business, technological, social and self-management *know-how*.

However, the emergence of the 'knowledge-based economy' which is also called the 'new' economy' ([3]) does not mean that the 'old economy' did not have a knowledge content. In questioning the long term competitiveness of countries that have focused mainly on the software and service-based aspects of the 'new economy' to the detriment of the renewal and maintenance of manufacturing activities, Fingleton (1999) in his provocative book '*In praise of hard industries*', contends that it is those countries such as Japan, Germany and Switzerland, which are adopting the 'new economy' but also sustaining the 'old economy' (capital-intensive and heavy manufacturing) industries, that will win out in the long run. From a knowledge development perspective, he argues that those industries build up a huge endowment of proprietary knowledge (*know-how*) by dint of many years of 'learning by doing' which would prove horrendously difficult and expensive for new entrants to emulate and would take them years to do so.

2.1.2. Knowledge development in the field of education and training

Those theories of 'knowledge development' which stress the collective problem-solving and systemic nature of knowledge development (involving knowledge sharing between all of the actors - researchers, teachers, workplace managers and workers) have key messages for the renewal of the education and training sector in promoting the knowledge society.

Indeed, these theories point to the growing fusion between knowledge development and learning – as the meaning of those terms expand in the knowledge society. The knowledge society comes about through becoming a 'learning society'. Everybody (researchers, managers, workers) contributes to that process through sharing their distinctive insights and *know-how* in building institutions and social systems capable of holding/memorising, mediating and continuously building new knowledge.

To implement this, modern theories and concepts stress the importance of creating spaces and designing instruments for knowledge development and knowledge sharing. In this context, social artefacts, such as networks, which provide opportunities for mutual learning in formal as well as informal settings, are essential. Modern information and communication technologies (ICT) and, in particular, internet or e-technologies, can greatly facilitate this process through enabling people to engage in dialogue and share knowledge and information across

([3]) The 'new economy' is often mistakenly equated with the dot.com activities within the 'new economy'.

spatial, cultural and different knowledge-discipline boundaries. However, often there are misunderstandings and oversimplifications concerning the role of information and communication technologies in the development of knowledge. 'Knowledge development' is sometimes equated with 'information acquisition' as if by the powers of digital techniques, the 'information society' can be transformed into the 'knowledge society'. 'Codified knowledge' (or *know-what* knowledge - see below) which is very similar to information, is confused with 'personal' and 'situational' (*know-how*) knowledge which is embedded in people and learnt through human cognitive and social endeavours. Some theories of knowledge also reduce knowledge to an economic commodity that can be bought and sold, totally distorting the social and personal dimensions of human knowledge. (See for example Por, 2000).

The complexity of the task facing those in the fields of education and training today is outlined in an OECD report entitled '*Knowledge development in the learning society*' (2000). This report emphasises the close link between 'knowledge development' and 'learning' and presents (on pp. 11-12) the challenge for those promoting the learning society as follows:

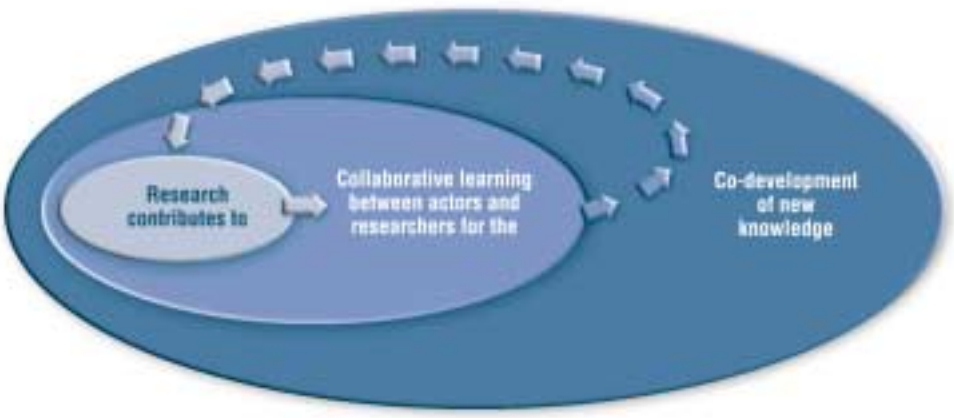
> 'Knowledge is the core element in the emerging mode of production, and learning is the most important process. Yet our knowledge of how knowledge is created, transferred and used remains partial, superficial and partitioned in various scientific disciplines, with the result that the basic concepts of knowledge and learning are defined and interpreted in different ways. The indicators used to measure knowledge and learning are correspondingly weak. It is fair to say that we have not yet reached a stage where we systematically apply knowledge to the production of knowledge. As we shall see this is true for schools, as there is little systematic understanding of what goes on in them. It is equally true for the learning that takes place within firms and in society. The real breakthrough of the industrial revolution occurred when machinery was used to produce machinery. It is tempting to see an analogy: the full-scale transformation into a learning economy will have to await the systematic application of knowledge to the production of knowledge'.

2.1.3. Summary of main argument

This paper attempts to make a small contribution to addressing the above complex challenge against a background of improving the competence of all those engaged in the education and training sector. The focus is on portraying how research methodologies, which attempt to grapple with the dialectical interplay between research and collaborative learning activities, can be implemented. In particular it argues that knowledge development is not a linear, top-down process but comes about through collaborative learning between researchers and actors as depicted in Figure 2.

Lundvall and Johnson (1994) state that knowledge development takes place through a process of interactive and collaborative learning between different institutions and actors and often occurs more successfully in particular cultural and local settings. In line with this view, learning takes place through understanding the interconnectedness between the different kinds of knowledge (social, technological and economic) from a 'systemic' perspective. Within the complex social system that we live, education and training has to develop active, as distinct from adaptive, knowledge development and learning strategies in order to shape technological inventions through the promotion of 'social innovation' (Rauner, F. et al.1988). This learning which is 'constructive' and 'expansive' (Engeström, 1994; 1991; 1987) is fostered in 'communities of practice' (Wenger, 1999), in 'ecologies of knowledge' (Brown and Duguid, 2000) and in 'knowledge creating companies' (Nonaka and Tacheuchi, 1995). A prerequisite for collaborative learning, leading to the development of knowledge, is the existence of a 'trusting relationship' between all of the actors involved, which can be described as 'social capital' (Putnam, 1993a; 2000). This process entails new roles for researchers and close collaboration between researchers and the other actors (including education and training and enterprise actors) in the formation of 'development coalitions' (Ennals and Gustavsen, 1999).

Figure 2. **Research, collaborative learning and co-development of knowledge**



The rest of this paper attempts to explore some of the concepts and issues raised above. The next section of the paper which is entitled 'The nature of knowledge and the dynamics of knowledge development' aims to portray briefly the different dimensions of the knowledge society (such as knowledge production, research, education and learning and innovation activities), but in particular examines how these dimensions are inexorably linked in complex overlapping configurations. This section, if one likes, can be said to deal with the question 'what makes up the knowledge society and what are the issues to be dealt with in making the transition to this society'.

The third part of the paper, which is entitled 'Context and spaces for knowledge development' illustrates some methodological frameworks and processes that can facilitate the integration of the different dimensions discussed in section two. This section, which, again, cannot be seen as anything more than exploratory, can be said to deal with the question 'How can one take steps towards building the knowledge society?' This is a difficult task as many of the methodological frameworks discussed, challenge current assumptions about the manner in which science and research contribute towards knowledge development. Even though the role of research in education and training is only treated in an implicit way in this section, the integrated frameworks discussed provide clues about the issues to be taken up by researchers in education and training and indeed the education and training sector as a whole.

2.2. The nature of knowledge and the dynamics of knowledge development

2.2.1. The need to develop different kinds of knowledge but in particular *know-how* knowledge

According to the popular understanding of knowledge development, it is the role of the research community (specialists/experts/university academics) to 'develop knowledge' and policy makers and practitioners to 'use' or 'apply' it. In this linear or top-down view of knowledge development, a clear distinction is drawn between 'knowledge development' and 'knowledge utilisation'. However, according to Lundvall and Johnson (1994) modern societies cannot be in the forefront of innovation and attain advanced economic and social goals for all citizens without everybody being involved in the production of knowledge as well as its utilisation. It is the responsibility of everyone, working from their own different perspectives, to contribute to the development of the different kinds of knowledge that society requires if it is to be a 'knowledge society' in an economic and social sense.

According to the above named authors there are four different kinds of knowledge – *know-what*; *know-why*; *know-how* and *know-who*.

Know-what refers to knowledge about facts which can be easily codified and differs little from information.

Know-why refers to knowledge about the principles of life, including knowledge for its own sake, purely theoretical knowledge or knowledge about the fundamentals of science.

Know-how refers to the practical knowledge that is required for living and working and is the major focus of vocational education and training. It is 'knowledge in action' and manifests itself in 'competence' both at an individual and a collective level.

This *know-how*, in turn, can be subdivided into 'instrumental knowledge' and 'personal and social knowledge'.

'Instrumental *know-how* relates to technological matters and is context-free. It can be represented objectively in formulas and procedures, which allow it to be transferred in a programmed way.

'Personal and social *know-how*, on the other hand, comes about through a process of deliberation about human and social issues. This has to do with taking appropriate actions in the light of interpreting a specific context and respecting human values. This type of *know-how* cannot be transferred in a programmed way but can only be learnt through the collaborative (teaching and learning) and reflective efforts of people in social contexts or in what have been termed 'communities of practice'.

Know-who is closely related to the two kinds of *know-how*, but in particular to *'personal and social know-how'* because it is concerned with building up a spirit of cooperation and trust through interacting, communicating and learning with people in one's own community or through engaging in networks comprising people from other disciplines and communities of knowledge.

All of the above types of knowledge are necessary for building the knowledge society, but in the context of attaining knowledge for 'working or professional life' the major focus is on developing knowledge related to *know-how*. In fact this entails managing the interplay between the two types of *know-how* (advanced technological (instrumental) knowledge and personal/social/contextual knowledge) which in real situations do not exist as separate kinds of knowledge, but fuse together into what can be can be termed 'socio-technical' knowledge (Emery and Trist, 1969, 1965). This is the kind of knowledge that gives us the capacity to innovate, reconstruct and shape our future, to master economic, technological and social challenges in an integrated way, and so develop a socially sustainable society.

2.2.2. Distinction between knowledge and information

With the more fashionable term 'knowledge society' taking over from the term 'information society' in much modern discourse, the distinction between information and knowledge is often blurred. In this regard, technology giants have entered a propaganda war over who can best deal with 'knowledge management' as distinct from 'information management'. An example of this is Microsoft's accusation that its

competitor Lotus repackaged its 'information-oriented groupware' as a 'knowledge management tool' in order to increase its market share (Brown and Duguid, 1999, p. 118). In promoting their commercial interests, therefore, information and communication companies blur the distinction between 'information' and 'knowledge' as the 'information society' (or the 'digital society') tends to be equated with the 'knowledge society. Since the development of knowledge and the dissemination of information are often equated, it is important to reflect on the distinction between 'knowledge' and 'information'. In a book entitled '*Wired life: where are we in the digital age?*' Jonscher states that 'the greater mathematical rigour which has been brought to bear on the evaluation of information has served to reaffirm rather than dispel the intrinsic subjectivity of the concept of knowledge. In a sense we have, after 200 years of developing information theory, come back full circle to the human mind as the basic seat and final arbiter of knowledge' (Jonscher, 1999 p. 59). In a similar vein, the mathematician Devlin (2000) argues that the most sophisticated ICT based systems will fail to respond to the knowledge development question.

The 'data-information-knowledge' hierarchy, therefore, needs to be kept firmly in mind. Data, which is at the bottom of the hierarchy, consists of raw signals and symbols. Next comes information which is 'facts' distilled from data. Finally, we have knowledge, which is information given meaning through interpretation in a social and cultural context (Jonscher, 1999, pp. 60-61).

2.2.3. Knowledge development as interactive and collaborative learning

It is interesting that it is economists, such as Lundvall and Johnson (1994), rather than education and training experts who are playing a leading role in pointing out the need to create dynamic and collaborative learning processes for the development of knowledge. They have a very relevant message for those in the vocational education and training sector charged professionally with promoting innovation in learning.

The kind of learning that they are talking about is an interactive process, based on exchanges between the different actors (technological researchers, social researchers, companies, universities, education and training agencies, consumers, civil society etc). This learning takes place through social practices, interchanges, institutionalised routines and networks, which are created and nourished in community contextual settings. The most influential of these learning practices tend to have a culture-bound history in that they are driven by, and sustained by, shared values. But, they also display pragmatic approaches to problem-solving.

Knowledge development, in this sense, comes about through social interactions between those in communities who are interested in promoting social and economic progress. This is about making sense of one's experiences in the company of others and making wise decisions and plans about shaping one's environment and/or adapting to it, as the circumstances demand. In summary, knowledge

development is a complex collaborative democratic learning process involving all of the actors (see also Brekke and Eriksen, 1998).

This kind of learning is collaborative and interactive and is not top-down and linear like the traditional approach described above. Also it does not have a purely individualistic focus like the kind of learning which springs to mind when one thinks about traditional forms of education and training. Rather, this is a collective form of learning - a community building process - in which education institutes are in partnership with other institutes (including technological research institutes, social and business bodies) in building knowledge to achieve common goals. This has similarities with the 'constructive' and 'expansive' learning and development theories expounded by authors such as Engeström (1987; 1991).

2.2.4. 'Development coalitions' between researchers and practitioners for knowledge development

According to the above concept of knowledge development, the traditional elitist role of researchers/experts in the production of knowledge no longer appears to be appropriate. Writing about the renewal of work organisation strategies, Ennals and Gustavsen (1999) argue that the efforts of behavioural scientists/researchers throughout the 20th century to find the optimal way in which work activities should be organised, have largely led to a dead end. They argue that the weakness of the responses of the 'human-relations', 'socio-technical' and 'human-centred technology' movements, in proposing theories to counter the technocentric 'scientific management' model of Frederick Taylor, was that they were characterised by the top-down method of developing and disseminating knowledge.

These efforts were caught up in an attempt to show us 'the best way' to organise things. However, at work, knowledge must be seen as a social artefact, developed by those who have a stake in it, and should not be seen as the 'scientifically proven' results of objective research. The type of knowledge we use in working life is a hybrid, entwined within cultural settings having unique features that cannot be replicated through the rationalistic application of general principles. The role of researchers in this context is not to search for a 'scientific blueprint' and hand it on to policy makers and practitioners, but rather to join in 'development coalitions' in a collaborative search to find the best way forward. According to this approach, knowledge, derived from 'context' and 'practice', complements that coming from classical 'scientific' sources.

2.2.5. A new role for research in developing knowledge for vocational education and training

The need for 'development coalitions' between researchers and the different actors in diverse learning contexts, for example, formal educational and work-based settings, is also evident in the development of knowledge in the field of education and training. The lack of impact of research in the field of education is noted in the

OECD study referred to above (2000, pp. 41- 45). This is not to be seen as a criticism of research or researchers as such, but is due to the lack of a shared vocabulary between researchers and practitioners, concerning the knowledge base that shapes educational practice. The researchers' knowledge base is derived from theoretical principles and objective scientific enquiry (that is in many respects a *know-why* type of knowledge). Practitioners on the other hand build their knowledge base though their personal experience ('practice') of working on their own in their classrooms. This is a personalised and individualised *know-how* type of knowledge. There has been little success in sharing this knowledge and analysing it from a collective systems perspective so it remains dispersed and untapped. It is ironic that in those institutions dedicated to learning and knowledge development, collective and organisational learning about the knowledge development process itself does not take place. Research, within education and training, does not help here, as it tends to follow its own scientific path and misses opportunities for the distillation of practitioners' experiences. As a result, education and training has to carry out its function largely unaided by systematic knowledge (OECD, 2000).

The promotion of a common understanding and vocabulary (what can be called a 'scientific knowledge base') about how all of the above disciplines come together in a systemic knowledge development process would appear to be the task of researchers. But, this can only be done in a collaborative learning exercise with practitioners. The OECD study (2000) points out how the education and training sector, with such low success in knowledge development and knowledge management, can learn from other sectors, such as health and engineering, but in particular from the information and communication technology sector. This sector not only produces knowledge-intensive products but also uses knowledge-intensive processes in the development of these products. Boundaries within these companies are constantly crossed as research and development, manufacturing and marketing specialists share their unique knowledge through working together on joint projects. Research and development also takes place on the 'shop-floor'. Everyone is producing and distributing knowledge. These organisations tend to have flat hierarchies and informal social relationships. Close contact is also maintained with the outside world - customers using their products in very different contexts, and the experiences of other firms and new ideas coming from research. These are seen as a source of knowledge. The prevalence of numerous informal networks based on mutual sharing of knowledge is a feature of these firms. Gibbons et al. (1994) refer to the above approach to knowledge development, which is a feature of successful science and technology companies, as 'Mode 2 knowledge production'. This is characterised by being inter-disciplinary, problem-focused, heterogeneous, hybrid, demand-driven, entrepreneurial and embedded in networks. It is contrasted with the more easily recognisable 'Mode 1 knowledge production' which is university-based, single disciplinary, expert-led with research papers being peer reviewed.

The collective knowledge development taking place within the information and technology sector is something that is missing from the education and training sector, where the insights (knowledge) gained in individualised or separate 'practice' settings largely remain isolated and untapped. The way forward is a much closer cooperation between researchers and practitioners, using 'action-oriented' or 'accompanying-research' approaches which recognise the permeability of the boundary between knowledge development and knowledge application. In a *know-how* knowledge development context, in which education and training is situated, knowledge develops within the process of using and applying it. This presumes collaborative professional efforts in which researchers and practitioners co-produce knowledge.

2.2.6. Knowledge development, innovation and learning

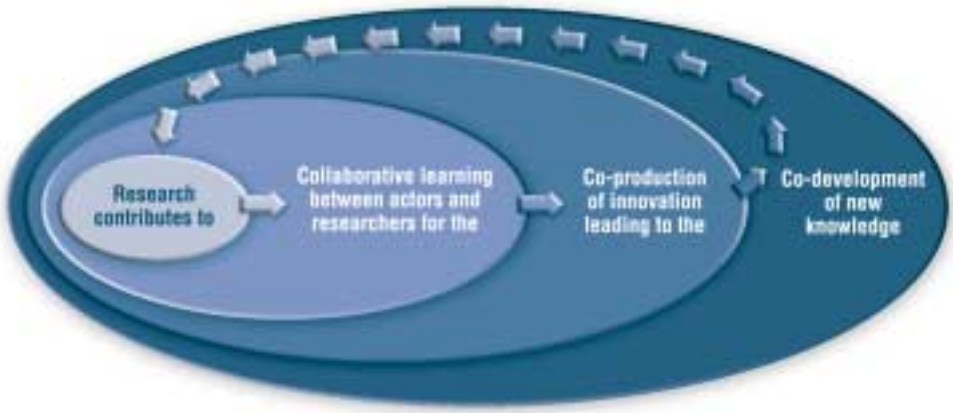
Reference has been made above to the fact that interactive knowledge development underpins the innovation process, but what is the relationship between knowledge development and innovation? Before discussing this question, it is necessary to clarify the difference between *innovation* and *invention*. Many people confuse the two, whereas they are quite distinct. Brown and Duguid (2000) point out that it is the innovation process that transforms an invention into an innovation and indeed claim that the forces that advance invention often create problems for innovation. An enormous amount of organisational coordination is required to turn an invention into an innovation, that is, a new product or process. Brown and Duguid (pp.155-156) go on to say that it is false:

> 'to believe that scientific results provide objective means that can show one technology to be superior to another. All that is needed for ideas to flow, from this perspective, is the right information. In fact, such judgements rely on subjective understanding, intuition and envisioning that varies from community to community and from practice to practice.'

The need for innovations to be constructed in a community setting or through dialogue between people in different professional disciplines within the same organisation, resonates with the concept of the 'interactive' view of the innovation process put forward by Ennals and Gustavsen (1999).

Regarding the relationship between knowledge development and innovation, it is interesting to note that Lundvall reiterated his point about the relationship between knowledge development and collaborative learning processes in the context of an EU report written with Borrás (see Lundvall and Borrás, 1997) that was concerned primarily with examining ways in which Europe can devise strategies and policies for innovation. Innovation is a product of inter-disciplinary knowledge development along the lines of the Mode 2 of Gibbons et al. (1994) referred to earlier and can be integrated in the earlier diagram as a feature of (or a stage in) the collaborative interactive learning process (see Figure 3).

Figure 3. **Research, collaborative learning, co-production of innovation and co-development of knowledge**



A 'systemic' and multi-actor view of innovation is also put forward in a European Commission policy document - '*Innovation in the knowledge-driven economy*' (EC, 2000). The following quote is from that document (pp. 21-22).

> 'Innovative activity is not just a matter for research, high-tech industry and individual entrepreneurship. Innovation is not directly founded on research, but on new management methods, new business models built on information and communication technologies, investment in new equipment and new skills and networking. Traditional approaches to the production and use of knowledge should be adapted to the systemic vision of the innovation process. In accordance with the "system" view of innovation, the interfaces cannot be treated in isolation from each other. To this end, new relationships should be established between public research facilities, universities and enterprises.'

The same document goes on to make a further point in arguing for the need for universities to engage with actors at the regional and local level because it is at this local contextual level that collaboration for innovation takes place most effectively.

> 'In addition to their traditional roles in education and research, universities should develop a third mission: promoting the diffusion of knowledge and technologies, especially towards their local business environment. Thus, as the understanding of innovation has become broader, developing into a key element of economic development policy, so has the importance of the regional dimension of innovation policy. Many actions are most effectively conceived at a regional level, since it is at this level that the needs of enterprises and the environment in which they operate can be assessed.'

The term ‘innovative milieu’ has been used to characterise the features of local or regional networks, which have an embedded regional-based capacity for innovation. A ‘culture of innovation’ is fostered through the sustained actions of regional institutions (public and private) and actors in cooperating with each other in devising innovative projects of a commercial or social nature. The so-called ‘industrial districts’ of Northern Italy, in particular in Emilia Romagna, illustrate this. (See Putnam, 1993b and Nyhan, Attwell and Deitmer, 2000.)

2.2.7. The challenge for the education and training sector to promote social innovation

For many people, innovation tends to be mainly associated with new technology breakthroughs (often in the sense of invention as discussed above) and frequently associated with information and communication technology related products. In line with this view, the challenge for society is to *adapt* to technological innovations and one of the main roles of education and training is to facilitate this adaptation process. However, despite the obvious need to react to changes in the technological (and economic) environment in an appropriate way, an essential role for education and training, and in particular the research area within it, is to attempt to *shape* technology so as it can be utilised effectively to meet economic, social and human goals. This is what is referred to by Rauner et al. (1998) as the ‘social innovation’ process. With his colleagues, he argues that instead of just reacting to the policies of technologists, education and training must, in its own right, be an influencing agent in shaping and adapting technology to address social and economic purposes. (See also Heidegger, 1997.) The lack of an educationally derived ‘scientific and systematic knowledge base’ built on, and derived from ‘practice’ (which was discussed earlier) could be seen to be as one of the main obstacles preventing education and training from making a greater impact in this regard.

On a separate but related point, the crisis in the European industry in the 1970s and 1980s was due, in many ways, to the poor level of ‘knowledge’ among those who were conditioned by a minimalistic tayloristic approach which entailed the human being adapting to the cycle of mass production technology. Indeed, the renewed interest in the term ‘knowledge’ in the vocabulary of vocational education and training is a timely reminder of some of the fundamentals that have been lost in a too narrow focus on adaptive skill and behaviour requirements.

2.3. Contexts and spaces for knowledge development

2.3.1. The knowledge creating company

The Japanese originated theory of the 'knowledge-creating company' focuses on the dialectical relationship between informal ('tacit') and formal ('explicit') knowledge within a company (Nonaka and Tacheuchi, 1995). This theory is illustrated by a series of case-studies which show how companies harness the multi-disciplinary and collective ingenuity or tacit knowledge of the different groups within the work force and transform it into explicit knowledge, which can then be used in an organisational sense for the creation of new products. The initial incomplete, incoherent, but creative thoughts and feelings derived from the sharing among the different disciplines and levels of hierarchy in the company - technological specialist, experienced workers, engineers, scientists, senior and middle level managers - are harnessed by means of a knowledge transformation process, so as to come up with new explicit ways of doing things.

In this way, knowledge is moved between individuals and groups and shared across the whole organisation. This addresses the problem of the non-utilisation of knowledge developed in one section of an organisation (or the 'stickiness of knowledge') leading to the frustration of the individual or group who created it, and making for a lost opportunity from an organisational innovation or product development point of view. It is claimed by the above authors that Easterners have the ability to harness the creativity of individuals in developing knowledge in a holistic organisational sense that Westerners do not. The problem of not being able to utilise the knowledge of individuals for the benefit of the organisation as a whole is expressed in the famous quote from a Hewlett Packard executive 'if only HP knew what HP knows'.

According to the Japanese theory, the transformation of knowledge comes about through the creation of a 'shared space' (the term '*ba*' is used in Japanese) which allows emerging ideas and ways of interacting between different individuals and groups to evolve from tacit to more explicit insights and *know-how*. This leads to shared organisational ideas about products and ways of working (Nonaka and Konno, 1998).

2.3.2. ‘Communities of practice’ and the development of expert knowledge

The work of Wenger (1998) on ‘communities of practice’ has generated new interest in ‘practice’ (or ‘praxis’) as a source of knowledge and learning. Underpinning this notion is the traditional theory going back to classical times that one derives ‘knowledge about living’ by means of participating actively in the life of a community (its ‘practice’) and thus sharing in and contributing to its search for meaning and excellence in acting. It is in the context of living, narrating, debating and challenging the ‘practice’ of one’s community that one learns to understand the principles and take on the values guiding that community. These principles and values, give one an identity and enable one to make sense of one’s life and in particular develop a ‘capacity for deliberative reasoning’, which is the ability to make appropriate judgements in social and political life.

In a working life context, Dreyfus and Dreyfus (1986) trace the progress from one’s initiation to a professional or vocational ‘community of practice’ as a ‘novice’ through the different stages to the highest level of being an ‘expert’ in the professional subject-matter area of that community. It is the ‘experts’ who have the role to assist beginners (‘novices’) in learning to handle situations so that they gradually acquire the capacity for ‘deliberation’ and become ‘experts’ themselves over a period of time ([4]).

An expert can only learn to be an expert in a social context, because becoming an expert entails learning the capacity for ‘deliberation’, that is, the ability to interpret and weigh up complex ‘socio-technical’ situations and act accordingly. Expert knowledge is ‘practice-based’ and ‘context-based’. This is very different from the mere application of objective or rationalistic or formal knowledge. The notion of *competence*, when used in the deeper sense to denote a person’s overall capacity for acting (as distinct from the more atomised *competencies* related to smaller units of action) has similarities with the above notion of ‘having expert knowledge’ in that it emphasises the ability to handle oneself in complex contexts or ‘practices’ ([5]). However, this is not to deny that the handling of complex tasks by an expert entails a correct balance between context-based knowledge and rationalistic or technological knowledge (or what Dreyfus and Dreyfus refer to as ‘situational knowledge’ and ‘context-free knowledge’).

([4]) The meaning of the Greek word for ‘expert’ (*εμπειρογνώμονας*) literally means someone who gives advice based on his or her experience gained in the community. Thus ‘expertise’ is derived from experience-based knowledge learnt in a community-setting rather than ‘scientific-knowledge’ or formal qualifications. According to Aristotle, this knowledge of the expert is based on ‘deliberative reasoning’. He distinguished this kind of knowledge, which he termed ‘practical knowledge’ (that is knowledge related to ‘acting’ in one’s ‘practices’) from ‘theoretical knowledge’. (This distinction is closely related to the one between *know-how* and *know-why* outlined earlier).

([5]) This notion of competence is also closely related to the concept of ‘key qualifications’ (see Kämäräinen, Attwell and Brown, forthcoming).

Wenger (1998) stresses the informal nature of 'communities of practice' which he sees as self-organising informal social configurations, arising within larger and more formal work organisations. Participants in these informal 'communities of practice' learn from each other in a cooperative fashion to solve problems. Learning and knowledge development is 'situated' and comes about through collaborative efforts (see Lave and Wenger, 1991). The benefits of cooperative efforts to achieve excellence in making products or delivering services which are rooted in informal (interpersonal) relationships are at the heart of this notion. These pockets of innovative problem-solving and learning revitalise the formal systems which often do not foster learning about how to deal with context-based problems. The way in which excellent work standards are achieved and problem-solving takes place in reality (in practice), through the flexible deliberations and commitment of the workers involved, can be contrasted with the manner in which formal policies and procedures represent the way work should be carried out. Wenger (1998) stresses that if companies are to be effective and, in particular, if they want to be innovative, they must cultivate these 'communities of practice' by giving them the space to flourish and providing them with tools.

2.3.3. Networking

Networks share certain similar features with 'communities of practice' as perceived by Wenger (1998) with regard to their self-organising and horizontal attributes and the largely non-formal code of conduct which regulates their behaviour. Networks are seen to offer an alternative structure to hierarchy and markets and are considered more effective in knowledge creation and innovation than the former. Their horizontal and open structures serve the function of sharing information and knowledge across spatial, cultural, hierarchical, and knowledge discipline boundaries. They build connectivity between people for collaborative knowledge-sharing and provide a context and framework for boundary crossing.

Their loose organisational structure also allows people to sample what is on offer without going through the formalities of joining as applies to traditional organisations. But, when a commitment is made to join and actively participate, members can engage in intense dialogue and carry out shared activities in areas of mutual interest. Thus, networks can develop into close working partnerships and virtual communities of practice.

Even though, sometimes, there may be formal legal contractual relationships, networks are not sustained by these and they offer no guarantee of effective functioning. At the heart of successful networks one finds 'mutual trust' based on 'shared values' and a 'commitment to openness'. Networks are built on strong social bonds and relationships that are often tacit. Networks have been described as 'constellations of social relationships' by Lundvall and Borrás (1997, p.104) that are sustained by the following ethical, social and psychological attributes:

- reciprocal exchange relationships among partners;
- trust in the integrity of partners;
- belief in the reputation of partners as persons of conscience;
- understanding of need for openness and willingness to learn;
- a personal disposition that is inclusive not exclusive;
- a political disposition that is empowering not elitist;
- a shared convention about the rules of the game.

2.3.4. Social capital

Putnam (1993a) refers to the above attributes, which are embedded within the social relationships of a network (or community) as 'social capital'([6]). This is related to a *know-who* type of knowledge built on relationships marked by trust, cooperation and mutual sharing which sustain societies but in particular allow informal and non-legally contractual social systems to operate. The notion of 'social capital' has a strong ethical dimension. Loosely-based social structures, such as networks and communities of practice, will quickly disintegrate unless they are sustained by strong ethical values.

Of course, networks can create social exclusion through becoming elitist and erecting closed boundaries making it difficult for less developed and disadvantaged groups to participate. Putnam (1995) writing about the United States, claims that social capital is being eroded on a massive scale, in the weakening of social trust and the decline of civic engagement. He calls for new policies which promote partnerships between public bodies and enterprises. In discussing the task of education in building social capital, Schuller and Field (1998) claim that we are only at the beginning of understanding the significance of social capital, in particular in relation to tackling issues such as social exclusion and lifelong learning.

2.3.5. Information and communication technology, supporting networks and the development of knowledge

Castells (1996) in his book *'The rise of the network society'* outlines how the global economy is characterised by the almost instantaneous flow of information, capital and cultural communication. This is giving rise to a 'culture of real virtuality' which can have positive or negative impacts. Advances in web-based technology allow for the development of active and continuous knowledge-sharing networks in which dispersed communities can participate. There is enormous potential in the development of web-based technologies to provide virtual spaces to support the development of knowledge.

([6]) In the past, significant attention has been paid to the notion of the development of 'human capital' i.e. the benefits derived from investments in education which are largely seen as the accumulation of individual benefits. 'Social capital', on the other hand, refers to inter-relational benefits having a collective and cultural nature.

There are two ways to see the role of information and communication technologies (ICT) and networking. ICT can be seen as either supporting and reinforcing human interactions or replacing them. The aim should be to use ICT both for the provision of databases containing information and presenting experiences (explicit *know-what* knowledge) but also, and perhaps much more importantly, to support the creation of virtual forums for discussion and debate concerned with sharing *know-how* type of knowledge. The latter has to do with the exciting, but still uncertain, potential of ICT to provide robust, easy-to-use and cost effective applications to support social interactions. Jonscher (1999) sees ICT technologies as providing the possibility to 'extend one's eyes and ears' so as to communicate and collaborate at a distance. The ideal to aim at would be to attempt to integrate and embed ICT technology for human objectives in the same way as the philosopher Martin Heidegger wrote about the hammer (tool) in the hand of the craftsman being subsumed for a human purpose, leading to the transformation (humanisation) of the tool.

However, effective networking for collaborative knowledge development and learning is not possible if it is dependent on virtual communication only. It requires opportunities for intensive face-to-face meetings. In discussing the successful networking of companies in the Silicon Valley in California, Saxenian (1994) states that while highly explicit knowledge can be handled though communication at a distance, the tacit dimensions can only be worked at if people are 'tripping over each other'. 'Real spaces' (face to face social interactions) are an indispensable channel for dialogue and collaboration. In making the point that social contexts are often overlooked by technology designers, Brown and Duguid (2000) state that what you end up with is 'tunnel design' - technologies that create as many problems as they solve. These problems arise from a neglect of taking into account factors that are outside the tight focus of information.

2.4. Conclusion

This chapter has explored a number of issues raised by the question ‘how can the vocational education and training research community play its role in contributing towards the building of the “knowledge society”?’ However, it does not claim to be anything more than exploratory in that it is venturing into an area - the knowledge society - about which there is an enormous diversity in people’s understandings.

Part two of the paper attempted to shed light on the different dimensions and interpretations of the knowledge society. But, it does more than that in arguing that researchers must become part of what can be called ‘knowledge-development coalitions’, including innovative practitioners from a range of different disciplines, in jointly constructing the knowledge society. This requires that the classical top-down and linear view of research gives way to an interactive one according to which knowledge development is a collaborative learning process. The OECD (2000) points out that the reason why the education and training sector lacks a systematic knowledge base is the absence of a common language between researchers and practitioners about the notion of knowledge. ‘Valuable’ knowledge for researchers tends to be a *know-why* type of knowledge derived from objective scientific enquiry whereas ‘valuable’ knowledge for practitioners is a *know-how* or *know-who* type of knowledge that is gained through personal experience. The challenge for those charged with responsibility for research in education and training is to devise new research strategies, quite different from the classical ones, to support the bringing together of these two strands.

Section three discussed a number of contexts and spaces which could provide a framework for more interactive research efforts along the lines mentioned above. Researchers in education and training have much to learn from the collaborative knowledge development and organisational learning practices of modern companies. Similarly, the ways in which ‘communities of practice’ and networks contribute to a dynamic horizontal exploitation and pooling of knowledge can be taken up in research and development programmes. Also, the huge potential of ICT is waiting to be exploited for communication, collaboration and knowledge management purposes.

Finally, this chapter emphasises the need for the education and training sector to build its collective knowledge base so that it can carry out its mission more effectively. This entails a mutual learning and development process in which all actors contribute to building this knowledge base. The challenge for the research community is to be a catalyst for this collaborative knowledge development process.

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Part Two

Illustrations of knowledge development actions

CHAPTER 3

Supporting European research cooperation - reflections from a Cedefop perspective

Pekka Kämäräinen

3.1. Introduction

This paper is written against the background of discussions taking place in recent years concerning the repositioning of Cedefop's role *vis-à-vis* European research in the field of vocational education and training (VET research). It addresses four related issues. First, the main questions facing Cedefop in the repositioning of its role regarding research are examined. Then, the scientific foundations and conceptual developments underpinning research on vocational education and training in Europe are discussed. Third, the role of European cooperation programmes (including transnational projects and research cooperation networks) in the promotion of European VET research culture are examined. Finally, the development of research communities as 'communities of practice' alongside communities of practitioners are discussed.

3.2. The repositioning of Cedefop vis-à-vis European research

After the move from Berlin (Germany) to Thessaloniki (Greece) in 1995, Cedefop had to reconsider its position as a European agency for promoting the development of vocational training.

The main challenges facing it regarding its role in promoting European research can be summarised in the formulation of the following questions:

(a) should Cedefop position itself primarily as an agency for research and development work, or as a programme support agency, or as an external agency for the dissemination and capitalisation of the results and outcomes of research?

(b) on what basis should Cedefop develop cooperation between itself and research communities - as an external funding body, or as a partner that provides targeted support for projects and networks, or as a hosting body that has permanent support functions?

(c) how should Cedefop emphasise the following aspects in its research cooperation activities - monitoring research capacities and progress in research; promotion of communication in research; and community-building, analysis and capitalisation of research results?

Following the initial repositioning debate, Cedefop began to take initiatives that entailed a more participative role in research work thus profiling its role more as a partner than as a major external funding body or as a host. Some of these initiatives have led to the development of new strategic frameworks for monitoring activities, community-building measures and capitalisation of results. In this context the plan to produce the Cedefop 'Research report' ([7]) and the initiatives to develop close collaboration with European projects and networks, can be seen as illustrations of ways in which these strategic movements began to be implemented. Later on, the creation of Cedra (Cedefop research arena) ([8]) was based on lessons learnt from pilot experiences in recent years.

The learning points from these experiences regarding the development of a European research culture, highlight the importance of the following activities:

- making a deeper analysis of the scientific foundations of European VET research;
- drawing conclusions concerning the role of transnational cooperation projects and networks for the development of a European VET research culture;
- developing a deeper understanding of the role of network-based cooperation in the consolidation of research communities as 'communities of practice' and in the interaction between researchers and 'communities of practitioners'.

([7]) The '*Research report*' is a multiannual publication which provides a comprehensive overview of European research in VET, including theory and methodology, empirical findings and implications for policy and practice.

([8]) The pillars of Cedra are as follows:

(a) a user-friendly information service that provides access to information and knowledge recourses ('*European research overview*');

(b) development of research-oriented knowledge in certain thematic areas (including the production of 'research resource materials', 'research resource bases', and the promotion of 'knowledge sharing networks');

(c) promotion of a knowledge development and research culture through different kinds of support activities.

3.3. Scientific foundations underpinning European VET research

A critical starting point for making a deeper analysis of the scientific foundations of VET research is that VET research must be seen as a multi-disciplinary space. On the one hand, this space is seen as a broad field derived from different disciplines. On the other hand, these disciplines are going through processes that link them more to the VET research field than to their original discipline structures. In this respect, VET research can be perceived as multidisciplinary yet characterised by a basic unity. Any attempts to analyse inner differentiation within VET research could only be from the angle of VET specific focal areas.

This position, however, can be challenged and transformed radically by a framework that takes into account the need for cohesiveness. The framework presented below identifies four kernel domains of knowledge development within the interdisciplinary field of VET related research. These four domains of expertise are linked to different problem contexts, conceptual backgrounds, methodologies and prospects for knowledge development.

(a) in the *socio-economic* domain the main focus is on the need for, and utilisation of, qualifications and competences in working life. VET is seen as a background variable and VET systems and VET providers are seen as users of knowledge produced in this domain. Research provides support for structural planning of qualification frameworks or feedback on the interrelations between VET provision and the labour market;

(b) in the *socio-political* domain the main focus is on the functioning of the VET system and the effectiveness of VET providers in the system. Some lines of enquiry give conceptual support for the development of VET policies while others provide feedback information that supports policy evaluation;

(c) in the *socio-educational* domain the focus is on the educational foundations of VET systems and VET provision. Research in this domain covers an analysis of underlying educational thinking, the accompaniment of curriculum processes and analysis of new modes of learning and competence development;

(d) research in the *socio-behavioural* domain of VET research focuses primarily on the individual behaviour of particular target groups concerning their use (or non-use) of VET provision and their behaviour in the labour market. From the methodological point of view, several lines of enquiry can be taken such as: a focus on transition surveys, studies on particular target groups, accompaniment of targeted training schemes and development of instruments to support guidance and counselling.

It is obvious that the above framework does not present the whole picture of VET research. However, it does identify the kernel domains of expertise and their related methodologies and prospective fields for knowledge development and knowledge utilisation.

Given the differences between the above kernel domains, it is necessary to look at ways to promote coherence and unity within the overarching field of VET research and facilitate boundary-crossing and working interfaces. These may be related to certain core areas for knowledge transformation that are characteristic of VET, as illustrated by the following examples:

- curriculum development;
- training of VET professionals;
- learning in organisational contexts.

In addition to these core areas, it is also possible to mention more specialised 'focal areas' for knowledge development that involve only some of the domains but could stimulate new alliances between VET related research and complementary fields of expertise. Examples are the following focal areas:

- information and communication technologies (ICT) in the field of VET;
- patterns for integrating work-related learning in VET provisions and new partnerships between educational establishments and work organisations;
- regional VET related initiatives and their links with broader regional initiatives.

3.4. The role of European programmes in the development of a research culture

It is important to note that the field of VET research is, to a large extent, dominated by national perspectives. Thus, national concepts and underlying assumptions often present barriers to cross-cultural communication and knowledge development at a European level. Transnational research cooperation programmes, therefore, play an essential role in the development of knowledge at a European level.

Generally speaking, European cooperation programmes can contribute to the development of a European research culture in the following ways:

- providing support for transnational projects that go beyond comparative reporting on national developments and focus on problem-oriented comparisons and the treatment of critical issues, through collaborative research efforts;
- building networks that do not limit themselves to the mere exchange of information but become 'learning communities' ([8]);
- creating communication facilities to support knowledge sharing among research communities and to promote the further analysis and utilisation of research through organised dialogue between researchers and the users of knowledge.

In this context, it must be noted that transnational projects have also raised awareness about this need for 'accompanying research', 'research-oriented monitoring' and 'research-supported capitalisation of outcomes' at a European level. 'Accompanying research' entails that reform activities, experimental

([8]) Transnational cooperation has opened up new possibilities for knowledge transfer between different national systems.

programmes or innovatory initiatives are supported by research. However, the notion of accompanying research often refers to single projects. The notion of 'research-based accompaniment', on the other hand, is a more generalised type of accompanying research that deals with a broader range of innovatory activities. In many countries there is no tradition of systematically linking research-based support and pilot projects. On the other hand, most European countries have experience in using research in the development of VET in ways that have certain similarity with accompanying research such as 'evaluation research', 'implementation research', 'process consultancy' and 'action research'.

The current interest in 'accompanying research' approaches is related to efforts to promote a more systematic understanding of research as an infrastructural and interactive element in supporting the development of VET systems. This interest is closely related to the efforts to reconceptualise VET research as a practical activity that has a particular mediating function between theory and practice.

3.5. Building 'research communities'

The issues discussed in this chapter often tend to fall beyond the scope of traditional research disciplines. It must also be noted that there are very few examples of countries that have laid the basis for the development of VET related disciplines. Indeed, the problem in most European countries is that VET research is a marginal activity. To some extent this marginalisation has been mitigated through the community-building initiatives of European transnational research cooperation networks.

As part of its efforts to promote European research cooperation, Cedefop has tried to develop an approach to support community-building measures that is based on 'independent' networks. Moreover, Cedefop has tried to find out whether there is a possibility to develop synergy between major networks having complementary tasks. However, because of their voluntary and temporary character, networks have only a limited potential to promote the consolidation of research communities within European VET research. Because of this, instead of being considered as infrastructural actors, they should therefore be considered as individual platforms that contribute to a community-building process.

In the context of Cedra, therefore, Cedefop has shifted the emphasis from 'networking the networks' to the 'networking of knowledge resources' as a support for knowledge development that draws upon the work of European cooperation projects and networks. Cedefop also has to take into consideration the limits of research communities as actors in knowledge development and the potential conflicts of interest between 'research communities' and 'communities of practitioners'. In this respect, Cedefop has to find the way to promote a balanced research dialogue between knowledge producers and knowledge users in the overall context of promoting policies to improve European research dialogue.

CHAPTER 4

Knowledge development and deliberative reasoning – the European forum on transparency of vocational qualifications

Sten Pettersson

4.1. Introduction

This chapter examines the methodological approach used in the 'European forum on transparency of vocational qualifications' against a background of more general ideas about knowledge development. The framework for this forum was developed by Jens Bjørnåvold and is outlined in a Cedefop publication (Bjørnåvold and Sellin, 1998). The purpose of the forum is to support and facilitate the mobility of workers across national boundaries in Europe.

Mobility is seen to be good for Europe, and has much support, at least at a political level. This has been the point of departure for the work of the transparency forum. The aim is to remove obstacles to mobility due to a lack of transparency of vocational qualifications.

4.1.1. Knowledge development in education and training

Before detailing the workings of the forum, some general comments should be made. The personal experiences of the author are restricted to knowledge production and use of knowledge in the field of education and teaching. The meaning of the term knowledge differs between different sectors and different disciplines. Natural sciences claim to have their reference points outside society while social sciences see them as being within society. Knowledge about, and for, education has certain characteristics which makes it a part of the social construction of reality. In that sense it is loaded with values. The character of knowledge in the social field also has implications for the use of knowledge where social capital plays an important role.

Since the industrial revolution, western thinking has been dominated by the natural sciences and a utilitarian rationality. This thinking has its roots in the Enlightenment with rational reasoning as the leading star. This way of looking at how development occurs is based on a modernist way of thinking, according to which scientific and technical development is the dominant influence. The

modernist project implies that rationality is in the forefront. Life is coped with through acquiring knowledge developed by means of well-designed scientific methods. Good choices are made when grounded in scientific knowledge. According to this view, almost any aspect of life can be developed by scientific methods conducted by well-trained experts. This model is the linear research and development (R&D) model - first, one carries out research and then development follows.

However, it is clear that the linear way of approaching R&D does not correspond with what really happens. Much educational research has little or very limited direct impact on practice and policy making (Tyden, 1993). The dominant R&D model, therefore, is being questioned and rethought (Tuijnman & Wallin, 1995). The relationship between scientific research and practice and policy-making is much more complex within the educational field than the linear R&D model implies. Perhaps the approach is useful for production activities based on natural sciences, but clearly is not with regard to social phenomena such as education and training.

Reflection on the relationship between 'knowledge production' and 'knowledge use' has given rise to a distinction between pure research and applied research. The latter is sometimes called 'action-research'. 'Applied research' is given a higher status than 'action-research', even if the latter is thought to have a closer relationship to practice. The discussion about applied research, however, is problematic since some practitioners assign more importance to pure or theory-based research. Caroline Weiss (1991) and others claim that research mainly has an enlightenment function. This is the crucial factor in gaining acceptance by practitioners, and is independent of the fact of whether the research in question is pure research, applied research or action-research.

4.2. The European forum on transparency

Taking these general comments as a point of departure, this paper continues by examining the thinking and knowledge development methodology behind 'The European forum on transparency of vocational qualifications'. The debate and work undertaken on the issue of transparency can be seen as a continuation of the efforts made since the signing of the Treaty of Rome in 1957. Different phases in this work were based on different rationalities. The right of all citizens in the European Union to live and work wherever they want is a common underlying principle. Measures taken at community level to support this process, as portrayed in Figure 1, fall into three different historical phases - *mutual recognition* phase; *comparability* phase; and *transparency* phase (see Sellin, 1997).

Figure 1. **Measures supporting mobility - three phases**

4.2.1. Mutual recognition

The first phase was concerned with the mutual recognition of qualifications for certain occupations. This was a way to establish minimum standards concerning the content and training duration of regulated professions, for example, medical doctors, lawyers and architects. This was applied to a number of university level professions. However, this strategy only facilitated mobility for a very small proportion of the workforce.

4.2.2. Comparability

The second phase entailed setting up information systems to compare other professions below university level, more specifically, white-collar and skilled blue-collar workers. This has been labelled the comparability approach. Comparability is a looser approach than recognition and its application was not compulsory for Member States. The problem with this approach, however, was the complexity of the methodology adopted and its lack of flexibility in a rapidly changing labour market. In reality, also, there was a low level of consultation with the target public about the information systems being drawn up.

4.2.3. Transparency

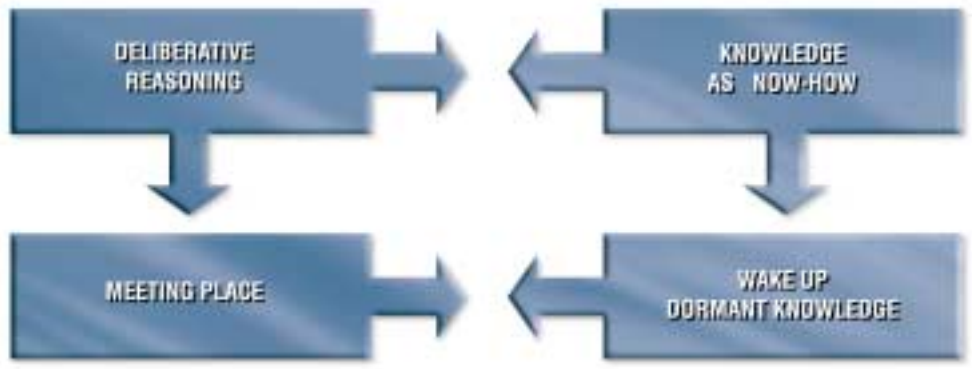
The third phase was characterised by the introduction of the transparency concept. It was argued that national government representatives and social partners (employers and trade unions) were the best ones to decide if someone trained and qualified in one Member State was able to do the job in another. What was needed was more and better information for governments, employers and trade unions to allow them make their own judgements.

Thus, the debate has moved on from recognition, through the notion of comparability, to transparency. Transparency entails making qualifications more visible and represents a shift in focus away from central regulation towards individuals providing information on the training they have received and the skills and competences they have acquired. Despite the fact that two Council Resolutions of the European Union supported the regulation approach, one in 1992 (EU, 1993) and the other in 1996 (EU, 1996), few concrete results were achieved. To further a new approach based on transparency, therefore, the proposal to establish a 'European forum on transparency of vocational qualifications' was put forward by Cedefop in 1997. This forum was established by the European Commission with the scientific and technical support of Cedefop towards the end of 1998. The aim was to create a meeting place where representatives of the Member States and social partners could meet to debate and find agreement on practical solutions to problematic issues in the area of the transparency of vocational qualifications.

4.3. Deliberative reasoning - the methodology of the forum

Two main 'knowledge development' approaches form the basis for the work of the European forum from a methodological point of view. The first has it roots in the 'deliberative democracy' debate (Brekke & Eriksen, 1998). The second relates to the exploitation of relevant knowledge (or *know-how*) produced since the Treaty of Rome, that had lain dormant (see Figure 2).

Figure 2. **The methodology of the forum (i)**



The simple idea behind the transparency forum is to use a deliberation approach to reach consensus on concrete actions as well as making existing gains visible for people so that they can act on them as they see fit. Experience shows very clearly

that imposing solutions on Member States is neither desirable nor feasible. The complexity of the issues makes 'top-down' solutions ineffective.

The forum on transparency can be seen as an example of how knowledge can be developed and used in a multidimensional social context. Harnessing old or 'dormant' knowledge, in a context where different people meet to face a shared problem, can add to the enhancement of understanding, resulting in knowledge development.

4.3.1. Negotiation

In an educational context the relationship between knowledge development and the use of knowledge is complex. In most cases is it not just a matter of implementation but of negotiation. Negotiation entails discussion and the exchange of ideas from equal positions. To use knowledge and experiences gained in one context and 'transfer' them to another context presupposes a process of recontextualisation and contextualisation. It is necessary to understand and adjust what is understood in one context to the features of another context. Education and training are always subject to both time and space. This, however, is not to say that there are no 'common' rules and that it is not possible to learn from others. But, it must be kept in mind that change is constant and knowledge governing educational issues has to be continuously contextualised, reformulated and developed.

4.3.2. Social dimension of knowledge production

This way of thinking about the social dimension of knowledge production and the use of knowledge means two things. First, if you want to remove obstacles to mobility due to the lack of transparency of vocational qualifications, you have to establish a 'meeting place' or an arena where key people can meet and discuss and hopefully agree on what to do and how to do it. Second, when the meeting place is established you have to support the process, using experts to provide overviews of 'possible' solutions and ways of dealing with problems. (See Figure 3.) This can be done through producing 'metatexts' - that is short texts commenting on other texts.

The Management Board of Cedefop, representing government ministries as well as the social partners, was asked to appoint nominees capable of communicating effectively with decision-makers to join the forum. One person from each country and four representatives from the social partners were appointed. Altogether, including representatives of the EU applicant countries, Cedefop and the European Commission, the group comprised about 30 persons.

The forum had four meetings in 1999, during which time it was possible to agree on joint actions. There was assistance from a small group of experts, including people from Cedefop and the European Commission. During that year, documents summarising previous work were prepared. Experts were invited to make presentations to the forum and a study of the projects dealing with the transparency issue within the Leonardo da Vinci Programme was carried out.

Figure 3. **The methodology of the forum (ii)**

4.3.3. Fostering shared understandings

The methodology used was very simple and can be described as putting what already existed into a frame of reference through discussion and exchange of ideas. This fostered shared understandings and meanings and enabled people to visualise different ways of looking at things. It also led to consensus on specific points, making it possible to take them further and opening up the possibility of more formal agreements or political decisions. The forum has been able to agree on two measures to improve transparency as a first step - a format for a supplementary certificate and a structure for European reference centres that can provide information on educational systems to those who require it. Perhaps this is a small step, but it is a step which leads to ideas on how to proceed further. To work step-by-step and at a pace that leaves no one behind, is important.

4.3.4. Addressing a political and social problem

The problem facing the forum cannot be seen purely as a technical problem, but is fundamentally a social and political problem. The questions being addressed have a history that is littered with research and even European Council resolutions, decisions and recommendations. But, nobody paid attention and few bothered to implement the legal framework that became nothing more than a paper tiger. This field is characterised by fragmentation, lack of overview, lack of coordination and the lack of cooperative relations between different levels in the European Union.

In a way, this is a perfect object for testing the deliberative approach and seeing how it works. The conditions are there - confusion and no concrete actions but a wish to solve a problem within a well-defined field and a lot of unexploited knowledge to be utilised. The fact that the field is well defined is important. The task, thus, is limited to finding and implementing concrete solutions.

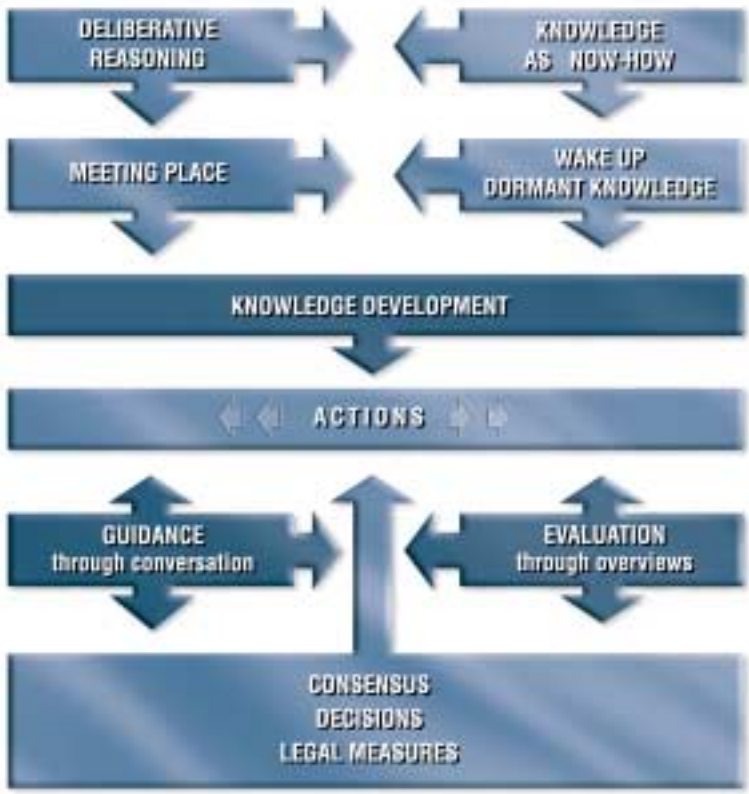
4.3.5. **Deliberative democracy - forum for conversation**

The deliberative approach has it roots, in the democracy debate. The point, albeit simplified, is that democracy offers a forum for conversation. The aim is two-fold. Conversation leads to something that everybody can agree on and provides a tool for the individual to make his or her own thoughts clear. Open conversation clarifies citizens' preferences leading to the possibility of consensual decision-making. Thus, deliberation has both individual and collective benefits: individual, because everybody listens, reflects, presents arguments, evaluates and takes a position; collective, in the sense that everyone is striving for consensus. (Much more can be said on deliberative democracy. There is growing literature in the field and one of the leading figures is the German philosopher Jürgen Habermas.)

4.3.6. **Guidance and evaluation**

The approach to the problem can also be seen as comprising two different perspectives - those of guidance and evaluation. (See Figure 4).

Figure 4. **The methodology of the forum (iii)**



'Evaluation' entails that materials - previous decisions, methods and instruments - are studied and reviewed in a systematic way. 'Existing solutions' are revisited, clarified and evaluated in the light of the present situation. Knowledge is used when it is relevant to solving current problems. This has meant the production of short texts covering the legal basis and reviewing projects within the Leonardo da Vinci Programme dealing with the transparency issue. These texts have been used as points of departure for conversation and supplemented contributions from invited experts in the field. The process during the first year of work covered both technical and political aspects of the issue. The result was a shared knowledge about what is possible and desirable, from both a technical and a political point of view.

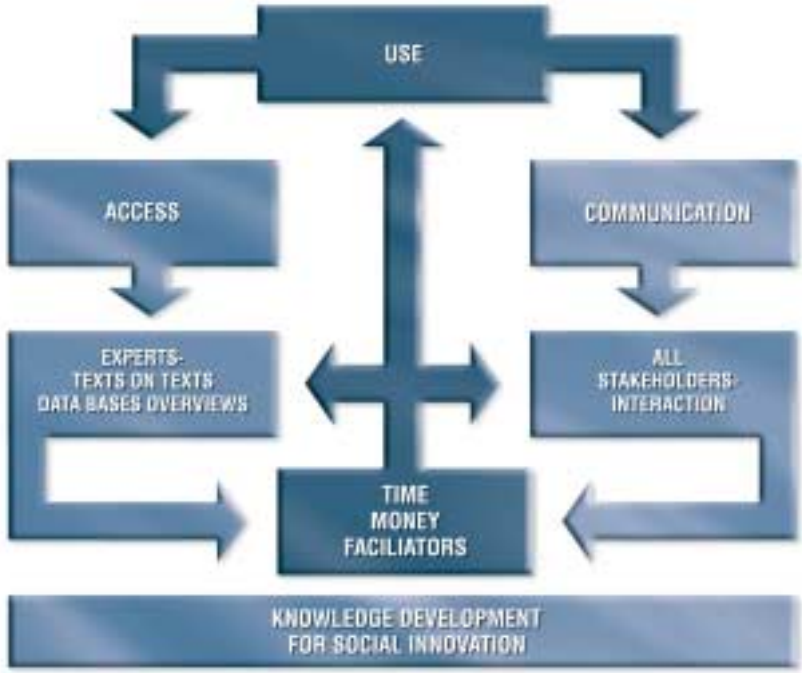
The 'guidance' perspective entailed the facilitation of an arena for conversation. At the first meeting of the forum it was clear that this should be seen as complementing existing efforts. The initial task was to open up conversation on the issues and promote the will to take actions in a step-by-step fashion. The long-term task was to seek ways of integrating what the transparency forum has agreed upon into the decision-making structure of the European Union. An interesting possibility discussed was the drawing up of a cooperation charter between all partners to summarise agreements in the form of forum proposals and chart a path for voluntary implementation.

4.4. Concluding remarks

There is a complex relationship between knowledge development and the use of knowledge in this field, in particular within a political context. By establishing a meeting place designed for conversation and mutual exchange of ideas, the forum created a tool for promoting increased transparency in a way that mirrors the complexity of the problem. The members of the forum taking part in these conversations have positions in their Member States that allow them to speak on behalf of their states and to act on the results when they return home. The support given to them has been mainly to provide overviews of what is already known or has already been done. This process produces its own momentum. Knowledge development and the use of knowledge occur simultaneously. Attempts to produce overviews have been more important than anticipated and perhaps have been crucial. An evaluation of what is possible has been facilitated throughout the conversations leading to the exploitation of previous experiences and knowledge in the field. The final results have not yet been seen, but this approach seems to be working.

Two points seem to be of particular importance with regard to maximising the relationship between knowledge development and the use of knowledge in addressing work-life and education and training problems. (See Figure 5).

Figure 5. **The methodology of the forum (iv)**



The first point is that knowledge should be easily accessible when it is needed. This means that expert advice is readily at hand, and that overviews, including databases with user-friendly interfaces, are available. Second, the lines of dialogue and communication between the producers and users of knowledge should be strong. The resolution of the dialogue and communication problem, however, is not just the responsibility of knowledge producers. It is the responsibility of both knowledge producers and knowledge users to ensure that knowledge is exploited.

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CHAPTER 5

Building arenas for collaborative development in a Swedish context

Bernd Hofmaier

5.1. Global challenges facing Sweden

Tremendous changes have taken place in the worlds of industry and business in Sweden, as in other industrialised countries, in recent years. First, there are the radical changes in production strategies, which have led to a new competitive intensity. Second, major developments in technology can be noted. Third, there is a world-wide trend towards deregulation of state-dominated businesses.

5.1.1. New production strategies

Traditional mass production and mass consumerism was based on 'fordism' which was the tayloristic production system servicing large and unified consumer markets. The competitive success of this regime was achieved through the large-scale manufacture of standardised goods. Mass-production organisations were characterised by purpose-designed machines, the assembly line, semi-skilled workers and a traditional bureaucratic organisation. The literature on 'fordism' is clear about the conditions necessary for the success of this system (e.g. Best, 1990):

- monopoly of supply through patent protection, unique production techniques, and economies of scale;
- expanding, consumer demand for standardised products;
- long-product life cycles.

However, this system was challenged in the 1970s by several factors:

- increase in demand for specialised, high-quality goods and services;
- increasing competition because of advances in transportation and telecommunication;
- increase in capabilities of competitors outside traditional industrial countries (e.g. in South-East Asia);
- shortening of product life cycles (Sabel, 1989; Womack, 1990).

However, there is less of a consensus about the new, 'post-fordism' form of industrial production. The argument depends on one's discipline or school. Different

writers emphasise different elements. One seminal contribution to the understanding of the new forms of industrial organisation is the 'flexible specialisation' thesis presented by Piore and Sabel (1984). They observe the emergence of regional production systems with highly skilled workers, flexible machines and custom-oriented products. This is epitomised by the Italian industrial districts with their tight networks of small and medium-sized enterprises.

Other contributors to the debate describe Japanese production systems such as the 'Toyota mode of production' which are essentially supplier networks organised by one dominating firm (Kenney and Florida, 1993). This production system is characterised by:

(a) new organisational models;
(b) new types of coordination in the production chain;
(c) reformulation of patterns for industrial policy, including the creative use and shaping of markets (Best 1990, p. 11).

5.1.2. Information and communication technologies

The development of information and communication technologies (ICTs) has changed relationships inside the company and the links between firms. ICTs are seen as offering a solution to internal operational problems and the basis for transactions with suppliers, customers and partners. ICTs are seen, typically, as a way to rationalise production and administrative processes. In Germany, this is called 'systemic rationalisation'. It is seen as a new paradigm of production with a mix of new organisational relationships and ICT based relations between firms (Altmann, Köhler, Meil, 1992).

Systemic rationalisation means that strategies are geared towards the integration of company processes. The new rationalisation strategies entail inter-company networking that can lead to direct data-based linking of sub-processes between companies. Proponents of this approach advocate strategies that focus on the 'elastic potential' of technology. This means that two goals can be pursued simultaneously, the increase in flexibility of a company's administration and manufacturing process and the achievement of a more cost-effective production system. Strategic rationalisation is concerned not so much with the elastic potential of human labour, but rather the utilisation of technology's flexible potential (*ibid*. p. 50).

However, technical and organisational development is accelerating and what was the standard model a few years ago is now becoming obsolete. ICT is penetrating not only the world of production but also the world of consumption and the private lives of consumers. The difficulty for consumers is not simply keeping up to date with developments but understanding what is experienced. It is interesting that 'grand theories' are still presented, still decried, yet still applied in a very productive way. (See Manuel Castells' opus on *'The Information Age: Economy, Society and Culture'* (Castells, 1996, 1997, 1998).

5.1.3. Deregulation of the labour market

The progressive deregulation of systems has occurred in the labour market and in the economy as a whole. The economic crisis in the early 1990s, which pushed Sweden into a period of decline, was partly the result of uncoordinated deregulation attempts. Similarly, the deregulation of the labour market, which may have been appropriate in other industrial regimes, is now hindering economic growth. Nevertheless, previous rigid structures were indeed a barrier to flexibility and efficiency.

5.2. Programmes to support change and development in Sweden

Countries are addressing these challenges in different ways, depending on their economic, political and cultural contexts. Taking a historical perspective, it is interesting that as far back as 1938 there was a concerted national effort to make Sweden a modern industrial state. The country created an industrial system – *Saltsjöbadsavtalet* – that promoted constructive relations in the workplace and innovation in technology. This had very positive consequences and there is a continuation of these efforts today in a national determination to move the country to a new technological base and a different type of economy. This has meant, for example, that company or union subsidised computer schemes have resulted in 50 percent of the members of the workers' trade union (LO) having a personal computer at their disposal at home, 75 percent of the white collar union members (TCO) and 90 percent of the academic staff union (SACO). More than 50 percent of the population now work interactively with computers.

After some initial drawbacks, this strategy is now bearing fruit. Swedish industry has become a major player in telecommunications and related technologies. Large pharmaceutical companies have recognised Sweden as being one of the leading countries in terms of knowledge-intensive industries. The OECD states that more than 50 percent of Swedish industry is 'knowledge based'. The present global restructuring of industry, however, may change this picture.

Despite the inherent tensions between labour and capital that always exist, a constructive and fruitful partnership between the different actors in the labour market continued through the 1970s and 1980s. One of the arenas in which the employees, employers and researchers could meet and do collaborative development work was provided by the Swedish Work Environment Fund. Since the 1970s, under the auspices of the Fund, several large programmes have been implemented.

The early programmes were organised using established models for planning and implementing organisational or technical change. A traditional one-step strategy was used. This has been described as a 'linear model' of development, in which learning is seen as 'learning-by-example' (Gustavsen, Hart, Hofmaier, 1991).

The label ‘N-step model’ given to this process, points to the fact that in many ways it fails to fully acknowledge change as a social activity. Collins gives an account of the stages in this linear model (Collins, 1998, p. 83):

(a) develop strategy;
(b) confirm top-level support;
(c) use project management to -
  (i) identify tasks;
  (ii) vassign responsibilities;
  (iii) agree deadlines;
  (iv) initiate action;
  (v) monitor;
  (vi) vaddress problems;
  (vii) finish the project;
(d) communicate results.

Even if such a model is efficient in some circumstances, it became clear that it was an inadequate one for organisational learning and development. Influences from other development projects in the Nordic Countries (particularly Norway) and experiences from Canada and other parts of the world, raised questions about this ‘linear model’ for promoting change. The issues that came to the forefront were that change processes are social processes, which require a focus on participation, learning and a ‘systems approach’.

Similar thinking took place in other academic circles. Chris Argyris and Donald Schön, for example, put forward a new perspective in their analysis of ‘single loop’ and ‘double loop’ learning in companies (1978). Other examples are Edgar Schein’s focus on ‘organisational culture’ and ‘process-oriented’ consultation (Schein et al., 1985) and Peter Senge’s book entitled *The fifth discipline* in which he describes the different dimensions of individual and collective mastery of change and development processes (Senge, 1990).

5.2.1. **The LOM programme - ‘leadership, organisation and co-determination’**

One of the programmes implemented by the Swedish Work Environment Fund in the 1980s used a new approach. The programme, entitled ‘leadership, organisation, and co-determination’ (LOM) started with the assumptions that development entails communicative processes and that learning should be built into the design of the development programme.

Key features of the LOM programme were:

- a focus on ‘praxis’ and ‘democratic dialogue’ – based on a theory of ‘communicative competence’;
- the use of a ‘conference methodology’ that included ‘search conferences’, ‘initial conferences’ and ‘follow-up conferences’ where experiences were shared;
- a radical orientation towards ‘process’;
- clusters and networks consisting of enterprises and academic institutions.

The main ideas underpinning the LOM programme are summarised in the evaluation report (Naschold et al. 1993, p. 9):

> 'The dominant, traditional model of organisational development, based on an instrumental-rational, action orientated approach is appropriate to solving problems at a low level of complexity (optimisation strategies) in a stable environment. The LOM development model, in contrast, is designed to cope with complex problems, in particular self-reflexive transformation processes, within organisations facing a turbulent environment.
>
> In the present context of a turbulent global economy, a linguistically complex, communicative infrastructure is a necessary precondition for instrumental-rational action, in particular for radical processes of self-transformation'

The evaluation of the LOM programme confirmed that interaction and communication were important parts of an enterprise's development activities. The main methodology used was the 'search-conference'. This was originally developed by Fred and Merrelyn Emery and Eric Trist and reported at the Barford Conference in 1960 (Emery, Purser, 1996). The principles were later modified and adapted to local circumstances and used in a slightly different way in the LOM programme (Gustavsen, 1992).

However, although the LOM programme demonstrated the appropriateness of certain measures, such as conferences and creating arenas for dialogue, there were certain drawbacks. The major problem was taking ideas created in a collective arena and embedding them in the organisational development processes of individual companies. Even if there were clear signs of joint learning between participants from different companies, the traditional way of organising projects in the company was still, in many cases, the 'N-step model'.

However, despite this criticism, the participating actors – including key people in the trade unions, enterprises and public authorities – learned that development work, whether organisational or technical, could be done in a collective arena. One of the other central ideas of the LOM programme was to include researchers from universities, particularly from the relatively newly established regional universities, in an attempt to promote collaborative relations between companies and universities. For some of the company participants this had the advantage of reducing their fear of working with people from universities. However, for others it had the opposite effect, with the critical stance of some university staff making them reluctant to engage in collaborative projects.

5.2.2. The Swedish Work Life Fund

Although the LOM programme has not yet been fully researched, it has already given rise to more than ten academic dissertations and has influenced many of the programmes that followed. A good example is the Swedish Work Life Fund, which

was implemented between 1990 and 1995. In the late 1980s, the Swedish government decided to 'withdraw' (some people termed it 'confiscate') a certain amount of money from companies in the form of a special environment tax to counteract inflationary tendencies in the Swedish economy. In the 1990s, it was decided to put back about 15 billion Swedish krona into companies in the form of support for development. Companies, including public sector organisations, had to apply to a special body called the Swedish Work Life Fund, providing an outline of the proposed improvement or development programme. This action plan had to focus on three integrated topics – work environment, work organisation and rehabilitation. Altogether 25,000 projects were supported, most of them in small and medium sized enterprises (SMEs).

The evaluation of the Fund's activity was carried out by the author of this chapter and others (Gustavsen et al. 1996). Several issues emerging from the evaluation are worth noting. The Fund was not only a provider of money but also a synthesiser of trends in Swedish companies and public sector institutions and a clearing-house for emerging ideas. Through its decentralised approach, the Fund was embedded in a regional context. Through facilitating activities, direct contacts were made that led to a continuous dialogue between different actors in the regions. These dialogues started with the specific problems of the users and not general principles like 'good work organisation'. Thus, bottom-up discussions about practical issues and problems were the starting points for the development process. The evaluation showed how people in the companies participated in discussions around strategic questions, such as company targets and created jointly agreed frameworks for action. Experts worked together with people on the shop floor (Gustavsen, et al., 1996).

In the beginning, the Fund focused on individual companies and their development programmes but after some time the direction changed towards supporting networks of companies. An important outcome of the initial activities, therefore, was a more focused interest in industrial clusters and what can be termed 'cluster politics'. Historically, the Swedish industrial landscape was characterised by relatively large companies in specific sectors and many very small companies. The large companies dominated the sectors. The activities of the Work Life Fund, however, focused on the 'development relations' between companies, particularly between small and medium sized companies (SMEs) and other organisations in a region.

The lessons learned from the Work Life Fund development programme (Gustavsen, Hofmaier, 1997, see also Ennals, Gustavsen, 1999) are as follows:

(a) the *task* is at the centre of the development activity. People address 'problems' that they need to solve. Academic knowledge is not the starting point but in solving problems people can use academic knowledge;
(b) tasks and problems are *situated*. This means that general ideas such as 'the good work place' or the 'need for diversity' are not seen as useful to people in companies, especially SMEs;
(c) problem solving requires *broad strategies*. Problems are often seen as one-dimensional, e.g. a technical solution to a 'technical' problem. However, solutions, must be multi-dimensional, often having technical, organisational and training dimensions;
(d) strategy is generated through *broad dialogue*. Because problems are multi-dimensional, solutions require collaboration between all of the actors, for example, managers, employees, internal/ external experts and researchers.

Other programmes implemented after the Work Life Fund confirmed the appropriateness of these ideas. The EU European Social Fund programme, especially *Objective 4*, was successful in Sweden because of the influence of the Work Life Fund programme. Several projects under the European Union ADAPT Programme were organised according to these principles.

5.3. 'Academic knowledge' versus 'practical knowledge'

The experiences from the LOM and the Work Life Fund programmes show clearly that learning and knowledge development are central factors. One of the more problematic issues, however, is the handling of different 'knowledge cultures'. It is not only the question of, for example, 'academic knowledge cultures' versus 'practical knowledge cultures' but also the different knowledge cultures existing within these broader ones. For example, companies in the same sector can develop very different ways of defining problems and developing solutions (see, for example, Dierkes, Hoffmann, Marz, 1997).

On the academic side, the question of the usefulness of knowledge produced in the academic field for economic growth has led to interesting debates about the university system in Sweden. The establishment of regional universities led to the question of how they should relate to the region in which they were located. Many of them established fruitful and rewarding relationships with companies, SMEs, regional authorities and local organisations. This practice was observed by the political actors and placed in the forefront of debates on economic growth and subsequently became known as the 'third task' of universities. Universities are now expected to form 'development coalitions' with companies and other organisation in

the region. This has been given impetus through the establishment of research funds for collaborative projects with firms.

This 'third task' raises lots of questions about collaborative development such as how development coalitions between different knowledge cultures are to be organised. It is clear that regional universities have taken this new role seriously but there are also signs of tensions between traditional universities and the new ones. As might be expected, there are many different interests at stake. This is a question not only of creating development coalitions embracing people from different knowledge cultures but also brings up deeper issues concerning epistemology, ontology and issues of power and privilege (see Gibbons et al., 1994).

5.4. Concluding point

This chapter has focused mainly on the shift in national policies, which are opening up opportunities for regional stakeholders to engage more actively in the development of their region. Today, there is an emphasis on working together with others. The decentralisation of responsibilities from the national government has meant that localities and regions are taking greater responsibility for their own development. Universities form a central part of this strategy. One of their main tasks is to develop 'knowledge linkages' or 'development coalitions' that bring together different partners to share the unique knowledge that each holds - thus taking steps on the journey towards the 'knowledge society'.

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CHAPTER 6

Making sense of mobility projects as vehicles for learning

Søren Kristensen

6.1. Introduction

This chapter examines the use of 'transnational mobility as a didactic tool' in the context of vocational education and training (VET). The notion of using mobility in this manner is a fairly recent phenomenon dating from the late 1980s and early 1990s. We have an abundance of practical experience to show that a placement abroad develops certain skills in people, especially in young people. But, we know very little about how this actually happens, and in particular why it may not happen. As work placements abroad become incorporated in more curricula and as more and more funding is earmarked for this purpose (particularly in European Union education and training programmes) the need for knowledge about this is increasingly acute. In order to address this it is necessary to create a stable environment, that can function as a repository for what we already know, while at the same time, act as a kind of nursery for the generation of new knowledge.

6.2. What is meant by 'mobility as a didactic tool'?

As an emerging subject in the research and development arena, 'transnational mobility as a didactic tool in the context of VET' needs to be defined *vis-à-vis* other areas, especially, since 'mobility' is a term that is used in numerous other contexts and, furthermore, qualified with the epithet 'transnational'. In order to clarify the meaning of the subject, it seems useful to provide a taxonomy of the term 'transnational mobility' according to the different purposes served. We can distinguish between (transnational) mobility that serves:

- recreation purposes (tourism);
- labour market purposes (migratory movements for work);
- learning purposes (which we are concerned with here).

Concerning mobility for learning purposes, we may again distinguish several uses, each appearing in a specific historical context, which are:

(a) mobility used as a vehicle for the transfer of technology and knowledge (as in medieval times, when the guilds insisted that a craftsman could not become 'a master' unless he had travelled abroad for a certain period of time in order to learn about new materials and methods);
(b) mobility used to foster intercultural understanding as promoted after the second world war, when several youth exchange organisations were set up with the explicit purpose of promoting peace and understanding through personal encounters. Examples are the American field service, which was originally set up by American ex-service ambulance men after World War I, and the Franco-German youth office, which was set up to improve relations between Germany and France after World War II;
(c) mobility used as a 'training ground' to encourage young workers to consider looking for employment abroad at a later stage. (This use of mobility is foreseen in the Treaty of Rome - Article 51 - and formed the rationale for the first EC mobility programme, that was set up in 1964).

If we look at the use of mobility specifically in a vocational education and training (VET) context, a fourth rationale appears which ties in with developments in industry and the economy that took place in the late 1980s and 1990s and which is: mobility as a didactic tool to foster the acquisition of 'international skills' (foreign language skills, intercultural competence) and personal skills (entrepreneurial, decision-making and interpersonal skills).

This form of mobility relates to recent developments in society such as globalisation and the rapid growth in technology. Both of these have important implications for the way in which VET is understood and delivered. As company mergers and acquisitions across borders multiply, as import/export relations proliferate and as production is split up in both time and space, there is a need for a workforce that is able to interact constructively with people from different cultural backgrounds. Also, as technical skills are made obsolete almost overnight, due to the introduction of new technology, the focus shifts to learning new knowledge rather than the reproduction of existing knowledge and from textbook knowledge to more general skills such as adaptability, creativity, risk-taking and team-building. These skill requirements have long been recognised in a VET context and many efforts have been devoted to devising ways to develop them.

Transnational mobility in the form of a placement abroad for a period of time is seen as a very efficient way of fostering these skills. In the first phase of the Leonardo da Vinci Programme (1995-99) 125,000 people participated in mobility projects. In the second phase of the programme (2000 - 2005) an increase of this number to 250,000 placements is foreseen. If we add these figures to the activities initiated nationally outside of the context of European programmes, we reach an

even more substantial number. In Denmark, for example, since 1992, everybody in initial vocational training has had the right to take a part (or all) of their mandatory work placement periods abroad. Every year, approximately 1,000 apprentices take advantage of this opportunity to spend an average of eight months in an enterprise in another European country. In Sweden, a similar scheme allows young jobless people to undertake a six-month placement abroad in order to improve their employability.

Evaluations undertaken at regional and national level show that these transnational placements do indeed 'deliver the goods'. Young people who have taken part in a transnational placement scheme, as a rule, return with a notable increase in international and personal skills. What we know very little about, however, is how this learning process actually takes place and what are the factors that facilitate it. With the numbers of young people involved, we not only have a right but also a duty to make sure that this investment, in terms of money and time, yields appropriate returns. We need to know what we are doing.

6.3. The lack of knowledge on mobility projects

Much knowledge is developed in what can be termed 'communities of practice'. Communities of practice are groups of practitioners organised around a common activity in which knowledge develops through the sharing of experiences. Very often, much of this knowledge is partly or wholly tacit and is transmitted from one actor to the other by word of mouth or simply by one practitioner observing, interacting and engaging with the actions and thoughts of another. (This process can be described as 'contextual learning' and is typical of traditional apprenticeship learning). Through their descriptive analysis, researchers can make this knowledge explicit.

If we apply this process to the organisation and management of transnational placement projects, the problem we encounter is that the practitioners are very differentiated. The average European vocational college (the most frequent placement organiser) will typically organise maybe one or two placement projects per year. In most cases different departments, and hence different people, will be in charge of organising these placements. For the majority of these it will often be a first-time experience, which they are unlikely to repeat in the immediate future as it is very rarely a core function of their jobs. The 'community of practice' in the field of the management of mobility projects will thus consist of people who are dispersed and whose range of experience is, in most cases, quite limited. Moreover, there is a constant flow of people in and out of the community. Indeed, the lack of stability and the limited possibilities for interaction make it questionable whether one can speak of a 'community' at all. The lack of any firm basis affects the production of 'knowledge' about this topic. Researchers wishing to work in the field will have precious little to go on apart from raw data on the quantitative aspects of placements.

This diagnosis is corroborated by an examination of developments in national and European mobility projects in VET since the early 1990s and the launch of the Petra and the Lingua programmes. The number of transnational placements has steadily risen due to increased funding but the nature of the debate on qualitative aspects has not progressed at the same pace. Indeed, this has stagnated rather than progressed. It seems to have remained stuck on the issue of the 'practical barriers to mobility', since the European Commission issued its Green Paper on the barriers to mobility in 1996. An analysis of pilot projects and surveys and analyses of the Leonardo da Vinci I Programme (strand II and III) shows up a very limited number of projects supporting mobility activities and that number has actually decreased instead of increasing in tandem with the growth in funding available.

Many reasons can be put forward for this. Traditionally, mobility has been perceived as an exercise in logistics rather than a didactic activity. The focus has been on the practical and logistical aspects such as the removal of legal and practical barriers to mobility rather than the actual content of learning. Thus, there has never been any major qualitative evaluation of the effects of mobility projects at a European level. The primary success criterion has always been numerical, while the outcome in terms of learning has received scant attention. Typically, it has been statisticians rather than educationalists who have set the agenda.

Without doubt, the major reason for this lack of knowledge lies in the difficulties in establishing a community (or communities) of practice that can help build up and pass on knowledge in this area. Instead of capitalising on past experiences, placement organisers are, to a large extent, forced to 'reinvent the wheel'. Thus, the knowledge-base built up is lost, as there is no community to whom it can be passed on. True, there have been attempts to build communities of practice in the field. In the EC '3rd Programme for the exchange of young workers' (1984-92), the European Commission worked with a number of 'national promoters' through whom all activities were channelled. These promoters formed a stable group that met regularly at both formal and informal levels and exchanged views on their experiences. As a result of this, a certain knowledge-base (albeit mostly tacit) came into being. This system, built around 'national promoters', changed when mobility projects were incorporated in the Petra programme. Although this greatly increased accessibility, in the long run it meant the erosion of much of the knowledge base that had been built up. Similarly, at a national level, we have the example of the German national coordination unit of the Leonardo da Vinci I Programme, which organised annual meetings of placement organisers. Here, information was disseminated, common problems discussed and working groups set up to delve deeper into selected areas. Other national coordination units tried similar approaches, but difficulties were experienced in elaborating an agenda to cater for a very heterogeneous group. Another problem with these strictly national communities is that, as a rule, they do not involve those responsible for organising mobility projects in the receiving countries.

6.4. What we know

The ‘knowledge’ that we do have is one that has come about not as the result of any concerted support effort by researchers but through the work of geographically dispersed practitioners. A brief outline of this ‘knowledge’ is presented below.

It appears that learning on mobility projects occurs through two different processes, which we may call ‘immersion’ and ‘responsibilisation’. ‘Immersion’ relates to the degree of proximity to and interaction with another culture or way of thinking. Put simply: the more participants are exposed to a foreign environment, the more they are likely to acquire, in terms of foreign language skills and intercultural competence. If, conversely, they stay mostly with colleagues from their own country and are not properly integrated in the work processes of the company in which they are doing their placements, their learning will be limited. The second process ‘responsibilisation’ denotes the space that is available to a participant for autonomous decision-making in his living and working environment. For many participants, the placement will be the first time that they, figuratively speaking, are playing an important match away from their home ground. They will not have their usual network of family, friends and teachers to receive instruction on how to solve the many small or large problems they encounter. They will have to devise ways and means of doing things for themselves. Furthermore, many of the challenges will have a cultural dimension and be of a nature where they cannot draw on past models for solutions. On the other hand, the fact that they are ‘alone’ in this new environment, means that they can act in an atmosphere where they are free from the expectations of others and can experiment with aspects of their personality that are normally not activated. In this process they have the opportunity to learn to become adaptable, enterprising and open to new influences in a positive way.

These two learning processes may take their course all by themselves, and indeed sometimes do. Most young people, however, need to be facilitated. A number of actions, therefore, should take place before, during and after a placement to ensure that it is a ‘quality’ experience. Above all, a participant must be properly prepared for the experience. Preparation should cover linguistic, cultural, vocational, practical and psychological issues. Preparation can be a long and costly business, but unfortunately, is often pared down to the bare essentials for financial reasons. With no preparation at all, however, the learning process is seriously impaired and what should be an empowering experience may turn into a negative one that produces the opposite results to those desired.

No preparation, however good, can cover all eventualities and, therefore, it is necessary to have a support system at hand to provide advice and practical assistance during the placement. In its most basic form this means the telephone number of a local person to whom participants can turn if they need advice or encounter problems that they cannot cope with on their own. A more sophisticated support system takes the form of ‘mentoring’. This entails the availability of a person

(mostly in the company where the participants are doing their placements) who supports the participants and supervises the proper development of the learning process. However, mentoring is a very delicate business and one should be careful about overprotecting participants in a way that interferes with the process of 'responsibilisation'. 'Mothering' the participant produces a situation where 'more becomes less'. After the placement project is finished and participants have returned to their home countries, they must be given the possibility to put their experiences into perspective through debriefing sessions.

It is not possible to produce any absolute criteria concerning the quality of transnational placement projects. These must be tailor-made for each project according to a number of factors. The first of these is duration. The longer a placement lasts, the more the participant is likely to learn. The conclusion from this would be to decree a minimum length for all transnational placements of, for example, three months. But, this is not possible. The funding available may not permit a stay of more than three weeks and in many VET systems, for example, it is not possible to send apprentices away for more than a maximum of one month if the stay is to be recognised as a part of their course.

It is also necessary to take into consideration the target group involved. Highly motivated and qualified trainees (from vocational, personal and linguistic points of view) may need very little in terms of preparation and mentoring. If, on the other hand, we are dealing with people with disabilities or participants otherwise disadvantaged, we need to adopt a radically different approach. The age of the participant is also a factor to take into consideration, as research undertaken in other contexts seems to indicate that the nature of the learning process and skill acquisition changes with age. This is the reason why the term 'young people' has been used above a number of times instead of the word 'participants'.

6.5. Knowledge generation about mobility and the role of Cedefop

The questions arising from the above reflections are:

(a) where do we go from here?
(b) how can we ensure that the present knowledge base is kept intact and properly disseminated?
(c) how can we expand it and what is the role of Cedefop in this regard?

Cedefop performs the task of accumulating and disseminating information through carrying out research and promoting cooperation between key players in the field of VET at a European level. In this context, the analysis of 'mobility as a didactic tool in the context of VET' is a relatively new area. However, despite the relative novelty of the theme in Cedefop's work programme, it is not a matter of starting from rock bottom. 'Mobility as a didactic tool' is a composite theme that

contains elements of several other themes - listed below - that Cedefop and other organisations are currently studying:

- work-linked training;
- key qualifications;
- intercultural competence;
- transparency;
- foreign language acquisition;
- recognition of non-formal learning;
- labour migration;
- learning and the process of ageing.

Thus, there is much that already exists that can be used to shed light on the subject of mobility as a didactic tool in VET. But, this needs to be processed further and put in perspective in order to become 'knowledge' that can be applied. There is a need to map progress in the field and pinpoint the many lacunae that exist and - in so far as it is possible - initiate new research to illuminate the dark spots on the map. To some extent, Cedefop could implement this itself through accompanying research linked to selected projects, but the absence of adequate budgets does not allow for the required large scale research to be undertaken.

Given the fact that Cedefop, by itself, can only address this task to a limited extent, it may be more productive to try to create a framework for the process of knowledge generation to take place. In this case, it would mean facilitating the creation of communities of practice on the theme of 'mobility as a didactic tool in the context of VET'. This 'facilitating role' implies carrying out two specific actions.

First, an inventory of existing knowledge and information needs to be created. The main task is one of identifying and editing useful knowledge from a large number of sources and contexts and ensuring that this is made available to all interested parties. Second, it is necessary to create a forum that allows for networking and interaction, leading to the active generation of knowledge.

Concerning the inventory task, Cedefop has launched a series of studies that eventually will comprise all EU member states (plus Norway and Iceland) with a view to:

(a) obtaining basic information on the use of mobility as a didactic tool in VET;
(b) gathering information on relevant research and development projects;
(c) locating examples of good practice.

These studies will pay particular attention to activities that take place outside of the Leonardo da Vinci Programme context. An analysis of the mobility strand of the Leonardo I Programme as well as a review of the mobility-related Leonardo pilot projects and surveys is also being undertaken.

Regarding the formation of a forum for networking and knowledge development, the traditional means for ensuring interaction and networking are seminars, colloquia and conferences. However, given the potential size of the target group, information communication technology (ICT) supported approaches must also be

used. ICT can never replace face-to-face discussions and interactions, but it can help bring a geographically dispersed group of people into contact with each other. Network relationships can be enriched through virtual encounters.

Finally, communities of practice in the context of ‘mobility’ must be supported at different levels. One of these is the group of placement organisers themselves, i.e. the people who carry out the practical work of implementing placement projects. Another concerns those engaged in research and development work. There is also a third group that spans both of the above named groups and comprises ‘reflective practitioners’ who are able to take their experiences out of their immediate contexts and transform them into knowledge of a more general nature. Making sense of ‘mobility as a didactic tool in VET’ depends on how far these three groups or communities can fruitfully interact with each other to generate new knowledge.

Part Three

Information and communication technologies and knowledge development

CHAPTER 7

Creating spaces for knowledge development – reflections on ICT support for the Cedefop research arena

Alan Brown and Graham Attwell

7.1. Introduction

The Cedefop research arena (Cedra) aims to explore and develop new forms of collaborative research and practice in the field of European vocational education and training, building on a growing tradition of collaboration within European Union funded research and development projects. Early EU funded projects focused on descriptive and comparative work, with partners sharing the outcomes of national research. However, with the creation of extended and shared knowledge bases between Member States, more collaborative ventures have come into being. These have been typically based around networks of partners, often with considerable experience of working together.

This has led to a new focus on the problems of establishing shared meanings among people from different cultures and supporting communications in extended and dispersed networks. At the same time, education and training has become increasingly recognised as central to a political agenda focused upon economic competitiveness and social inclusion. What was once a marginal area of interest (at least in research terms) has become a key area of economic and social policy. Yet, despite increasing recognition, vocational education and training (VET) has not achieved the status of a discipline in itself. It is best seen as an interdisciplinary – or a connective - specialism, made up of researchers from many related fields, including pedagogy, labour market studies, psychology, sociology and economics. It is only recently that we have been witnessing the gradual emergence of a community of practice in research in European vocational education and training.

Information and communication technologies (ICT) have played an increasingly important role in enabling the emergence of this community of practice. Most important has been the use of e-mail – allowing cheap and fast communication among individuals, groups of researchers, and project partners. More recently, the Web has permitted better access to research findings, outcomes and reference

materials. However, the use of these technologies has been restricted by the limitations of the technologies themselves and by the (traditional) low level of 'electronic interactions' between researchers in their daily work practices. The major use of these technologies has been as a fast and cheap means of providing information but not so much in supporting the development or transformation of knowledge.

The explosion in information provision made possible by digital technologies has turned our attention to the difference between information and knowledge. Information and knowledge are not the same. Industrial pundits and European policy makers claim that the creation and use of knowledge is critical to the creation of 'added value' and innovation in the modern economy. It is not enough for us merely to adapt to faster and more efficient forms of information. Instead we need to look at ways of developing and transforming knowledge.

Knowledge development lies at the heart of the Cedra agenda. The use of information and communication technologies for knowledge development in vocational education and training research forms the main subject of this chapter. Before beginning our exploration, we should state our basic assumptions. We do not believe that the use of ICT can replace human interactions. A rich range of peripheral communications that take place in the physical world is dependent on inter-subjectivity, presence and spontaneity. Relationships, trust and commitments between partners are often developed where there are opportunities for face-to-face contacts and these often occur in peripheral settings rather than in formal meetings. The sidelines to the main discussions often provide opportunities to generate new ideas. Knowing 'who' can be as important as knowing 'what'. Gesture and intonation can convey much more than the printed or electronic word. Cedra, therefore, is not just about computer based resource development. It is also about providing opportunities for face-to-face discussions that can enrich and re-invigorate 'computer-mediated communications' (CMC). At the same time, developments in CMC are opening up other opportunities for collaboration and, as such, are a major focus in Cedra. We believe that computer-mediated communications can play an important role in knowledge development, but only if appropriate tool development takes place.

We also believe that knowledge development is closely related to continuing professional development and learning. Innovation comes about through interaction between ideas and actions. This entails learning, and learning is essentially a social and collaborative activity. This chapter explores the support systems needed to build this collaboration. Software tools and ICT environments that support collaborative practice need to be developed. In order to focus on collaborative practice, tools are required to enable the different actors, such as, teachers, trainers, researchers and students to communicate and learn from each other. Policy makers and planners also require tools to participate in this process.

This paper starts by examining the process of knowledge development itself,

which is at the heart of our work, through discussing the theoretical model of knowledge creation of Nonaka and Konno (1998). Then it explores ways of promoting collaboration for knowledge development in dispersed communities of practice through the use of ICT, drawing on and referring to work previously undertaken for Cedefop in the Televet project (Attwell and Brown, 1999). Finally, it relates these discussions to developments taking place in the Cedra context.

7.2. Building a foundation for knowledge creation

Nonaka and Konno (1998) examined the basis and conditions for knowledge creation and drew attention to the importance of developing collaborative relationships. They used the idea of *ba* as a shared space for emerging relationships. They believed that what differentiated *ba* from ordinary human interaction is the concept of knowledge creation. *Ba* provides a platform for advancing individual and/or collective knowledge. The key role of *ba,* therefore, is to be a shared space that serves as a foundation for knowledge creation.

If knowledge is separated from *ba*, it turns into information, which can then be communicated independently from *ba*. Information resides in media and networks. It is tangible. In contrast, knowledge resides in *ba*. It is intangible. To participate in a *ba* means to get involved and transcend one's own limited perspective or boundary. This exploration is necessary in order to profit from the 'magic synthesis' of rationality and intuition that produces creativity. Within an organisation, then, one can both experience transcendence in *ba* and yet remain analytically rational, achieving the best of both worlds (Nonaka and Konno, 1998).

Ba is also conceived as the frame (made up of the borders of space and time) in which knowledge is activated as a resource for creation. This links to the SECI Model (see Figure 1) of knowledge creation as a spiralling process of interactions between explicit and tacit knowledge (Nonaka and Takeuchi, 1995). *Ba* therefore offers an integrating conceptual metaphor for the SECI model of dynamic knowledge conversions.

7.2.1. Knowledge creation and the characteristics of the four types of *ba*

There are four types of *ba* that correspond to the four stages of the SECI model. Each category describes a *ba* especially suited to each of the four knowledge conversion modes. These *ba* offer platforms for specific steps in the knowledge spiral process. The combinations of processes are shown in Figure 1. Each *ba* supports a particular conversion process and thereby each *ba* speeds up the process of knowledge creation.

Originating *ba* is the world where individuals share feelings, emotions, experiences, and mental models. Originating *ba* is the primary *ba* from which the knowledge-creation process begins and represents the socialisation phase. The

Figure 1. **The four characteristics of *ba*** ([10])

interacting *ba* is more consciously constructed, as compared to the originating *ba*. Selecting people with the right mix of specific knowledge and capabilities for a project team, taskforce, or cross-functional team is critical. Through dialogue, individuals' mental models and skills are converted into common terms and concepts. Two processes operate in concert: individuals share the mental model of others, but also reflect on and analyse their own. Interacting *ba* is the place where tacit knowledge is made explicit, thus it represents the externalisation process. Dialogue is key for such conversions; and the extensive use of metaphors is one of the conversion skills required (Nonaka and Konno, 1998).

Cyber *ba* is a place of interaction in a virtual world instead of real space and time; and it represents the combination phase. Here, the combining of new explicit knowledge with existing information and knowledge generates and systematises explicit knowledge throughout the organisation. Exercising *ba* supports the internalisation phase. Exercising *ba* facilitate the conversion of explicit knowledge to tacit knowledge ([11]). The organisation's *ba* is not just the accumulation of different

([10]) The SECI model implies continuing spirals of socialisation, externalisation, combination and internalisation.

([11]) Learning by continuous self-refinement through off-the-job training or peripheral and active participation is also stressed by Lave and Wenger (1991).

materials or information, rather it refers to the dynamism to continually create new knowledge through a cycle of converting tacit knowledge into explicit knowledge and then reconverting it into tacit knowledge (Nonaka and Konno, 1998).

Where for Nonaka and Konno (1998) it is the role of top management to act as the providers of *ba* for knowledge creation, we also see a role for ICT supported 'virtual knowledge development environments' to promote knowledge creation and transformation in the European VET research community. The Cedefop research arena (Cedra) can play a part in supporting this process.

7.3. ICT supported networks and interactions

This section of the paper will examine the potential of computer based information and communication systems to support the development of new knowledge. It is our concern that the use of ICT be seen primarily as a tool to support processes of communication, discourse and exchange. Information systems and databases as such will not create new knowledge. It is the process of reflection and discourse that generates and transforms knowledge

The Cedefop Televet project (Attwell and Brown, 1999) evaluated the potential use of ICT based media for developing knowledge within communities of practice. Different media within collaborative networks can be used, for example:

- e-mail;
- telephone-video conferences;
- computer supported conferences;
- computer-based information systems, such as the ones developed by the 'REM telematics in Europe' project coordinated by the University of Wales, Bangor. (See Owen and Liber, 1998).

It may be useful to reflect upon whether, within European VET research networks, a small number of people using ICT could act as 'key communication nodes'. These focal actors could link many others who are not involved in such intensive communications, providing extensive coverage through a few central figures. It should be remembered that this process advocates the use of ICT tools as a support alongside other means of communication, in line with recent investigations showing that 'media fills different niches in collaborative work patterns of distributed groups' (Haythornthwaite, 1999). What are the issues to be considered when looking at the collaborative work patterns of distributed groups? The following are put forward as a basis for discussion:

(a) promoting exposure to the ideas and experiences of others;
(b) need to maintain an evidence base;
(c) role of project meetings and conferences;
(d) convenience/ease of use of ICT tools;
(e) danger of information overload;

(f) need for group support. (Much commercial software is organised around taking decisions. This overlooks many areas where the main focus is not on taking decisions.)

Other potential uses for ICT based systems include support for brainstorming, negotiating, learning, engaging with policy networks and dissemination. ICT based systems may provide for greater transparency and access to papers and materials as, for example, in the REM European VET research folders (see Owen and Liber, 1998). In the initial phases, computer-based systems can help orientate people working on a certain 'topic'. They may also be of value in building consensus within project groups through providing transparency, even if there are many passive participants. Key people who are reluctant to travel can participate in 'virtual meetings'.

Researchers have traditionally interacted with subject matter through shared and cumulative annotations of documents and artefacts. ICT based systems could include support for:

- development, editing and modification of documents;
- sharing of documents;
- information retrieval;
- searchable texts;
- shared annotation;
- classification and re-classification of texts and parts of texts;
- knowledge development/transformation.

Knowledge can be seen as meaningful information once it has been put into a context. Thus the systems being developed are not just about the transmission of correct information, but focus on how to facilitate distributed groups in knowledge transformation**.** Thus, taking these considerations together, VET researchers and other actors can use ICT support with regard to the following:

(a) access to knowledge from different sources;
(b) collaborative reflection and inquiry;
(c) openness - allowing the participation of others;
(d) opportunities to disseminate;
(e) assistance with personal and group knowledge building.

It should be noted that the availability of ICT instruments ('cyber spaces') does not replace the need for more traditional forms of communication tools – meetings, seminars, books and journals. The view of a representative of an IBM research and development laboratory bears this out: 'Computers don't support conversation well, particularly asynchronous conversations among groups. Such conversations often lack coherence, tending towards drift, dissolution, or chaos'(Erickson, 1999, p.59).

But 'computer-mediated communications' (CMC) does offer persistence. Conversations may be searched, annotated, restructured and recontextualised. The REM system, for example, allows the asynchronous participation of those

unable to attend conferences and network meetings. The REM project was characterised by a deep-rooted commitment to the notion of collaborative learning as a social process. In this respect a pedagogic model of collaborative learning led technological development rather than vice versa (Owen and Liber, 1998).

7.4. The Cedra computer mediated 'research resource bases' (RRBs)

The focus of Cedra is not on computer-mediated communication but on enhancing and facilitating the process of knowledge development in communities of practice. In pursuit of this aim Cedra is commissioning research, organising seminars and colloquia and publishing books and papers as well as developing and experimenting with CMC and ICT based systems and tools. Cedefop has developed three 'pilot' computer mediated 'research resource bases' (RRBs) dealing with:

- ICT as a support for VET and learning;
- the education and training of VET professionals;
- 'the learning organisation'.

These can be accessed/viewed on the Cedra page of the Cedefop electronic training village (ETV) site. These themes were selected because they were considered central to the future development of education and training research and practice in Europe and are the focus of European transnational networks.

The material on these three themes has been converted into structured XML resources using an XML editor, forming what are called 'research resource bases'(RRBs). This conversion allows:

(a) meanings to be made more explicit;
(b) richer meanings to be added to documents;
(c) discussion about documents to take place at 'a fine grained' level ([12]).

One of the key aims of Cedra is to develop knowledge through sharing ideas and meanings and it is believed that there is a need to have a wider exchange of materials. However, in this regard, the existing form in which researchers express their ideas - predominantly in paper or document format - has severe limitations. One purpose of the ICT based research resource bases (RRBs) is to break down documents into smaller components - or 'chunks' - permitting a synthesis and clarification of the meanings lying within each component. There are several reasons why flat content creation is not good enough. The advantages of enabling structured content include:

- rich display – browsers can offer a very rich interactive display of content, provided that the 'insides' and 'organisation' of the content are revealed in a meaningful way;

([12]) Although, it should be noted that the term 'documents' is used here with some reservations.

- annotation – users can more usefully annotate and add to the content of documents if they can act on their sub-structural parts instead of monolithic wholes;
- reference and cross-reference – the act of 'pointing at' content is much more powerful if it can 'reach inside';
- reuse – document writers are familiar with the 'cut and paste' approach to re-using texts; it is preferable to reuse standardised content by pointing and linking;
- collaborative authorship – as for reuse, collaborative authorship requires that the parts of a document can be individually accessed, signed-out, edited, proofed, etc.

The features above require that document structure is represented explicitly, but this could be a simple outline structure. Much more powerful features become possible when the parts of a document has 'types' - special characteristics suited to expressing and interacting with different kinds of meaning.

The aim of the Cedra tools is to create richer environments for collaborative working and learning. This vision sees the browsing of content as being inseparable from creating conversations hinged around that content. It is essential for users to be able to iterate the development of knowledge networks by adding links, assertions, notes and criticisms to the content in our systems. It is also essential that all users are empowered to be authors of sophisticated interactive content and publishers of shared knowledge. Finally, our approach to the future of electronic messaging is to put conversations in the context of the content they refer to, rather than in 'mail folders', and to allow the same richness of structure within messages as within documents. These goals require new user interfaces for browsing and creating message content, that is interfaces that will initially use web browsers as their platform.

7.4.1. Extended mark-up language (XML)

There are numerous ways of representing and exchanging structured content. In the past, most web applications which transferred structured information did so in a proprietary format unique to each application, and almost all web content was stored and authored in HTML. The World-Wide-Web Consortium (W3C) and other bodies developed standardised representational formats to ease this problem. XML is a very simple format, from the W3C, for which there are now many tools for parsing and processing text which encodes XML-documents.

It is important in our plans to use XML as the transport representation of our content and interactions for four reasons. First, it makes it possible to use existing software for basic processing. Second, it opens up the possibility of interoperating and exchanging content with other systems, and for displaying content authored in a wide variety of tools. Third, it allows us to create powerful tools and environments for the management of shared structures in collaborative communities, while opening ourselves to structures from other environments. Finally, the use of XML allows Cedra to participate in the process of agreeing standards for developing and sharing knowledge within 'communities of practice'.

7.4.2. Cedra and knowledge development

In its focus on discourse through shared annotation as a means of communication, Cedra is building on older academic practices of knowledge development. Documents cease to be statically presented but take on a 'social life' through a process of interpretation and disputation. The process of knowledge transformation may be particularly potent in an interdisciplinary field such as 'careers guidance'. Knowledge may be transformed through a process of recontextualisation to different settings and boundary-crossing between different academic traditions. The fine-grained semantics that the editing tools seek to supply should facilitate these processes. A focus on practice is a central theme of Cedra, in order to encourage the development of knowledge, that makes use of the processes of 'knowing' that Brown and Duguid (1996) see as crucial in the development of new knowledge. The key problem unmasked by the attempt at extensive computer-mediated collaboration by teacher training institutions across Europe in the REM project (Owen and Liber, 1998) is how to facilitate discourse and interaction. Unfortunately, most university or project web sites focus on disseminating the outcomes of research rather than on facilitating debate about practice.

How can this focus on practice be developed? Cedra will attempt to link with practitioners and policy makers as well as researchers. Reflective actions undertaken during development can be more important than the end products. For this, the provision of a good user interface is critical. Cedra will draw upon face-to-face discussions and events to link in with a series of 'events' using virtual technologies. These could take the form of on-line seminars or debates. The key criteria are that they are well prepared, time bound and moderated. Whilst the use of the tools outlined here might mark a first step, further investigation is needed into the design of interfaces for continuing professional development for dispersed communities of practice. At the same time as developing Cedra as a focus for knowledge sharing and development, it is important to continue explorations and research into the broader processes of knowledge development in communities of practice. The evaluation of the use of collaborative technologies in supporting communities of practice is vital if lessons learned on this project are to be generalised. There has been considerable interest in the role of technology in the support of collaborative and communicative work and learning. This has been seen, for instance, in the context of work flows (Winograd & Flores, 1987), in relation to collaboration around living documents (Brown & Duguid, 1996) or as socio-cultural activity systems (Engeström & Cole, 1993). These ideas have been applied to education (for example, Guile & Hayton, 1999), where they have generated strong opposition (Robbins & Webster, 1999) but also gained support regarding the use of collaborative technologies as learning tools (Mason, 1998). In general, however, practice has not always lived up to the potential (Hilz, 1985), so critical evaluation, both formative and summative, is vital in order to assess the degree of success of the innovative use of telematic tools proposed in this project.

Perkins and Newman (1996) point out that while there are often virtuosos in such a milieu, there are also those who are only there by virtue of registration but not engagement. The issue of what is and what is not effective for some in these on-line collaborative situations needs to be addressed if we are to develop some generalisation about the use of technology in the support of communities of practice. For this reason Cedra will evaluate the processes of collaboration and learning supported by the technology. It will study communities of practice in their socio-cultural setting to uncover some of the reasons, issues and problems that make the use of these technologies successful or unsuccessful. This is intended to be a formative and iterative approach as the management of the system will change in reaction to the evaluation. Cedra will adapt methodologies of systems design that are firmly based on socio-cultural activity theory (Engeström and Cole, 1993). Kapetelinen and Nardi (1997) have produced guidelines that will be incorporated into the evaluation approach.

Kapetelinen and Nardi's checklist, for the application of 'activity theory' to human computer systems design, can be used for identifying the most important factors influencing the use of computer technologies in a particular setting. The process, from their perspective, follows a clear sequence. The first phase involves starting from observational data indicating potential problems, then formulating requests for further analysis, before providing suggestions on how the problems can be solved. In the second phase an activity checklist, that can be used interactively, is introduced. The general structure of the checklist corresponds to the four main perspectives relating to the use of the technology to be evaluated:

(a) focus on the structure of the user's activities - that is the extent to which the technology facilitates and constrains the attainment of the user's goals and the impact of the technology on provoking or resolving conflicts between different goals;
(b) focus on the structure of environment - that is the integration of technology to support a community of practice with tools and resources in line with the social norms of the environment;
(c) focus on the structure and dynamics of the interaction - that is, internal versus external components of activities and support for transformations and building communities of practice;
(d) focus on development - that is the developmental transformation of all the above components as a whole.

7.5. Concluding point

The knowledge transformation activities of Cedra will involve a mix of real and virtual encounters, leading to a spiral of knowledge creation and transformation on different themes. The dynamic structure of the telematic environment will allow material and ideas to be rapidly transferred between themes entailing the potential capacity to continually create new knowledge. The role of the telematic platform is to provide a rich virtual knowledge environment to support the processes of knowledge creation in vocational education and training in Europe.

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CHAPTER 8

Web-based support for collaborative research

Sabine Manning

8.1. Introduction

This chapter discusses issues surrounding knowledge development in vocational education and training (VET) in the context of the design of information and communication technology (ICT) tools for the Cedefop research arena (Cedra). The author's ideas are based on practical experience in developing ICT web-based support systems for collaborative research. Two issues in particular are discussed:
(a) the tension between ICT driven innovation and users' needs; and
(b) the dialectical relationship between '*knowledge*' and '*information*'.

ICT is a powerful driving force – new software and new tools are emerging that have great potential for supporting research work. However, it is not known at the outset whether a new ICT application will actually prove useful. It is necessary to experiment, test and evaluate, and, in the end, the users will decide, without mercy, on its success or failure.

In this context we are facing new questions concerning the relationship between knowledge and information. Apart from the cognitive dimension of this relationship, there is also the practical issue of the deeply rooted division of labour between 'knowledge development', as pursued by researchers, and 'information processing' carried out by documentation experts. With the emergence of ICT facilities and expertise, new opportunities for interrelating these two processes arise. However, this requires new modes of collaboration which may be in conflict with traditional attitudes.

8.2. Sharing knowledge and information

Cedra is promoting initiatives and experiments related to sharing knowledge and information. It has two priorities: providing an overview of research and promoting knowledge development. Both areas are important for the research community. Their differences, however, may not facilitate an integrated approach. A first attempt to understand the diversity of Cedra related activities shows a sophisticated arrangement of elements according to thematic areas and layers of knowledge development. The documentary (or information providing) overviews and the

conceptual aspects of knowledge development appear as two poles along an axis.

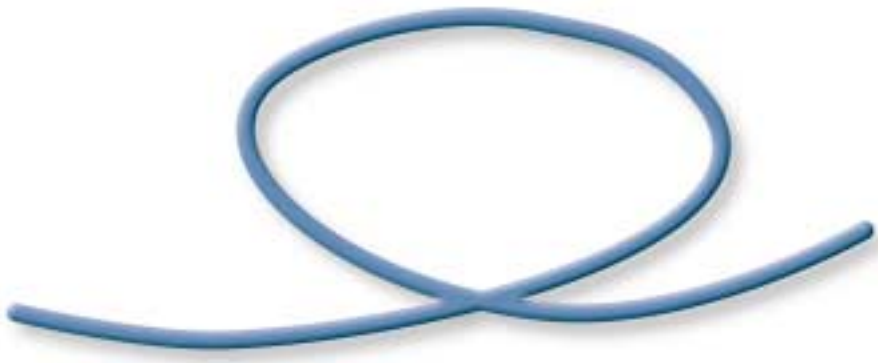
If viewed from the practice of research activities, however, knowledge and information may also be regarded as being interrelated. Information about facts, findings or ideas may be compiled or transmitted in any form (overviews, reports, resource bases) and also shared through collaborative processes. If information is taken up by individuals or teams in an intellectual process (research, debate, construction) it is integrated in knowledge formation, which may be the result of a collaborative process. Furthermore, if the output of this knowledge is passed on to others (through dissemination) it turns into (research-based) information and may be exploited for knowledge formation in further contexts. In this perspective, information and knowledge are conceived as part of a 'spiral' making for a continuous process of transformation.

8.3. Model of a collaborative research process

The 'spiral' image may depict the general pattern of a research project and also provide for the potential integration of web-based tools in the process.

Figure 1 describes the three phases of a collaborative research process which are typical of project work: preparation, knowledge development and dissemination. These phases may overlap, since research is not a linear process, although they mark a sequence which cannot be entirely reversed or abandoned.

Figure 1. **Phases of a collaborative research process**



PHASE 1
Preparation
Collecting information, conceptual development, building research team

PHASE 2
Knowledge development
Investigating (in teams), sharing knowledge, producing results

PHASE 3
Dissemination
Publishing results, evaluating outcomes, preparing follow-up

Knowledge development is mainly concentrated in phase 2, but it also forms part of the preparation and dissemination phases. The flow of information is essential, not only in phases 1 and 3, but also as a means of integrating all phases of the process in carrying out a project. The interrelation between knowledge and information in the course of this process may be described in a simplified manner as follows:

(a) phase 1: integration of information from various sources, including external research results; development of conceptual knowledge as a basis for phase 2;
(b) phase 2: intensive phase of knowledge development, including the generation and sharing of knowledge in a research team;
(c) phase 3: representation of knowledge and transmission to the public and/or transfer to other contexts including knowledge application and further development.

While the model above may apply both to individual and collaborative research, there are specific characteristics and requirements related to collaboration in European transnational partnerships. These are summarised below in Figure 2.

Figure 2. **Issues to be addressed in European collaborative research**

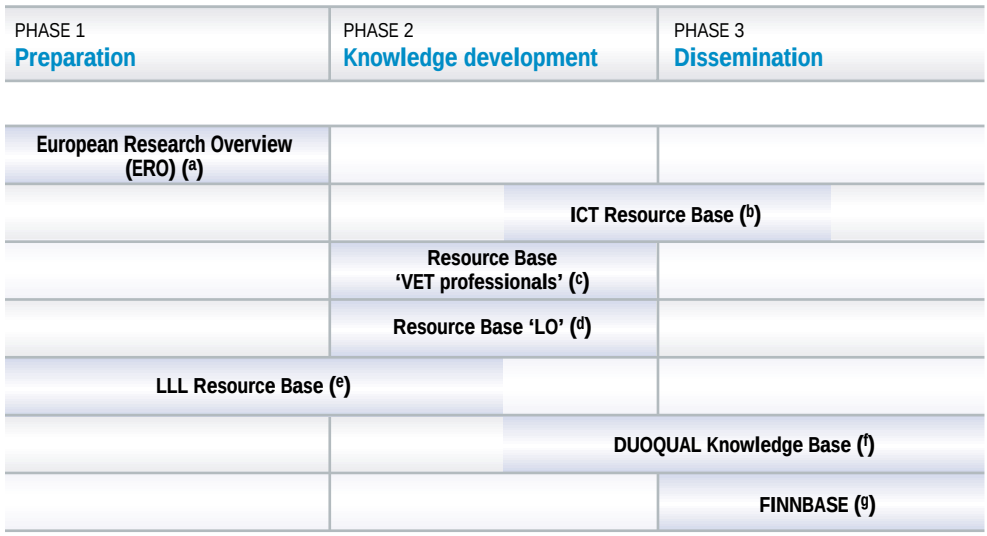
- tracing previous knowledge by a group of experts from different backgrounds;
- relating concepts and terms across different languages and cultures;
- keeping up-to-date with new concepts and findings among dispersed experts;
- developing and sharing research resources in the course of the project;
- working jointly in writing papers, often at a distance;
- using the rare opportunities of face-to-face meetings for developing knowledge;
- communicating knowledge generated in group discussions;
- producing results relevant to a culturally diverse audience;
- ensuring that the outputs of the project are available for exploitation and follow-up;
- sharing knowledge across several other projects and partnerships.

The above issues underline the many practical problems which come up in collaborative projects. Addressing these issues undoubtedly increases the potential and enhances the quality of collaborative research.

8.4. Web-based tools for research

A deeper understanding of the issues in a collaborative research process is also vital for considering ICT support for such processes. If we carefully analyse the real needs in a research process, we also recognise the potential usefulness of tools.

Figure 3. **Piloting of web-based tools for research in VET and HRD**



(a) The European Research Overview (ERO). A pilot project within the Cedefop Research Arena (Cedra). Coordinator: Research Forum WIFO/ Sabine Manning. Initial phase: April 2000 to June 2001. Experimental ERO site: <http://www.b.shuttle.de/wifo/vet/ero.htm>

(b) Cedefop Research Resource Base on ICT and Vocational Education and Training. Editor: Graham Attwell. Cedefop Electronic Training Village. November 1999. Internet: <http://www.trainingvillage.gr/etv/ictrrb/Cedefop%20files/introduction/frames/introductionframes2.htm>

(c) Knowledge Sharing Network/ Research Resource Base 'The Development of VET Professionals'. Cedra pilot project. (Information on Cedra home page: <http://www.trainingvillage.gr/etv/cedra/index.asp>)

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Deeper investigations, including empirical studies regarding the piloting of tools, are required to ensure progress. Furthermore, the piloting of tools should ideally always be supported by accompanying research, including empirical surveys of the users' responses. First steps have been taken in the Cedra context by means of a study on the use of the Internet for research by European partners (Manning, 2000).

There are great expectations of web-based tools in supporting transnational collaborative research among dispersed communities of researchers in European partnerships. Various pilots for designing and applying these tools are being developed. Cedra has set out to provide an environment for experimenting with these tools, although this is only one of its tasks. However the present structure of Cedra may need some rethinking. In this respect, two areas of practice are present: one revolving around web-based tools for knowledge sharing networks and research resource bases ('knowledge development') and the other centring on the provision of research overviews ('information sharing'), while other initiatives fall somewhere in between these two.

A more flexible way in which supportive web-based tools may be used in a collaborative research process is presented in Figure 3. For further information on these web-based tools see the URL address in the footnotes.

Although a preliminary review of these tools suggests that most of them support just one of the phases of a collaborative research process, they should be able to support all of them. Furthermore, they should be linked up with other resources and databases in a broader environment, for instance within Cedra and the Cedefop electronic training village (ETV).

The added value of web-based tools has to be assessed in terms of the improvement of quality in the knowledge development process, increased efficiency of the process and enhancement of the potential of the research team. In technical terms, web-based tools for supporting collaborative projects should be easy to handle for mainstream researchers and be accessible to all members of a project team. Meeting these user-friendly and open-access requirements may not accord with more ambitious technological experiments and security oriented environments.

8.5. Conclusion

The model of web-based support presented above can enhance collaborative research in the following ways:

(a) making the process of collaborative interactions in a research partnership transparent;
(b) linking knowledge and information management in a continuous transformation process;
(c) accompanying the different knowledge development steps in the collaborative research process.

This model is 'experience-based' in that it is based on 'real' projects. This is an important feature of the model because of the expanding availability of ICT tools with uncertain potential. Although the success or failure of ICT tools can only be assessed in retrospect, a careful analysis of the real needs at the beginning of the project will assist decision-making in the design or selection of appropriate tools.

8.6. Reference

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Part Four

Theories, frameworks and conceptual issues

CHAPTER 9

Theories of knowledge development within organisations – a preliminary overview

Massimo Tomassini

9.1. Introduction

Knowledge holds a crucial position in current analyses of economic, social and organisational dynamics. It is widely recognised as the fundamental resource in post-industrial society and the engine of innovation and productivity in all sectors. However, the difference in viewpoints about the meaning of knowledge and its impact on the economy and society is remarkable. For instance, the impact of knowledge on jobs and work activities can be seen in terms of the primacy of 'knowledge workers' or 'symbolic-analytic workers' who are perceived as the real wealth of nations in contemporary economies (e.g. Reich, 1991). Alternatively, knowledge can be seen as a trigger of change that affects people at all levels in every manufacturing and service sector (e.g. Blackler, 1995). Numerous different theories of knowledge can be considered. Some of these are based on disciplines such as industrial economics, sociology of organisations and cultural psychology. Others focus on the use of knowledge to achieve certain ends which, for example, address the needs of company managers. Finally, there are theories concerned with a deeper level analysis of knowledge from an epistemological perspective.

In the interests of brevity, this chapter cannot presume to take into account such a wide landscape. Thus, the present overview aims to bring together preliminary and, necessarily, partial investigations, prepared in the context of a long-term agenda of work to be done in exploring the different conceptual interfaces between knowledge and organisation. These initial ideas can at least explain the characteristics of different methodologies for knowledge development in organisations whilst also helping us to understand the relationships between education and training interventions, on the one hand, and interventions for knowledge development on the other hand.

This chapter sets out to contribute to the debate about knowledge dynamics initiated in the context of the Cedefop research arena (Cedra). First, it looks briefly at some relevant theories in which knowledge is assumed to be a productive resource, usable in value-creation processes. Particular attention is paid to the work of Nonaka and colleagues (1991, 1994, 1995, 1998), who create links between

economic and managerial theories of knowledge and new approaches concerned with the epistemological dimensions of organisational knowledge. Second, starting with an analysis of a seminal article by Blackler (1993), the above approaches are considered in more detail with a specific focus on the concept of 'knowing' linked to the concept of 'practice'. Finally, there are some concluding remarks and suggestions for new lines of research on knowledge development.

9.2. Knowledge and value creation

The concept of the 'knowledge-based economy' is the result of the emergent interest by economists in knowledge dynamics. It tries to explain recent developments in Western economies in terms of the synergy between two types of knowledge; *explicit* knowledge and *tacit* knowledge (Lundvall, 1992). Explicit knowledge can be equated with information (*know-what*) and is closely allied to formal scientific knowledge (*know-why*). Tacit knowledge is linked primarily to individual or organisational abilities (*know-how*) and to the functioning of networks of a social nature (*know-who*). More recently, the notion of the knowledge-based economy has been reframed in terms of 'the learning economy' in order to underline how the competitive advantage of enterprises – as well as territorial entities and entire countries – depend on their abilities to maintain and continuously develop tacit knowledge rather than rely on the availability of existing stocks of explicit knowledge. Tacit knowledge cannot easily be reproduced and transferred whereas the transferability of explicit knowledge is dramatically increased by means of modern information and communication technologies (Lundvall, 1999).

However, an organic, knowledge-based theory of the firm does not exist although an attempt to develop one has been made by Grant (1996) who constructed a theory from different building materials. Some of these are borrowed from the 'resource-based view' of the firm (see below), some from more traditional industrial economics and others from organisational approaches such as organisational learning, managerial cognition and technology management. Grant (1996, pp. 111 – 112) identifies different characteristics of knowledge, drawn from a broad range of economic and management literature. One key characteristic is transferability. Explicit knowledge (i.e. information) can be transferred and communicated swiftly. This is consistent with traditional economic thought, which considered it a public good that 'once created can be consumed by additional users at close to zero marginal cost'. In contrast, tacit knowledge cannot be easily extracted from the context that generated it. The resource-based view of the enterprise also sees transferability as an important way of distinguishing between the two: information is revealed through communication while tacit knowledge is revealed through application. Tacit knowledge is acquired through practice and its transfer is slow, costly and uncertain (Kogut and Zander, 1992).

Another characteristic of knowledge identified by Grant is its 'capacity for aggregation'. It has been shown that the most effective knowledge transfer takes place in contexts where a significant 'absorptive capability' already exists among the knowledge recipients (Cohen and Levinthal, 1990). However, there are differences between explicit and tacit knowledge in this respect. Efficiency of knowledge aggregation is greatly enhanced when knowledge is expressed through 'common languages'. For example, in an automobile company, information in statistical form about specific issues, such as inventories or cash balances, can be transferred easily from multiple locations within the firm and aggregated at a single location. This is explicit knowledge. Conversely, knowledge about the capabilities of the same company's management is idiosyncratic knowledge that cannot be aggregated at a single location.

'Appropriability' is another relevant characteristic. It refers to 'the ability of the owner of a resource to receive a return equal to the value created by the resource'. Except for patents and copyrights where knowledge owners are legally protected, explicit knowledge cannot be appropriated through market transactions. It is a 'public' and 'non-rivalrous' good: any one who acquires it can resell it without losing it and 'the mere act of marketing knowledge makes it available to potential buyers' (Arrow, 1984). On the other hand, tacit knowledge can be 'appropriated' only through repeated application in a specific context. Most explicit knowledge and all tacit knowledge is stored within individuals but, at the same time, much of this knowledge is created within an organisation and is 'company specific'. This creates an ambiguity about property rights and ownership of knowledge.

9.2.1. A knowledge-based theory: individualistic and coordination features

Grant takes these characteristics as the starting point for building a knowledge-based theory, bringing together 'individualistic' and 'coordination' features, according to which a company is composed mainly of knowledge-holding individuals. The idea of 'organisational knowledge' external to individuals, that is typical of the 'organisational learning' approach, is rejected on the basis of Simon's assumption that knowledge can be found only in individuals. The enterprise's *raison d'être* lies in its capacity to coordinate the knowledge applications of individuals. Thus, knowledge creation is seen as a combination of individual knowledge application (for instance, within teams) and of the company's coordination capabilities in providing the direction and resources for these teams. From this perspective, the firm is a mechanism for the governance of economic activities, coordinating processes that integrate the knowledge of different individuals for the production of goods or services.

9.2.2. The 'resource-based view': focus on strategy

The main difference between this (albeit briefly-presented) attempt to build up a knowledge-based theory of the firm and the more consolidated 'resource-based view' of the firm seems to lie in the role assigned to strategy. Authors arguing for the resource-based approach (Teece et al., 1991; Kogut and Zander, 1992) underline the importance not only of the firm's 'organisation' as a coordination system but also the firm-specific 'strategies' for maintaining and continuously developing knowledge embedded in a firm's competences. They assume that this is the fundamental source of competitive advantage. The enterprise is seen as a complex set of resources and idiosyncratic abilities. The task of management is to maximise their value whilst also planning for the future on the basis of these resources (Kogut and Zander, 1992).

Company strategies must enhance the continuous transformation of the ways competences are used and re-combined in the company. These processes are typical of the individual firm and not easily replicable. Resources such as technologies and equipment, human resource approaches, proprietary knowledge such as patents (already possessed by the firm or acquired on the markets) can be seen as general factors, whereas competences are much more specific. Competences are highly context-dependent, path-dependent and idiosyncratic. They are related to the company's ability to use its resources within appropriate organisational processes in order to bring about the desired results. In particular, this approach sees business competence as based on capacities for knowledge development and internal transfer held by the human capital of the enterprise. The core competences of the firm represent the roots of a tree of knowledge that generate products to promote competitive advantage (Pralahad and Hamel, 1990).

Many other authors in the fields of economic and management science, working beyond the strict boundaries of the resource-based view, have highlighted other factors such as: the importance of the learning potential in 'competence management' (Leonard Burton, 1995); the difficulties in handling knowledge resources because of their 'sticky' characteristics (Von Hippel, 1994) and the crucial role of inter-organisational relationships for knowledge development (Badaracco, 1991; Wickstroem and Norman, 1994).

9.2.3. Knowledge-creating organisations and organisational learning

Severe criticisms of the 'resource based view' have been expressed by those who put forward the theory of the 'knowledge-creating organisation'. Commenting on key proponents of the resource-based view, Nonaka and Takeuchi observe that they treat knowledge only implicitly. Although several authors have recently incorporated the notion of knowledge into the resource-based approach, the focus is still blurred because of the lack of agreed-upon and well-defined terms (Nonaka and Takeuchi, 1995, p. 48). Nonaka and his colleagues (1991, 1994, 1995, 1998, 2000) set out to build a solid theory of the knowledge-creating organisation based on precise definitions. Nonaka has been particularly concerned with constructing a concept of

organisational knowledge in opposition to Simon's view that individuals are the real knowledge holders. This coincides with the thinking of other authors in the field of organisational learning who developed in-depth hypotheses about the meaning and functioning of organisational knowledge. Levitt and March (1988) in particular, considered organisational learning as a phenomenon of knowledge sedimentation, which allowed newcomers to understand the organisation's history and to become integrated within established routines.

Argyris and Schön (1978) based their work on the idea that 'organisational learning' can be achieved through 'enquiries' carried out by actors in relation to 'errors' occurring in their collective actions. Organisations, in their view, function as 'holding environments for knowledge'. This includes the knowledge held in the minds of individual members as well as that which exists in the organisation's files and 'physical objects that members use as a reference and guidepost as they go about their business'. Furthermore, organisations 'directly represent knowledge in the sense that they embody strategies for performing complex tasks that might have been performed in other ways' (Argyris and Schön, 1996, pp. 12 – 13).

However, deep epistemological differences exist between the notion of a 'knowledge-creating organisation' and theories of 'organisational learning'. From the viewpoint of organisational learning, the 'enquiries' aimed at collectively structuring organisational knowledge are carried out by the actors on the basis of a more or less in-depth working-through of individual images and socially shared maps about the organisation, its mission, its rules and its 'task system'. From exactly the same perspective, the 'learning organisation' approach promotes the 'surfacing of mental models' (Senge, 1990) as a discipline for organisational actors, which enables them to recognise 'theories-in-use', generalisations and abstractions used in decision-making.

In contrast, the theory of the 'knowledge-creating organisation' suggests that organisational knowledge is not only about better self-understanding and problem-solving but has a specific productive dimension. It improves the efficiency of the organisation and the achievement of new products and new value-creation. Furthermore, while every bit of organisational knowledge is produced by organisational actors, it is, at the same time, de-personalised and becomes part of a wider organisational knowledge network. In a sense, knowledge-creation does not derive from the actors 'heads' but from the shared organisational fabric through processes that take place within 'communities of interaction', crossing intra and inter-organisational levels and boundaries. This has similarities with the theories of 'situated cognition' (Suchman, 1987) and of 'communities of practice' (Lave and Wenger, 1991; Wenger, 1998). According to the 'organisational learning' and the 'learning organisation' perspectives, the development of organisational knowledge has a psycho-sociological dimension in which individuals interact cognitively, whereas in the knowledge-creating organisation perspective it is the context that shapes the way in which people think and behave.

9.2.4. Distinctive characteristics of Nonaka's theory

However, careful reading of Nonaka's work reveals that individualism and cognitivism also characterise his vision of tacit knowledge. In particular, in defining the double nature of knowledge - explicit and tacit - and the differences between Western and Japanese organisations, Nonaka explains that explicit knowledge 'can be expressed in words and numbers and easily communicated and shared in the form of hard data, scientific formulae, codified procedures and universal principles' while tacit knowledge is strictly linked to persons. Tacit knowledge includes 'subjective insights, intuitions and hunches' and is 'deeply rooted in an individual's action and experience, as well as in ideals, values and emotions'. Furthermore, tacit knowledge can be said to have two dimensions. The technical dimension encompasses 'the kind of informal and hard-to-pin-down skills or crafts captured in the term *know-how*, (similar to the *know-how* of the master craftsman) and the cognitive dimension 'consists of schemata, mental models, beliefs and perceptions so ingrained that we take it for granted'. The cognitive dimension of tacit knowledge reflects our image of reality (what is) and our vision of the future (what ought to be)' (Nonaka and Takeuchi, 1995, p. 8).

Although influenced by cognitivism, Nonaka's notion of tacit knowledge does not emphasise the 'mental' features of knowledge to the same extent as the more typical theories in this field. Nonaka claims that tacit knowledge, in a 'Japanese' sense, emphasises the non-opposition between body and mind, that is typical of Zen Buddhism. Moreover, an organisation is not only a place where human interactions and sharing take place, but is also a place for knowledge-creation. There are two dimensions of knowledge-creation: the 'epistemological' dimension, in which the reciprocal conversion of explicit and tacit knowledge occurs and the 'ontological' dimension, in which knowledge is processed organisationally from individuals and crystallised as part of the knowledge network of the organisation.

Nonaka claims that a knowledge-creating organisation can also be depicted as an autopoietic system, according to the theory of Maturana and Varela (1980), which explains the functioning of living organic systems in terms of autonomy and the purposive orientation of their parts. 'Similar to an autopoietic system, autonomous individuals and groups in knowledge-creating organisations set their task boundaries by themselves to pursue the ultimate goal expressed in the higher intention of the organisation' (Nonaka and Takeuchi, 1995, p. 76).

Knowledge-creation in this sense needs a linguistic fabric of a radically different nature from cognitivist 'images' and 'maps' of reality. This fabric has three characteristics. First, figurative language such as metaphor and analogy is used to facilitate the articulation of tacit knowledge. Second, the sharing of personal knowledge and its conversion into organisational knowledge is maximised through dialogue and discussion. Third, the use of ambiguity and redundancy help in fostering new ways of thinking among organisational members.

The value of the above analysis is not just purely theoretical but can provide

guidance to company management (both top and middle-management) on how to promote and coordinate innovative knowledge-based actions, through, for example, understanding the importance of the linguistic dimension and seeing how 'creative chaos' can support the creation and functioning of self-organising teams (Nonaka and Takeuchi, 1995). Illustrative examples from different large companies deliberately focusing on knowledge-creation in the above sense, demonstrate the positive effects in relation to 'managing conversations', 'mobilising knowledge activists', 'creating the right context' and 'globalising local knowledge' (Von Krogh, Ichijo and Nonaka, 2000).

9.2.5. Different perceptions of the role of ICT in knowledge management

It must be pointed out that the above view of 'knowledge creation' is very different from the 'knowledge management theories' that mainly focus on an intensive use of information and communication technologies. The latter have become widespread since the mid 1990s and have been adopted in mainstream business practices as a kind of cultural model for 21st century enterprises, offering a structured approach to managing information and the intellectual assets of firms (Cushman et al., 1999). In this sense 'knowledge management' is used as a general umbrella term to cover different uses of technological tools to enhance and enable knowledge generation, codification and transfer (Ruggles, 1997).

Within this general framework, different programmes and intervention models have been put forward focusing on technology, strategies, processes, human resources and competence development (Morici, 2000). These programmes tend to be heterogeneous and not confined to specific theoretical backgrounds, although often commented on in terms of explicit and tacit knowledge (e.g. Ruggles, 1997; Teece, 1998). It is important to note that these approaches frequently make tacit knowledge subordinate to explicit knowledge. A typical hypothesis is that it is possible to 'extract' tacit knowledge from experts in organisations by means of ICT in order to make it available for further use by others. The useful 'information assets' of an organisation are considered to be 'structured databases, textual information such as policy and procedural documents and, most importantly, the tacit knowledge and expertise residing in the heads of individual employees' (Cushman et al., 1998, p. 8).

Although the above technology-centred theories of knowledge management do not have homologous conceptual roots, they nevertheless share some common traits which can be described in terms of 'substantialism' and 'commodification'. They are characteristic of many ICT-based knowledge management systems, which are based on the assumption that a firm totally owns the knowledge within its boundaries and that tacit knowledge can be transformed into explicit knowledge and thus processed and stored. According to the 'resource-based view' (described above) on the other hand, while the firm may own knowledge, the very nature of tacit knowledge, (which is considered to be the real source of competitive

advantage) makes it difficult to transfer and process. According to the 'knowledge-creating organisation' theory, while the company's ownership of knowledge is uncontested, what is underlined is the creative function of the organisational context. Finally, according to emerging 'knowledge-based views', knowledge appears as a problematic commodity with regard to 'appropriability' and 'aggregation' but individuals play a fundamental role in knowledge creation, and organisation is a key factor in knowledge mediation and development.

9.3. From 'knowledge' to 'knowing'

Recent advances – mainly within sociological, cultural and ethnographic approaches but with relevant contributions also from managerial and strategic thinking – have focused on an analysis of the epistemological roots of knowledge. Von Krogh and colleagues (1995, 1999) have put forward interpretative paths to shed light on three underlying epistemologies of knowledge, namely: the '*cognitivist*', '*connessionist*' and '*autopoietic*' (Von Krogh et al., 1999, pp. 37- 43).

Cognitivist epistemology – according to the authors in this field, from Simon to the school of 'scripts' – considers organisations to be open systems in which actors develop knowledge through progressively formulating accurate 'representations' of pre-defined worlds. Most cognitivist approaches actually equate knowledge with information and data.

A *connessionist* epistemology shares the principle of representationism with cognitivist theory but is based on a different concept of reality representation that is linked to rules that are local rather than universal. Organisations are seen as self-organised networks driven by specific information processing systems and inter-related by devices connecting different units. From this viewpoint, 'organisational knowledge is a state in a system of interconnected individuals'.

Autopoietic epistemology represents a significant break from the above theories. According to authors in this field – mainly Maturana and Varela (1980) – knowledge cannot be directly conveyed from one individual to another or shared among them. Every component of a system is self-referential in relation to its reality. It continuously controls all changes occurring within itself, determines its boundaries through self-reproduction, *observes* the external world and regulates the flows of inputs from it. Accordingly, the system appears simultaneously to have an open and closed nature. Inputs flow within for the individual components to process them and convert them into information and knowledge. Thus, knowledge appears as something to be continuously co-created by the components of the system. Knowledge 'is observer and history dependent', 'context-sensitive' and only indirectly shared through discussions.

The work of Von Krogh and colleagues (1995, 1999) shows that distinguishing the above different epistemologies is important both for understanding

developments within organisational thinking and implications for management activities. The focus being placed on the epistemological foundations underlying organisational theories is typical of a new wave of organisational studies that share a critical concern about the prevailing 'substantialist' notion of knowledge and the dominance of cognitivism. In general, the new theories claim that the term '*knowledge*' is inadequate to cover the complexity of '*knowing*' as an activity that accomplishes organisational aims.

9.3.1. Blackler's 'taxonomy' of knowledge

In a number of important articles on the logic of '*knowing*', Blackler (1993, 1995, pp. 1023-1025) criticises the idea of knowledge as a specific resource that one can 'have' and tries to demonstrate how it is inextricably connected to different forms of 'doing'. He makes reference not to economic and managerial theories of knowledge, but to organisational learning theories that emphasise the close links between learning and doing. According to Blackler, a number of different 'images' to portray knowledge have been developed over time. Thus, knowledge can be viewed as '*embrained*', '*embodied*', '*encultured*', '*embedded'* and '*encoded*' (Blackler, 1995, pp. 1023 – 1025).

'*Embrained knowledge*' is 'dependent on conceptual skills and cognitive abilities'. This is very different from the knowledge embedded in routine behaviours and is closely related to 'double-loop learning' (Argyris and Schön, 1978) and the recognition of mental models (Senge, 1990).

'*Embodied knowledge*' is 'action-oriented and is likely to be only partly explicit'. This is the physical knowledge of production processes possessed by certain skilled workers and has to do firstly, with the control of machines and production flows through sensorial information; secondly, with 'practical thinking' leading to problem-solving without regard to abstract rules (Scribner, 1986); and thirdly, simple interaction-based interpretations of the functioning of machines.

'*Encultured knowledge*' 'refers to the process of achieving shared understandings'. It is the way in which organisational actors share views of their situation on the basis of 'cultural meaning' systems. The latter are 'intimately related to the processes of socialisation and acculturation. Such understandings are likely to depend heavily on language and hence to be socially constructed and open to negotiation'. According to different authors within the cultural and ethnographic schools, encultured knowledge can include 'ideologies', 'group imagery', 'shared metaphors' and 'stories'.

'*Embedded knowledge*' is the 'knowledge that resides in systemic routines'. Granovetter (1985) uses the notion of embeddedness in the context of social and institutional structures. Nelson and Winter (1982) define organisational routines in terms of the 'evolutionary theory' of the firm in which organisational skills and capabilities emerge from a mix of interpersonal, technological and structural factors. Levitt and March (1988) see organisational routines as allowing

maintenance of, and accessibility to, organisational learning. The resource-based view of the firm understands embedded knowledge in terms of 'organisational competences'.

'*Encoded knowledge*' is 'information conveyed by signs and symbols' within traditional artefacts (books or manuals) or new information systems ('electronic texts' shared by organisational actors connected via ICTs) (Zuboff, 1988).

Blackler's overview demonstrates the difficulties in defining knowledge while at the same time showing the different ways in which knowledge is crucial in all sectors:

> 'What the variety of images of knowledge identified here serves to emphasise is the complexity of issues that any discussion on knowledge within organisations must address. For example it indicates that all individuals and all organisations, not just so-called 'knowledge workers' and 'knowledge organisations' can be 'knowledgeable' (Blackler, 1995, p. 1025).

9.3.2. 'Activity theory' and 'situated learning theory'

Blackler also points out the inadequacy of the many different attempts to answer the simple, but fundamental question - 'What is knowledge?' In this respect, new schools of thought such as 'activity theory' and 'situated learning theory' have come up with new insights. In particular, the work of Engeström on activity theory (Engeström and Middleton, 1996), in which the theory of Vygotski is developed, takes into account the dynamic relationships between individuals, their communities and the objects of their activities. This provides a clear alternative to approaches that attempt to study such things, and the factors that mediate the relationship between them, in isolation from each other.

According to this perspective, 'the appropriate unit of analysis is neither the individual nor the organisation but the socially-distributed activity systems'. According to Engeström's model, knowledge does not appear as a separate category, but rather permeates the activity system. His approach models the dynamics of 'knowing'. Each moment is a compromise as the balance within an activity system changes constantly. Participants employ their situated knowledge in a situation which is itself constantly developing. In response to this changing situation, participants' knowledge and behaviour will also inevitably develop. (Blackler, 1995, p. 1038).

Other contemporary forms of activity theory, similar to Engeström's but starting from different conceptual premises, are concerned with the processes through which shared visions are created in activity contexts and through which learning develops through socialisation. According to 'situated learning theory' (in particular, Lave 1993), knowledge, far from being seen as a 'timeless body of truth', is assumed to comprise different disciplinary insights and abstractions that experts use creatively in specific circumstances. The focus is on 'knowing' rather than

'knowledge' and the conventional distinction between knowledge and learning is not made. Thus the process of 'knowing' is at the heart of a new theory that encompasses knowledge but which overcomes its connotations of abstraction and permanency. This requires the re-modelling of many traditional concepts in this field, as the split between abstract and concrete, general and specific, individuals and communities, and the social and the technical, is overcome. Old concepts need to be abandoned and 'new approaches to conceptualising the multidimensional processes of knowing and doing need to be created' (Blackler, 1995, p. 1035).

9.3.3. The theory of Cook and Brown – 'the generative dance between knowing and knowledge'

A different interpretation of the concept of knowing and a more complete articulation of 'knowledge' and 'knowing' is provided by Cook and Brown (1999). Echoing Blackler, knowledge is seen as related to practice. Cook and Brown distinguish an 'epistemology of possession of knowledge' in a traditional sense, from an emerging 'epistemology of practice' which has 'knowing' as its object. These two are not seen to be competing but complementary and mutually enabling. The aim of the authors is to create a schema in which the contribution of different kinds of knowledge and knowing can be valued and in which the interplay between knowledge and knowing is seen as a potentially generative phenomenon.

> 'For human groups, the source of new knowledge and knowing lies in the use of knowledge as a tool of knowing within situated interactions within the social and physical world. It is this that we call the generative dance. Understanding the generative dance (how to recognise, support and harness it) is essential, we believe, to understanding the types of learning, innovation and effectiveness that are prime concerns for all epistemologically-oriented organisational theories' (Cook and Brown, 1999, p. 383).

Their schema is based on the differences between tacit and explicit knowledge and between individual and group knowledge, and generates four categories of knowledge, each of which is assumed to be unique and irreducible. The authors identify:

(a) individual/explicit knowledge i.e. 'concepts, rules and equations that typically are presented explicitly and are known and used by individuals';
(b) group/explicit knowledge i.e. 'stories about how work is done or about famous successes or failures as well as the use of metaphors or phrases that have useful meanings within a specific group';
(c) individual/tacit knowledge i.e. 'skills in making use of concepts, rules and equations or a 'feel' for the proper use of a tool';

(d) group/tacit knowledge i.e. linked to different *genres* or different kinds of narrations. A *genre* enables actors to understand and interpret their experiences (e.g. memos, emails, meetings, conferences, etc.).

What is important is that these categories of knowledge cannot be effective without the function of knowing, which represents the practical and interactive use of such knowledge. Understanding the 'generative dance', therefore, is a way to strengthen organisational ethnologies and provide a framework for the analysis of organisational contexts.

9.3.4. 'Communities of knowing'

Another interesting view of the interplay between 'knowledge' and 'knowing' is derived from an understanding of the increasing complexity of internal relations within large organisations. In hi-tech contexts, in particular, such a complexity is determined by the interplay of different types of disciplinary knowledge and the idiosyncratic traits of organisational actions. Boland and Tenkasi (1995) have developed the concept of '*communities of knowing*' to explain these interactions. These communities are composed of experts in the same scientific discipline areas in large hi-tech enterprises and in knowledge-intensive organisations in different service, industrial and governmental sectors. They state that:

> 'The multiple communities of knowing in knowledge-intensive firms overlap in complex and shifting ways. There is a rich structural hierarchy of communities of knowing within the firm and between the firm and its environment. Divisions, functional areas, product lines, professional specialities, project teams, issue-based committees and so on, are all possible sites for communities of knowing that interweave with each other across various levels of the organisation. Individuals will find themselves as members of several communities of knowing operating within a firm and its environment' (Boland and Tenkasi, 1995, p. 352).

The concept of communities of knowing is particularly important for understanding and intervening in the communication dynamics within innovative organisations. The production of new knowledge to create innovative products and processes is seen to be the result of complex communicative interactions that can be supported by information and communication technology (ICT). In epistemological terms, the traditional 'conduit model', based on classic communication theory, is not an adequate framework to explain such complexity. Instead, Boland and Tenkasi suggest a 'constructionist' and 'narrative' model that can explain the ways in which 'knowing' in a specific community is internally developed, reinforced and shared with other communities. The model proposes that there are two main ways that reinforcement and sharing take place in a community of knowing, one being internal and the other external. The first is called '*perspective making*', which is 'the process whereby a community of knowing develops and strengthens its own knowledge domain and practices' (Boland and

Tenkasi, 1995, p. 356). The second is called '*perspective taking'*, through which actors recognise and accept the different ways of knowing of others.

According to this theory, knowing is a conceptual tool that shapes the design and fine-tuning of complex electronic mediated communication systems supporting exchanges within communities of knowing. The complexity of communication, and in particular its narrative quality, means that it cannot be adequately mediated by simplified groupware technologies. It is reasonable to suggest, therefore, that 'theories of knowing' open up new avenues for organisational thinking that are congruous with the theory underpinning 'communities of practice', 'activity theory' and 'actor network theory'.

The 'community of practice' concept (Wenger, 1998) relates to a notion of practice in which work, learning and the production of knowledge are intertwined. The knowledge of the community does not reside in the heads of its members but in the structure and social functioning of the community and hence is intrinsically situated (Suchman, 1987). In other words, the community is the arena in which the transmission of tacit knowledge and 'knowledge-in-action' takes place (Nicolini et al., 1996). 'Practice' is also the focus of 'activity theory', which sees knowledge not as a separate category but linked to the 'doing' of different components of dynamic and interactive 'activity systems' (Engeström, 1993). 'Actor network theory', in contrast, sees practice and knowledge as parts of the collective work of heterogeneous 'actors', constituted by human and non-human intermediaries, that converge in the structuration of a specific social order (Callon, 1987).

9.3.5. **A new research agenda**

The concepts treated in this section open up the possibility of 'practice-based theorising on knowing' (Gherardi, 2000). These concepts of 'knowing' usher in a new phase of studies on organisational knowledge that are now in their exploratory phases.

A new research agenda is being generated which has five main items, each linked to different characteristics of knowing (Blackler, 1995, pp. 1040-1042).

The first concerns 'knowing as mediated' through information and communication technologies. Research is needed on how previously separated activity systems are becoming larger and more complex and on ways in which people can improvise, communicate and negotiate within expanded activity systems.

The second issue relates to 'knowing as situated': deeper understandings are needed about the ways in which individuals and 'communities of professionals' interpret their contexts and the differences between various types of communities.

A third item for research is the notion of knowing as 'provisional', something that develops continuously to deal with the tensions arising within activity systems. It is important to alert people to these tensions, so that processes of dialogue and collective learning can be facilitated to 'transform participants' understanding of their activities and the systems through which they are enacted'.

Fourthly, knowing is ‘pragmatic’. New research is needed on how to develop communal narratives within expanded activity systems that deal with the anxiety people experience in the face of conflicting demands for change in their work.

Finally, ’knowing is contested’. Knowledge and power are interrelated and conflicts have to be expected at different levels, for instance between the new generation of symbolic analysts and established professionals and managers.

9.4. Concluding remarks

This chapter has presented an overview of theories of knowledge development within organisations. The first part outlined different theories that focus on knowledge as a ‘substantial’ entity essential to the value-creating processes. The second section examined the epistemological foundations of knowledge, in particular those dealing with the organisational processes of ‘knowing’. However, this paper must be seen as just a first step towards a long-term research agenda that has two main objectives. First, it must produce deeper analyses of conceptual relationships between knowledge and organisation and second, it must create a framework for evaluating existing methodologies for knowledge development and for generating new ones.

The theories presented here not only have a theoretical value but also show potential in making an impact through practical interventions. Indeed, better understanding of the theoretical background of knowledge development can support interventions in education and training and organisational development. Organisations today which are confronted with introducing radical changes to deal with economic and social challenges, cannot restrict themselves to the mere updating of traditional programmes or focus only on technological innovations.

While the education and training sector can be seen to be successfully dealing with the knowledge domains within traditional disciplines, enterprises are confronted with the development of ‘new knowledge’ relating to new ‘social constructions’. To educate and train in these situations, is equivalent to building learning contexts to support knowledge development and even knowledge creation (Rebuffo, 2000). An intensive dialogue is required between the education and training sector and enterprises about the nature of the knowledge and the dynamics of knowledge development. While the education and training sector cannot give up its institutional approach, as this is crucial in relation to long-term policies and programmes, it is also necessary that it has an understanding of the ‘knowing dynamics’ that enable organisations to deal with competition and continuous development.

New research is needed to support better understanding of the above, taking into account the complexity of the knowledge development process as discussed in this paper. In particular research and widespread debate should take place with regard to the following issues:

(a) clarifying the epistemological presuppositions underlying different intervention typologies;
(b) understanding the links and differences between interventions for transferring 'explicit knowledge' and those related to the stimulation of 'contextual knowledge';
(c) understanding and improving strategies to enable 'organisational knowledge enablers' to function more effectively;
(d) evaluating the most appropriate knowledge-related methodologies to promote organisational change such as, 'action-research', 'action-learning' and 'learning networks';
(e) understanding the relationship between the individual and collective dimensions of knowledge development.

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CHAPTER 10

Capturing the knowledge embedded in 'practice' through 'action research'

Barry Nyhan

10.1. Introduction

It is argued in this chapter that there has been an overemphasis on the value of objective and theoretical knowledge to the detriment of subjective and contextual knowledge ('knowing') derived from 'practice' ([13]). This needs to be redressed in the context of furthering knowledge development and research in vocational education and training, because of the distinctive 'practice' features of that field. This chapter also contends that current debates about the notion of practice, for example, those relating to 'communities of practice' would be enriched by taking into account the classical (historical) concepts of 'practice'. This chapter firstly puts forward the 'classical concept' of 'practice' before going on to discuss 'action-oriented research' approaches which, it is argued, are required to develop knowledge based on practice and have a particular relevance in the field of vocational education and training.

10.2. Classical concept of 'practice'

Carr (1995) contends that many researchers seem reluctant to discuss the meaning of the concept of 'practice', relying on a common-sense understanding of the term. He argues that current understandings fail to address the core issues underlying 'a practice' and that it is only when 'we are prepared to give historical depth to philosophical analysis' (Carr *ibid.* p.61) that we will arrive at an adequate

([13]) Cook and Brown (1999) refer to an 'epistemology of practice' which is the 'knowing' found in individual and group practice, that is, a dynamic, living and continuously developing knowledge. They contrast this with an 'epistemology of possession' which treats knowledge as something static that people possess. The latter also lays more emphasis on objective (or explicit) knowledge over subjective (or tacit) knowledge and knowledge possessed by individuals over that possessed by groups. (Cook and Brown contrast these two epistemologies, characterising the former as being about 'knowing' and the latter focusing on 'knowledge'.)

understanding of the meaning of ‘practice’. He goes on to say that this historical perspective can also demonstrate the usefulness of the concept of ‘practice’. In reflecting on the history of the concept of ‘practice’ Carr contends that in bringing our own ‘contemporary understanding of the concept of practice face-to-face with a historical account of how it has been understood in the past’ that one discovers ‘a core concept of practice’ which can more adequately address modern questions about the nature of education and training endeavours (*ibid.* pp. 66-67). He asserts that this ‘core concept of practice’ goes back to the ‘classical concept of practice’ reinterpreted by modern philosophical writers such as Gadamer (1980), MacIntyre (1985) who have drawn on Aristotle’s theory of ‘practice’ and his account of the ‘practical knowledge’ that is embedded in ‘practice’.

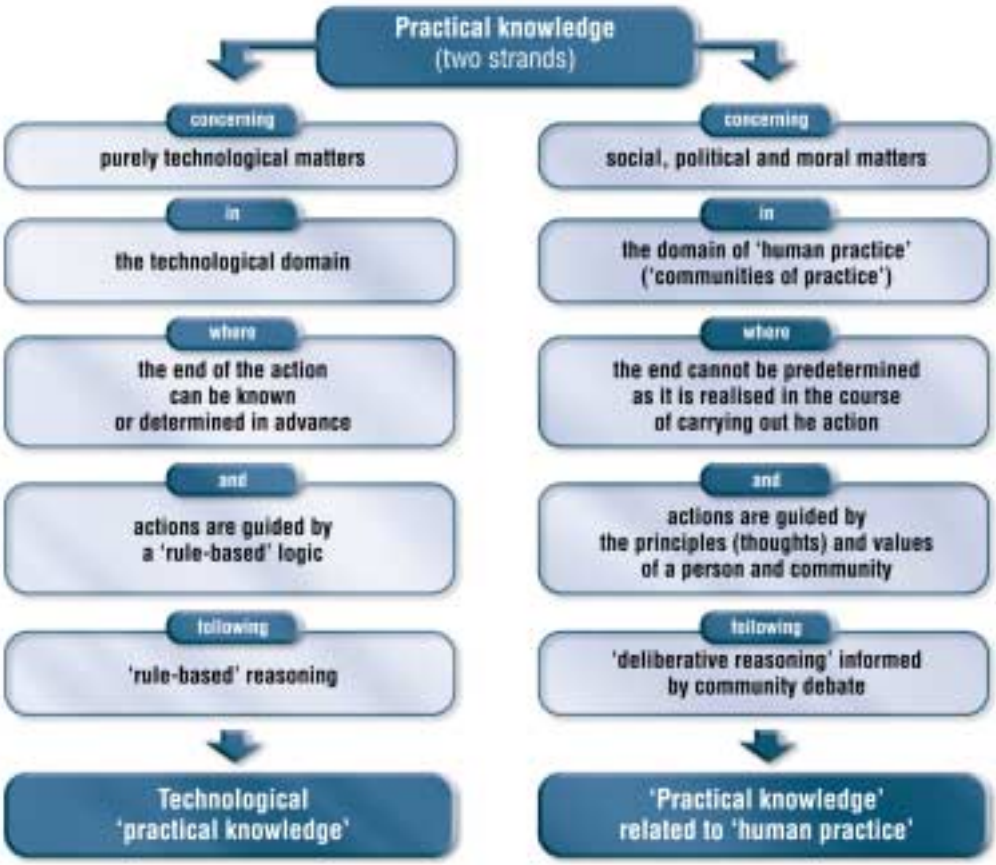
10.2.1. The knowledge in ‘practice’ – ‘practical knowledge’

According to the classical understanding of ‘practice’, it is not to be contrasted with ‘theory’, as is the normal understanding, nor should ‘action’ be contrasted with ‘knowledge’ as one usually makes the distinction today. Rather there are two complementary types of knowledge - ‘theoretical knowledge’ and ‘practical knowledge’- each ‘articulating two different forms of socially embedded human activities and each with its own intellectual commitments and moral demands’ (Carr 1995, p. 67). ‘Practical knowledge’ is concerned with living (human actions) while ‘theoretical knowledge’ is about the pursuit of truth - knowlege for its own sake.

A further distinction is made regarding ‘practical knowledge’ for human actions, between a ‘*making action’* (*technological* ‘practical knowledge’) and a ‘*doing action*’ (‘practical knowledge’ related to ‘*human practice’*). (See Figure 1: The two strands of practical knowledge). A ‘making action’ has to do with making a product or artefact according to detailed specifications – the end is determined. This action is undertaken by following rules. Therefore, it follows a rule-based, instrumental or reductionist logic and is guided by what Aristotle calls ‘technical knowledge’ (*techne).* A ‘doing action’ (‘a practice’), on the other hand, has to do with realising a human (social, political and moral) good whose end is achieved in carrying out the action itself – the end cannot be predetermined. (See also Arendt, 1975.)

Decisions about the manner in which ends are to be achieved in ‘a practice’ are guided by a process of rational discussion or deliberation which is informed and guided by a body of inherited and often unarticulated ‘practical knowledge’ (a kind of ‘theory derived from living’), generated by a ‘community of practice’ (Wenger, 1988). This can be seen as constituting the ‘tradition’ or ‘culture’ of that community. This body of knowledge does not lay down precise instructions for actions but provides the general principles (and guiding values) to be followed, which then in turn have to be interpreted (reinterpreted) and acted on in accordance with a contextual reading of the situation in which an action is to be implemented. Just as ‘technical or rule-based reasoning’ (*techne*) guides a ‘making action’ so it is a form of ‘deliberative reasoning’(*phronesis*), that guides a ‘doing action’ (‘a practice’).

Figure 1. **The two strands of 'practical knowledge'**



According to Aristotle the disposition of *phronesis* equips a person with the 'competence for deliberation' and 'sound judgement'.

10.2.2. **The criteria of 'a practice'**

One learns the capacity for 'deliberative reasoning' or 'sound judgement' through sharing in and contributing to a community of practice. This is not just any type of 'practice' in the common-sense meaning of the term but is characterised by a number of criteria.

Shaped by broad, democratically agreed human and social values and guiding principles, three criteria of a 'practice' in line with the classical tradition (see Carr 1995 and MacIntyre 1985) are put forward below:

(a) *'a practice' is socially established* - a 'practice' entails a socially established set of cooperative human activities which together form a tradition of excellence in

a ‘community of practice’. ‘A practice’ is guided by a process of deliberation which is informed by general principles (values and ways of thinking and acting) generated and learnt within a community setting;

(b) *‘a practice’ is about achieving human excellence for its own sake* - the goal/good to be achieved in a ‘practice’ is internal to that practice. This means that a ‘practice’ is about achieving excellence as an end in itself and cannot be just a means or an instrument to achieve an objective external to the practice;

(c) *‘a practice’ extends human knowledge in an individual and community sense*. ‘A practice’ enhances a person’s humanity or quality of life from a social perspective (linking the individual with the community). It extends a person’s potential (learning capacity) to achieve human excellence. This entails a dialectic between continuity with the past (tradition) and a process of openness to critique and continual improvement (learning and innovation).

In summary, a practice firstly takes place in a ‘situated community generating and sustaining’ context, secondly, it entails human development as an end in itself, and thirdly, it enhances individual and community knowledge and learning in a continuous manner.

The ‘classical’ notion of practice has been presented here in a very brief introductory way without going into further discussions about, or comparisons with, other notions of practice. It is argued by the author that it has a valuable contribution to make to the growing number of debates about the nature of ‘practice-based knowledge’ and how ‘communities of practice’ can foster it.

10.3. Capturing the knowledge embedded in practice

After providing an outline of knowledge that is embedded in practice in the previous section, this section now goes on to discuss the value that the different knowledge development and research traditions assign to this knowledge.

Competing views about the epistemology of knowledge and practice give rise to radically different definitions of science, which are related to different traditions in the socio-economic and socio-educational/pedagogical research communities. These different traditions have different underlying assumptions about the nature of research or knowledge development and the value of knowledge embedded in practice, which have great relevance for research policies in the field of vocational education and training.

Three different views of what is considered to be a ‘scientific approach’ to the study of human behaviour, are discussed here:

(a) the positivistic (natural scientific) social research tradition;

(b) the interpretative and critical approaches, (two schools are grouped together here because they share some common basic assumptions, although they also diverge in other respects);

(c) the 'action-research perspective' which is closely related to the views about the importance of 'practice' as a source of knowledge development, put forward in the previous pages.

In the outline of the different social research traditions presented here, the author is indebted in particular to Usher (1996), Carr and Kemmis (1986), and Bryant (1996) ([14]).

10.3.1. Positivistic tradition

According to the positivistic tradition, the validation and respectability of social research, including vocational education and training research, depends on following the quantitative/empirical procedures of the natural sciences. This standpoint was adopted as a logical consequence of the critique by the Enlightenment thinkers of the validity of - what they would have referred to as - subjective (non-rational) observations, and in particular, the weakness of the authority of 'tradition' and 'practice' as sources of knowledge. This gave rise to the development of a research model which sought to ground the validity of knowledge - the production of scientific knowledge - in empirical measurement and rational (objective) analysis, giving rise to what is termed the 'scientific method'. As a consequence, non-empirical analysis tended to be dismissed as pseudo-science. (A similar distinction is sometimes made between 'science' and 'art'.) The force of argument of the exponents of the 'scientific method' approach has led to the positivistic/empirical model becoming the dominant one in social science research (Bernstein, 1978; Usher, 1996).

Schön (1983, p. 30) poses the rhetorical question:

> 'How comes it, that in the second half of the twentieth century we find in our universities, not only embedded in people's minds but in the institutions themselves, a dominant view of professional knowledge as the application of scientific theory and technique to the instrumental problems of practice?'

This dominant viewpoint has had an influence on the direction taken by researchers in vocational education and training research, leading to a preponderance of empirical studies dealing with socio-economic topics such as labour market studies and analysis of skills needs.

Because of the influential position of the positivistic 'scientific method' approach, three assumptions underpinning it should be noted. First, according to this approach, as the social world is governed by cause and effect in the same way as

([14]) The remaining part of this paper draws heavily on a previous paper by the author entitled *Promoting a European vocational education and training research tradition - the role of the survey and analysis measure of the Leonardo da Vinci programme* in: Dietzen, A.; Kuhn, M. *Building a European cooperative research tradition in vocational education and training*. Berlin: Bundesinstitut für Berufsbildung, 1998.

the natural world, the goal of social research is to discover the universal laws which explain how it works. Thus the emphasis is on explaining and predicting events as one does in the natural sciences as distinct from exploring purposes and intentionality (Von Wright, 1993). Proponents of the 'scientific method' approach would view 'educational theory as being, in comparison with physics and chemistry, an immature science, standing in need of development and sophistication.' (Carr and Kemmis, 1986, p.60). Second, a clear distinction is made between the 'subjective' knower (the researcher) and the 'objective' world (the researched). The latter relates to facts, which have to do with the domain of the 'objective', the valid arena of scientific research, while the former has to do with values, relating to the knower/researcher and, therefore, in the domain of the 'subjective' and the non-scientific. Researchers must be neutral, therefore, and not let their concerns interfere with the discovery of objective truth. The third point, which is a consequence of the first two above, is that because the logic of science is more important than its historical or cultural locatedness, research has a universal (objectivist) rather than an embedded rationality (Usher, 1996, p.13).

10.3.2. Critique of positivism

Kuhn (1996) presented a view of rationality diametrically opposed to the above objectivist view. For him, because rationality is always rooted in a particular political and cultural value-laden context, research carried out in accordance with the scientific method ends up distorting reality in attempting to objectify it.

Researchers are not neutral according to Kuhn, but operate in relation to a 'paradigm', which he defines as a conceptual framework within which a community of researchers operates, and in terms of which a particular interpretation of reality is generated. He goes on to say that they cannot stand outside their paradigm in a neutral or objective way as they claim. Their empirical methodologies do not allow them to do this. Neither can they discover a new paradigm without jumping out of their present one. Accordingly, Kuhn favours a view of scientific research as a social, culturally-bound interpretative process and not pure objective analysis.

10.3.3. 'Interpretative' and 'critical theory' research approaches

The starting point for Dunne (1993) is a concern about the fact that the positivistic/objectivist view has made enormous in-roads in educational theory in recent years, in the form of behaviourism, without receiving any great degree of critical analysis. He explores an alternative tradition of which the 'hermeneutic/interpretative' and the 'critical-theory' schools, outlined below, form a part. These two influential theories of social research - similar in some major respects although differing in other key assumptions - challenge the positivistic position.

According to the 'hermeneutic/interpretative' approach of Gadamer (1975), the development of knowledge in social research should not be concerned with a

search for generalisations and the prediction of events, but rather with interpretation, meaning and illumination. He rejects the imperialistic stance of the positivistic tradition in claiming to offer the sole pathway to the truth, arguing on the contrary, that human actions have to be interpreted within the context of social practices. If research is restricted to the measurable and observable, then one is likely to miss out on some of the most important aspects of life. An authentic approach to science therefore is 'iterative and spiral as distinct from being linear and cumulative as portrayed in the positivistic/ empiricist epistemology' (Usher,1996 p.19).

According to the 'critical theory' approach of Habermas (1972), the role of the human scientist is to go beyond interpretation and illumination and engage in critical reflections which expose the underlying principles limiting freedom and sustaining injustice. He argues that there are three different types of science determined by three distinct 'cognitive or knowledge interests'. (See also Carr and Kemmis, 1996, pp. 134-154.) This thesis is put forward in opposition to the positivistic understanding of science as a neutral, disinterested and objective search for knowledge. In elaborating on his theory that all knowledge is shaped by the existence of underlying knowledge interests, he argues that the natural sciences, and the social sciences in general - his first 'category of science' - are driven by a 'technical knowledge interest' directed at technical control. As ends are seen to be given, enquiry is only concerned with finding the most appropriate means (or techniques/ instruments) to achieve these ends. The 'hermeneutic/interpretative' sciences (human sciences and some forms of social sciences) - the second 'category of science' for Habermas - are driven by 'a practical knowledge interest'. This generates a form of interpretative understanding that can inform and guide appropriate judgements and decisions to be made in specific contexts.

Habermas maintains that neither of the above two approaches can provide an adequate basis for human science. It is the third interest, 'the emancipatory knowledge interest', derived from the human subject's thrust towards autonomy and responsibility, which gives rise to a critical human science ('critical theory' approach), providing individuals with an understanding of how to pursue their real goals in a rational way. To achieve this third level of emancipatory interest, Habermas developed a complex theory of communicative competence ([15]).

([15]) Gustavsen (1988) describes how this theory served as a framework for communication between the different actors in the Swedish LOM working-life development programme. (See also Gustavsen, 1993).

10.3.4. Action-research

'Action-research' is a term used by those who agreeing, at least implicitly, about the primacy of the contextual (interpretative and/or critical tasks of research), go further, arguing that research should be seen as an integral aspect of social actions. The role of research is to bring systematic reflections to bear on the different stages of an action or a 'practice'- planning, execution and review. Action and research (reflection and understanding) are seen as interdependent components of human living. Action-research, therefore, is a form of enquiry oriented to change as much as understanding.

Accordingly, in education and training, the role of researchers is to bring their observational and analytical skills and theoretical knowledge to bear on the improvement of educational or training interventions in dialogue and collaboration with the actors involved. This can be done at the planning stage, through providing 'state-of-the-art' information and frameworks; at the implementation stage in analysing, documenting and supporting reflection and dialogue; and at the evaluation stage through enabling people to learn from their experiences, facilitating discussion and feedback and articulating the key learning points.

Bryant (1996) points out that in action-research either the practitioners are capable of researching their own actions or the researchers are participants in the actions they are researching and work collaboratively with practitioners. According to Carr and Kemmis (1986, p.179): 'action researchers accept that transformations of social reality cannot be achieved without engaging the understanding of the social actors involved'. The researcher's interest, therefore, is not just reflection and understanding but implementing new insights. In doing this, researchers go beyond the role of observers, or even participant-observers, and take up the role of reflective actors in the area they are studying, becoming in effect 'researcher-consultants'.

Action-research is different from 'applied research' in that the latter is concerned mainly with generalising or testing the conclusions of 'fundamental' or 'basic research' carried out at an earlier stage, often by other researchers. In that respect 'applied research' it is a derivation of the 'natural science' model of research, according to which it transfers the results of basic research to practical situations. Carr and Kemmis (1986, p.56) talk about the 'engineering view of educational research'. Cohen and Manion (1994, p.187) see applied research as being 'concerned mainly with establishing relationships and testing theories'. Applied research, therefore, adopts a linear model in applying or testing theory, while action-research, as mentioned above, follows a spiral path moving between theoretical and practical standpoints. The result is a type of knowledge which goes beyond both theoretical and empirical knowledge (Toulmin and Gustavsen, 1996).

One of the arguments in favour of action-research is that it seeks to address the often expressed concern about the non-utilisation of research results, or the limited take-up or interest in the new knowledge made available, by those outside of the research community. Instead of following the traditional research sequence - which

normally entails producing a report with a series of recommendations, and then organising seminars to debate the results, or perhaps a series of dissemination initiatives to promote or discuss the conclusions - the action-research strategy offers channels for continuous dialogue about the validity or implementation of the concepts being studied, with the relevant stakeholders (policy-makers, actors), right throughout the project. An action-research project, therefore, attempts to build concurrent dissemination activities into the research process.

The action-research approach has been implemented in many European countries, in particular in work and learning programmes in Norway, Sweden, Denmark and the Netherlands (Gustavsen, 1993, p.118). The notion of the researcher-consultant has become commonplace on working-life development projects in Sweden (Asklöf, 1992). In Germany, what has been termed an 'accompanying research' approach has been used in national vocational training development programmes 'to support the implementation of pilot projects and to describe and analyse the effects of the changes which have taken place' (Dehnbostel, 1966). The Tavistock Institute in the U.K. did much pioneering work in this area in different fields, including education (Brown, 1967). The Grubb Institute (1984), also in the UK, has used what it refers to as 'a research based consultancy and training' approach on a variety of vocational educational and training related assignments. The fact that action-research can provide practical results has led to its relative popularity in recent times with those who are funding research, because its practical and dynamic methodology seems to offer better value for money (Bryant, 1996, p. 108).

There are, however, many problematic questions surrounding it, not least because it attempts to bring together two activities which are seen by most people as separate. Action is the domain of the practitioner and research that of the professional researcher. According to Cohen and Manion (1994, p. 187), action-research interprets the scientific method loosely. Winter quoted in Bryant (1996, p.112) states that: 'we need a model for the process of reflection which is clearly different from the logic of natural science, otherwise action-research projects will merely seem to be incompetent versions of "real science"'.

Despite the unresolved theoretical and practical issues concerning action-research it would seem to be an appropriate orientation for research in vocational education and training which is concerned with improving and changing 'the way people act'- practice - through involving people in their own change processes. The comment of Bernstein concerning the classical Aristotelian concept of political science as being not so much an analysis of how the political system works but rather of how to live 'a good and just life in the polis', shows that the action-research understanding of science goes back a long way. He states that 'the primary problem to-day (in social and political research) is the reconciliation of the classical aim of politics - to enable human beings to live good and just lives in a political community - with the modern demand of social thought, which is to achieve scientific knowledge of the workings of society' (Bernstein, 1976, p. xxii).

10.4. The perceived value of 'practice-based' knowledge

A related issue regarding the importance of practice-based knowledge and action-research is the decline in the status/attractiveness of vocational (practical) knowledge, illustrated by what has been referred to as 'the drift towards academic studies'. As a result there is a danger that the distinctive benefits to be derived from work-place (or 'practice-based') learning, and an understanding of the nature of such benefits, could be lost. European countries could be in danger of losing touch with this practice based and - what is also called 'work-process knowledge' - which has been a hallmark of small and medium sized European companies in particular, a key source of competitive advantage in the market place and which cannot be learnt by means of theoretical or academic study.

The European Commission's White Paper *Teaching and learning - towards the learning society* (1996), outlines the problem in clear terms:

> 'Observation, common sense, curiosity, interest in the physical world around us and the desire to experiment are qualities which are often neglected. Yet these are the qualities which will enable us to train inventors rather than mere technology managers. In yesterday's Europe, irrespective of whether it was rooted in rural life or in manufacturing industry, learning was naturally directed primarily at the acquisition of abstract concepts to round off practical skills absorbed from day-to-day life outside school. The greater part of this practical knowledge base has been modified and has regressed in our urbanised, automated media-dominated society. It needs to be brought back into a broader knowledge base as a way of preparing individuals to master the technical instruments they will have to use, so that they, rather than the techniques, are in charge.' (p. 29)

Leonardo da Vinci argued strongly in favour of the value of practical (experience-based) knowledge, as is evidenced by the following quotation: 'They will say that not having learning, I will not properly speak of that which I wish to elucidate. But do they not know that my subjects are to be better illustrated from experience than by mere words? Experience has been the mistress of all those who wrote well, and thus, as mistress, I will cite her in all cases.' (cited in Cooley, 1987**,** p. 60).

The challenge for those with an interest in the field of vocational education and training research is to develop it as a 'practical science' which promotes the value of learning through the mastering of 'practices', and generates a theoretical perspective which can be informed by, as well as informing, practical knowledge. This entails a dialectical relationship between action and theory. The task, therefore, is both to capture and articulate the expertise and knowledge of practice, translating it into theories and frameworks, (Nonaka and Takeuchi, 1995), and also to develop conceptual models from theoretical sources, including the exploration of the theories/insights of other neighbourhood disciplines, which in turn can nourish innovation in vocational education and training practice.

10.4.1. Different and complementary research and knowledge development approaches required

In order to ensure that the whole of the vocational education and training terrain is treated in a comprehensive manner, it is essential that different kinds of research investigations take place. The same reality needs to be examined from different angles. Multi-disciplinary approaches in particular are required. Bernstein (1975, p. xiv) states that an adequate theory of social research must be 'at once empirical, interpretative and critical' with the different research perspectives influencing each other in a dialectical way. Multi-disciplinary research approaches, indeed, are needed in vocational education and training because it deals with a topic that is at the intersection of a number of different fields such as general education, professional development (identity) and the improvement of business performance.

Perhaps the example of Leonardo da Vinci can again be cited to show the way in this respect. Echoing the sentiments of Leonardo, Sertilanges states in his essay entitled *The thoughts and intelligence of Leonardo da Vinci*, that it is through extending one's thinking to many things that one's understanding of each of them becomes more profound, 'because all things are connected in their roots' (p.10). In recalling one of the maxims of Leonardo – 'not to appreciate life, all of life, is not to deserve it', Sertilanges goes on to say that: 'It is certain that Leonardo would not have been the painter he was if he had not been an engineer, mathematician, philosopher. And conversely, his skill at drawing was of immense benefit to him in every respect, and to us all; for he left behind in his manuscripts rough or rigorous sketches of all his research.' (p. 10).

10.5. Concluding point

The importance of the action-research approach, based on acknowledging the value of practice as a source of knowledge, has been highlighted in this chapter. Change cannot take place without the commitment and initiative of policy makers and practitioners. The participation of the different partners in research and knowledge development projects is sought in recognition of the fact that change is not only a question of rational thinking, but is a collaborative learning and development process in which all stakeholders participate.

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CHAPTER 11

The limitation of computers in the management of knowledge

Tryggvi Thayer

11.1. Introduction

Over the past decade we have seen a profusion of new concepts related to knowledge and computer technology. Business and computer gurus speak of things like ‘knowledge capture’, ‘knowledge bases’ and ‘knowledge retrieval’, all of which somehow fit into the more general concept of ‘knowledge management’. We are led to believe that the key to capitalising on the knowledge within any organisation is to invest in computers that will store that knowledge and give everyone in the organisation access to it. But, there is something disturbing about the notion that machines are capable of handling something so human and so complex as knowledge. Philosophers have tried to define ‘knowledge’ for over 2500 years and still the concept remains just as elusive as ever. Do these gurus know something that philosophers do not, or might their understanding of ‘knowledge’ be something different from that which philosophers have so ardently sought?

11.2. Information is not knowledge

A mere glance at the language of ‘knowledge management’ and how it has developed suggests at least one answer to the questions posed above. Previous to the rise of knowledge management issues to prominence, we had grown accustomed to concepts such as ‘information systems’, ‘information retrieval’, ‘databases’ and of course, ‘information management’. Judging from the similarities one could assume that the concepts ‘knowledge’ and ‘information’ are virtually interchangeable, and indeed that would seem to be how they are often used. Perhaps, with the advent of ‘knowledge management’, man has successfully managed to reduce all knowledge to a tangible form that can be recorded and stored in much the same way as data or information. If this is the case, it appears to have entirely slipped past the philosophers who have so ardently striven to provide an accurate account of knowledge. For, although the concept of information as such has only recently become a topic of discussion amongst philosophers, there are some valuable insights about it and how it differs from knowledge.

Robert Losee (1997) has pointed out that the term information is used very differently in different professions. Nonetheless, he has attempted to put forth a general definition of the concept which, in the light of what appears to be a blurring of the distinction between the concepts 'knowledge' and 'information', may prove quite valuable. He suggests that 'information may be understood in a domain-independent way as the values within the outcome of any process' (Losee, 1997) ([16]). That is to say that various domain-specific processes have the potential to produce and or carry information. Losee is not implying that this is 'the one and only' definition of information, rather that it is a generalisation that captures what is common to the various domain-specific definitions of the concept without discounting their individual validity. This is very relevant in the context of the concept of 'knowledge management' since judging from the broad use of that concept, in literature and in practice, similar to Losee's definition of information, above, it does not seem to be domain-specific. In fact, the generality of the use of the term 'knowledge management' and related terms (such as 'knowledge capture') seem to bear this out.

11.3. What we 'know' about knowledge

Given the argument that information is distinct from knowledge, it is necessary to provide at least some hint of a definition of knowledge. While acknowledging the continuing efforts of philosophers (working on this issue for 2500 years and still going strong) it is possible to come up with a generalisation that will at least do for the time being.

Philosophers have generally settled on two types of knowledge: '*implicit knowledge'* and '*explicit knowledge'*. Explicit knowledge seems to most closely resemble information in that it is what we know and can easily be expressed in everyday language and therefore be relayed to others, put on paper or presented in the form of electronic documents. In this sense, a person can claim to be 'knowledgeable' about the addition of decimal numerals. He or she might have the ability, given any equation involving the addition of decimal numerals, to offer a correct answer. What is more, it is possible to relay to others in speech, writing or by example how the correct answer has been derived. All of these methods of 'transferring knowledge' to another person can easily be stored in a computer and made accessible to others in a way that they will be able to learn from them. Even an exceptionally 'dumb' computer can be taught to do this. But still, the question remains as to whether knowledge has been transferred or simply information that

([16]) Various domains define information in different ways. For instance, a search for 'information' on the Internet is likely to return results related to 'information theory' and 'information science'. These two disciplines treat the notion of information very differently.

the recipient can then use to develop knowledge on the subject.

'*Implicit knowledge'*, on the other hand, is not always so obvious to the knower and therefore not so easily communicated as explicit knowledge. Implicit knowledge can refer to 'knowledge of how to go about one's daily tasks' and even things we do 'without thinking' so to speak. One of the primary concerns of knowledge management has been to capture this type of knowledge. The task is to make implicit knowledge explicit so as to document it and thereby facilitate its transfer throughout an organisation.

The most obvious difference between knowledge and information seems to be that information can be separated from 'process' while knowledge entails a process, that is 'knowing'. Furthermore, as far as implicit knowledge is concerned, it is in a sense internal to the knower. Brown & Duguid (2000) and Drucker (see in Miller, 1998) have emphasised this point. Drucker claims that 'knowledge is always embodied in a person; carried by a person; created, augmented, or improved by a person; applied by a person; taught and passed on by a person; used or misused by a person' (Miller, 1998). Brown & Duguid outline three characteristics that distinguish knowledge from information (Brown & Duguid, 2000):

(a) knowledge usually entails a 'knower';
(b) knowledge appears harder to detach from the 'knower' than information;
(c) knowledge seems to be acquired more by way of assimilation.

11.4. Knowledge objectified - is it still knowledge?

S. D. Neill (1992) claims that some types of knowledge can be 'objectified' in the form of abstractions and models 'for communication purposes' and 'machine-readable representations'. He concludes that this is how knowledge, once separated from the knower, is rightly viewed, as 'representations of knowledge' (Neill, 1992). This is further reinforced by the common sense view that knowledge is dynamic. It is constantly undergoing changes, and therefore, when it is separated from the knower, can only be regarded as a snapshot of what that knower knew at the time when that knowledge was divulged.

What then are these 'representations of knowledge'? They are in fact 'the values within the outcome of a process', i.e. information in Losee's sense. And representations of knowledge do seem to display the properties commonly attributed to information, that of a sender, a receiver and a channel of communication (Dretske, 2000; Israel & Perry 1990 & 1991). In the case of knowledge-based technology, that which is stored in the technology is more rightly called a 'representation of knowledge', which is in fact information rather than knowledge. As has been argued above, because knowledge cannot be separated from the knower, then a knowledge based system must focus on the knower. The shift of focus from information to knowledge entails an increased focus on people.

Thus, where there is an intention to focus on knowledge, no amount of investment in computer hardware or software will do away with the need for human interaction, human ability and willingness to learn. Computers will not transfer knowledge from one user to another but provide opportunities for knowledge to be transferred. Using these opportunities and turning information into knowledge is entirely up to the users of the computers.

11.5. Will computers ever be capable of 'knowledge'?

It is possible to differentiate between 'factual education' and 'knowledge'. An individual may be 'well educated', with numerous degrees from well-recognised universities, but lack the creativity, experience, understanding, insight or reasoning abilities 'to apply' this education. 'A knowledgeable person', on the other hand, possesses these attributes and uses them to 'apply' her/his education.

The so-called 'learning capabilities' of today's computers relate more closely to certain aspects of 'factual education' rather than 'knowledge' in the true sense. Consider the case of 'Deep Blue', the computer that managed to beat a grand master of chess at his own game. Would we say that this computer was 'knowledgeable' in chess? No, it used what is commonly referred to in IT language as a 'brute force' approach. That is, it had information on over a century of historical chess moves which, due to the use of several computer processors at once, it was able to search through at speeds of up to 200 million positions per second (*Science Daily*, 2000). This, is closer to the behaviour of someone with a 'factual education' rather than a truly 'knowledgeable person'. It is a process of trial and error that does not require the attributes previously attributed to a knowledgeable person.

There are several aspects of knowledge that have been central to philosophical debate which do not appear in the above general definition of knowledge but which illustrate the shortcomings of technology in knowledge management. The most obvious relates to the truth validity or justification of knowledge. Most modern computers have a very simple way of determining what is 'right' and what is 'wrong' because they are entirely constructed around the notions of 'yes/no' and 'true/false'. Their strength, as is illustrated by Deep Blue, lies in the speed at which they can apply these notions. But, it has by no means been established that these are genuine attributes of knowledge. In fact, the trend has been to do away with the notion of 'truth/falsity' as far as knowledge is concerned in favour of notions such as 'certainty' and 'justifiability'. These notions capture better the dynamic nature of knowledge and its apparent fallibility. They also illustrate the complexity of human knowledge and how humans act on that knowledge.

To properly apply these concepts to knowledge or information requires at least an understanding of language (which computers are notoriously bad at) and a level of abstraction similar to that which allows humans to link seemingly unrelated

concepts. However, although computers seem unlikely to manage such complex tasks today, they will continue to be developed and their capabilities will increase. Already there are very promising theories and ideas that will allow us to construct far more complex computers. A focus of development today is on the use of so-called 'fuzzy logic' ([17]). The most promising aspect of machines using fuzzy logic is that they break out of the rigid 'yes/no' logical structure of contemporary machines. Instead of traditional binary logic, these machines are capable of handling 'yes/no' values and varying levels of degree of each. Although various fuzzy logic technologies are available and in use today, much development is needed to produce machines capable of handling a variety of complex tasks. Since fuzzy logic systems need explicit rules, although these rules may be fairly vague, constructing systems capable of conducting general tasks is very complicated. The hope for the future is that these systems will be able to formulate much of the necessary 'rules-base' on their own. To accomplish this requires vast amounts of processing power since fuzzy logic arithmetic requires more processing power than traditional methods. Machines capable of a broader range of tasks will not be commonly available for many years (Scientific American, 1998).

11.6. Conclusion

Even though the future-generation computers will be capable of performing far more complex tasks than contemporary ones, this does not necessarily mean that they will be any more 'knowledgeable', in the sense described above, than contemporary computers. First of all, expanding the logical values utilised by computers to include a degree of certainty or uncertainty does not necessarily bring with it a sense of creativity or intuition. Second, by the time the next generation of computers becomes available, our knowledge about 'knowledge' is very likely to have changed from what it is today.

Contemporary computers excel at things like storing information, managing relationships between different information bases and doing what they are told. Humans excel at other things such as reasoning, understanding and creating. It makes little sense to ascribe to computers any notion of knowledge, for the reason

([17]) Fuzzy logic was first introduced by Dr Lotfi Zadeh in the 1960's as a means to model the uncertainty of natural language. Recently the validity of fuzzy logic has been debated, especially following Charles Elkan's claim that, at least in certain instances, fuzzy logic reduces itself to binary logic. If this is the case, it would have considerable impact on the future of computers' capability to use fuzzy logic for performing general tasks since it would affect the architecture of the logic gates. The primary difficulty in constructing logic gates for handling fuzzy logic is that they must be capable of handling many degrees of the polar values 'true' and 'false'. Traditional binary logic gates are very simple since they do not need to recognise or handle different degrees of the polar values.

that knowledge has to take into consideration underlying human attributes. The term knowledge necessarily implies extensive human involvement. Regarding the role of computers in knowledge management, the appropriate strategy is to use the powerful memory, organisational and communication facilities of the computer to support and complement the unique knowledge development capabilities of human beings.

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Taking steps towards the knowledge society

reflections on the process of knowledge development

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This book examines ways in which professional and vocational education and training can contribute towards building the emerging 'knowledge society'.

In particular, it explores ways in which education and training can support the generation of 'action-oriented' and social knowledge that people require for living and working in today's world.

A special focus of the book is on the distinctive role and contribution of the research and development community in taking proactive steps to shape the form of the knowledge society coming into being.

The book contains a number of reflections and illustrations by those engaged in research and development work about the most appropriate knowledge development strategies to be employed in today's context.

One of the key challenges highlighted by many of the authors in this volume is the need for researchers to adopt more 'action-oriented' approaches. This entails working closely with practitioners in 'collaborative learning networks' for the co-development of knowledge.

Barry Nyhan

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