

**KNOWLEDGE MANAGEMENT IN
EDUCATION AND LEARNING**

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INTRODUCTION

Despite being in the learning business, teachers, schools and education authorities are notoriously poor knowledge sharers. There are exceptions, of course, but in general the education sector could be described as one where there is slow creation and diffusion of knowledge. This stands in sharp contrast with sectors such as ICTs, transport, biotechnology, and to a lesser extent health. At a time when knowledge management is a driving force for change elsewhere, how is the education system responding and how should it respond?

These were among the many issues reviewed at a forum which brought together academics, practitioners, and policy-makers in Oxford on 18-19 March 2002. It was organised by the Centre for Educational Research and Innovation (CERI) at the Organisation for Economic Co-operation and Development (OECD); Department for Education and Skills (DfES); The Qualifications and Curriculum Authority (QCA); and the Economic and Social Research Council (ESRC). It was the fourth in a series of such seminars - previous ones were held in Ottawa, Copenhagen and Tokyo - and they provide an important input to the CERI/OECD project on "The Economics and Management of Knowledge".

SOME DEFINITIONS:

Knowledge management

Knowledge has always been at the heart of economic development but factors determining the success of firms and national economies are more dependent than ever on the capacity to produce and use knowledge. Innovation and technological change have become more central to economic performance.

The more successful businesses (compared to schools and local education authorities, for example) have named knowledge sharing as an explicit value (as in KPMG) and created corresponding mechanisms and incentives to engage in it. They have valued both the 'giving' and 'receiving' of knowledge as critical to improvement.

It may seem that business organisations are paragons of knowledge creation and sharing, but as Prof Michael Fullan, Ontario Institute for Studies in Education at the University of Toronto, remarked it is likely that only a small minority are very good and they don't necessarily sustain that level of goodness. Many of the same (good) companies appear in different books, so the list seems longer than it actually is. He surmised that the average company is about as bad as the average school system when it comes to knowledge sharing, but the best companies are better than the best school systems. "There are proportionately more of them, and they are working more diligently on the task".

Knowledge based economy

A variety of terms related to the "knowledge-based economy" (KBE) came into circulation in business, government and academic publications during the 1990s. Many of them, as Prof Paul A David from All Souls College, Oxford and Stanford University, observed have derived from perceptions that the landscape of economic activities was being transformed by advances in information technologies culminating in the deployment of computer-mediated electronic communications networks. This was most noticeable in the Internet's explosive growth. The aura of "hype" has evaporated with the

collapse of the "dot-com" bubble but what has remained largely intact is the longer-standing set of shared perceptions about the existence and character of transformations in the structure of economic life. These commonly perceived indicators of KBE are:

- greater quantitative importance of human and business assets in the form of intangibles based upon reliable knowledge
- higher concentration of tangible capital formation in equipment designed to process, transmit, capture and store digitalized information
- greater attention of business enterprises to acquisition, strategic management, exchange and commercial exploitation of information, extracted from ever-larger volumes of data
- correspondingly expanded volumes of telecommunication traffic and enlarged stocks of codified publications

Knowledge - how it's generated

Much of the debate in Oxford was on the manner in which knowledge is created and accumulated. Prof Dominique Foray (OECD/CERI) and Prof David Hargreaves (Wolfson College, Cambridge) characterised two models that are different from the point of view of the nature of the knowledge base - the Science illuminating Technology (SiT) model is strongly influenced by the creation of scientific knowledge which is of direct value to develop process and product innovations. The other "humanistic" model is based on learning processes occurring "on line" (in the plant, on the usage site, in the classroom).

SiT includes the following features: experimentation in the development of science; strong linkages and feedback loops between the development of science and the advancement of technology; most of the inventing goes off-line (in R&D labs); an important part of the knowledge base is codified in instructional guides and documentation, providing an effective way for transferring knowledge from science to technology and practices. SiT is at the origin of a rapid accumulation of knowledge in some sectors.

In a number of sectors, however, the main source of knowledge is related to some kind of "learning-by-doing" effects, where individuals learn through activity and, as a rule, can assess what they learn and hone their practices for what follows next. In this context R&D, as usually defined, is not of immediate value for developing applications and practical knowledge. In such cases, advances in know-how are not dependent on scientific progresses but on the ability to fully exploit the opportunities offered by learning-by-doing. In cases where the learning-by-doing opportunities are well exploited, this model can be an extremely potent form of knowledge creation. However, in most cases know-how advances are slower than in the SiT model.

The two models are not only different in terms of the way in which knowledge is created, they also differ in the manner in which it is diffused. Scientific knowledge is explicit and codified and, thus, can be transmitted through the media of books and journals. Much humanistic knowledge is tacit and so requires interpersonal interactions, such as coaching and mentoring, if it is to be transferred. Foray and Hargreaves argued that in practice no sector

relies on a single model. Even the most science-based sectors such as ICTs and biotechnology have some new knowledge deriving from learning-by-doing processes. In the same way people-centred professions which strongly rely on the humanistic model may also benefit from scientific knowledge; doctors build up their expertise through a combination of science-generated, explicit knowledge with their own learning-by-doing expertise from work with their own patients. There are strong variations in the relative weights of the two models across sectors.

KEY QUESTIONS

Knowledge management is increasingly central to public sector reform in the UK and a number of the important issues related to its application were raised by Michael Barber, UK Prime Minister's Chief Adviser on Delivery at the official opening of the forum. The first is how to foster, invest in and draw on the intellectual capital of the public sector workforce? Doing so successfully can lead to effective practice and effective policy but is also central to nurturing of modern, disciplined professionalism which is data-driven and informed by best practice. It also ensures that the staff of the public services find their work rich and rewarding and is, therefore, central to the recruitment/retention of staff in the medium term. Related issues deal with implicit and explicit knowledge, professional development opportunities, redefinition of work and the nature of leadership.

The second question is how to ensure the most rapid transfer of knowledge across large complex systems including the education service. Current strategies are born out of frustration that old knowledge transfer approaches were too slow, partial, patchy and never followed through. Top down approaches can by definition only be applied to very few priorities where the knowledge base is strong. The key to success, he suggested, is to pay attention to identification, refinement, dissemination and adoption.

The next two points are related - how to strengthen learning across public sector boundaries and across institutional boundaries? Little learning occurs across boundaries, yet there is so much to learn. It is striking how often in the 1990s and before, how insular the UK education service was and how rapidly people lined up excuses to explain why pupils performed less well than in some other parts of the world, rather than asking "what can we learn?" Crucial to the UK's capacity to learn, to implement strategically and to contribute is active partnership in international studies such as the recent PISA study of the OECD and through the creation of networks of international educationalists who comment on the UK's work and draw attention to emerging themes in the Pacific Rim, Europe, North America and elsewhere.

Michael Barber's introduction set the tone for the Forum and the main issues it set out to address:

- Can the public sector, and in particular, education and learning institutions realistically play a more important role in shaping knowledge-driven communities and hence in the knowledge-driven economy?
- Can the strengthening of user-producer interactions improve the management of knowledge within the public sector and more specifically within education and learning?

- How can schools and other learning environments develop a commitment to knowledge management?
- How can teachers and learners in education and learning systems be given incentives to promote knowledge and learning organisations?

MORAL AND SOCIAL ISSUES SURROUNDING KNOWLEDGE MANAGEMENT

Maximisation does not equal optimisation. This observation by James Tobin about financial transactions could apply equally to what might be termed knowledge transactions - we should be concerned about more than the speed or volume of circulation of knowledge. If all we are concerned about is providing greater and greater access to more and more information for more and more individuals then we end up with an information glut.

Brown and Duguid (2000) establish the foundation for viewing knowledge as a social phenomenon when they argue that "knowledge lies less in its databases than in its people" (p. 121) or again "for all information's independence and extent, it is people in their communities, organisations and institutions, who ultimately decide what it all means and why it matters (p. 18). A viable system, they suggest, must embrace not just the technological system, but the social system - the people, organisations, and institutions involved (p. 60).

Dr Tom Schuller, Dean, Faculty of Continuing Education, Birkbeck College, University of London developed this theme when he spoke on the relationship between human and social capital. He identified the following rationale for bringing the notion of social capital (SC) into discussions about human capital and lifelong learning:

-SC helps to counterbalance reliance on policy concepts and instruments which are too narrow to deal effectively with the complexities and interrelatedness of the modern world

-SC's focus on relationships allows the issue of distribution and social cohesion to be addressed. Merely increasing the stock of human capital in any given society will not ensure social or economic progress. It may even impede it, by further isolating some groups, who do not have access to it, and whose position is relatively further weakened by the fact that most others are gaining skills and qualifications

-SC helps to insert a longer-term perspective into policy-making. Its accumulation/erosion is a process which almost always requires several years at least. It therefore acts as an important counterweight to the tendency to look for quick-fix solutions

-Finally, SC reintroduces a moral dimension into policy thinking. The quality of relationships in any given social unit will determine its sustainability, and the role of education in sustaining values should be properly acknowledged.

Social capital is normally defined in terms of norms, networks and trust. Because education has a key socialising effect it affects the norms within the organisation or social unit. This is an obvious point but without basic and recurrent socialisation, knowledge management becomes more difficult because employees or, more broadly, citizens do not have enough of a common

vocabulary or value set to allow proper communication. Put another way there is likely to be a positive relationship between effective socialisation and effective knowledge management. But it can also be the case that oversocialisation can inhibit diversity and creativity, and therefore knowledge management.

Education strengthens people's access to knowledge by increasing their networks and by giving them the confidence to mobilise and exploit them. Research on the Wider Benefits of Learning (see www.learningbenefits.net <<http://www.learningbenefits.net/>>) confirms that it endows people with the confidence to use networks, and to seek help, a challenge is how to make this happen effectively but not exploitatively.

The third Social Capital triad is trust which is inherent in the effective sharing of knowledge so that it is the task of knowledge managers to foster trust. If colleagues in an organisation trust each other they are far more likely to share knowledge than if they are in some state of Hobbesian competition. The relationship between education and trust levels is complex and it cannot be assumed there is a nice linear process of more education leading directly to higher levels of trust and therefore greater social capital. Pertinent questions include: how far do the world of work and the wider social sphere promote trustful relationships? What might be done to counter the drift towards pervasive litigiousness?

IMPACT OF KNOWLEDGE MANAGEMENT IN TWO DIFFERENT SECTORS

The emergency health service

A useful example of knowledge management in action was given by Prof Robin Mansell, London School of Economics and Political Science and Dr Richard Curry, independent consultant and SPRU, University of Sussex who described a study on its application to the emergency health system in the UK. This is an intensely knowledge-driven sector that relies on public and private financing to provide outputs in the forms of services that are widely perceived as 'public goods'. Current Government policy aims to enhance the performance of the public organisations that comprise the system. This is to be achieved, in part, through the use of ICTs to provide decision support tools and to facilitate communication.

The health care system comprises multiple knowledge-driven communities of professionals. The study examines their perceptions of transformations in the organisation and structure of emergency health care services from 1992 to the present. At the start of the period, the knowledge generated, shared and applied within the emergency health care system involved only very limited use of ICTs. By early 2002, there had been major efforts to reconfigure the structure and activities of the relevant professional communities and to intensify their use of ICTs.

The results demonstrate that there are many discontinuities in the knowledge-driven activities within and between the health care professional communities. For instance, there is the almost inevitable resistance to changes - this is attributable in part to poor communications. There is debate as well about the effects of the continuing inconsistencies in the information, advice and decisions regarding health care and treatment that can be attributed to a lack of co-ordination between the professional

communities. The organisational incentive structures perpetuate this lack of consistency despite the use of ICT based knowledge management systems. Most members of the professional communities, however, believe that they have reasonably good internal information and decision support systems (albeit using different standards and platforms).

What has emerged is a dual system of knowledge-driven activities. There is a considerable emphasis on human and technology-driven services to help members of the public get through the emergency health care system more effectively. This is occurring alongside systemic under-investment in training and education which tends to perpetuate traditional social norms and practices that govern when, and with whom, knowledge can be shared.

A further feature of the transformation of the emergency health care system is the application of ICT systems that are insufficiently tailored to the requirements of their users. Many potential users lack the time and resources to learn to use them effectively or to maintain them. This is partly due to the turbulence created by constant change in the wider National Health Service. But there is also the potential to build trust in the relevance and quality of information embodied in ICT decision-making support systems and in new knowledge-intensive systems through peer-to-peer networking.

The results provide insights into the problems that occur when investment in technologies for improved knowledge management is accompanied by under-investment in the skills-base. Greater attention needs to be given to fashioning the relationships between organisational and technological change and to understanding their implications for knowledge-driven activities within the emergency health care sector.

LAM - Libraries, Archives and Museums

There is a widespread view that the Information Age, especially since the rise of the Internet, has spelt the end of the realm of libraries, archives and museums (LAM). After all, everything, we are told will be "on the net", available to everyone, everywhere, all the time - everything of knowledge value will be "intellectual property", exchanged in a universal cyber-space.

At first glance this would seem to be confirmed by a study of the online habits of 2,000 American college students conducted by netLibrary which found that:

- 82% of the students surveyed own a computer and virtually all of them use the Internet
- 93% claimed that finding information on-line makes more sense than going to the library
- 83% said they are frequently unable to get the materials they need because of limited library opening hours
- 75% said they do not have enough time to go to the library
- 75% liked the convenience and 71% liked the time saved by finding information on line any hour of the day

But Drs Margaret Hedstrom and John Leslie King from the University of Michigan set out to rescue the information age from what they regarded as "foolish nonsense". They referred to recent studies of the architecture of the web which distinguish between the surface web and the deep web, or what is also called the 'dark' or 'hidden' web. Search engines index only the surface web of unrestricted, static web pages. The deep web is estimated to be 500 times larger and is growing faster. More significantly, resources available in the deep web differ in quality, organisation, and structure from surface web documents. Typically, deep web resources are curated resources that have been selected, indexed, and controlled for quality and authoritativeness by subject experts or editors. They tend to be narrower and richer in content than surface web sites and oriented towards specific domains or disciplines. Students who rely on one or two Internet search engines to locate information on the web not only are unaware of the richer and higher quality content in the deep web, their search skills and their ability to judge the resources are often poorly developed. According to one recent study "because of easy access to the Web, undergraduates are using library collections and services less than in the past and, in the absence of quality information and tools on the surface, they may imperil the quality of student learning" (Troll p. 10).

Hedstrom and King argued that the deinstitutionalisation of LAM collections was not only folly from a philosophical standpoint but would be foolish on practical grounds. The role of LAMs in bridging the "digital divide" is obvious - libraries serve as equalisers to disparities in access to information by providing free access to materials that individuals choose not to purchase or cannot afford. Similarly, long-term preservation and knowledge accumulation is another core function that often is overlooked in market-based strategies and alternative distribution mechanisms. LAMS are sophisticated meta-information constructs, of which the original raw material is only part. Collections and the larger context around them are the interpretive element that allow LAMs to play a key role in distinctions between disambiguation and ambiguation. In contrast the Internet is a poor substitute, it is very superficial. There are great opportunities arising from the revolution in information technology to complement and leverage the realm of institutionalised collections. But none of these opportunities are possible without preserving and strengthening the existing realm of institutionalised collections.

KNOWLEDGE MANAGEMENT IN EDUCATION

Why is the education sector traditionally characterised by a slow development of knowledge?

This was one of the key questions at the Oxford forum. Michael Fullan said there are structural and normative reasons for this, built-in to the history and evolution of schools: - Structural in that teachers have little time in the course of the day to get together to share ideas and refine their teaching; Normative because teachers do not have habits of giving and receiving information. Indeed, in many cases, the cultures of schools discourage such sharing (e.g. "I don't want to blow my own horn"; "who does she think she is"; "others won't be interested in what I am doing", etc).

A more robust explanation is that knowledge creation in this sector is not based on the SiT model and that there are few knowledge spillovers. Or to put it another way, the humanistic culture relying mainly on learning-by-doing

processes is both persistent and very influential in this sector. There is substantial evidence that the science-technology interface is difficult and innovation diffusion does not always work well in the education sector. Foray and Hargreaves suggested that the structure and dynamics of the professional knowledge base within the education sector were based on three factors:

- formal R&D is of secondary importance. The ability to conduct educational experiments is limited, so that many benefits of research and learning are not exploited
- most of the practical knowledge remains tacit, so that an important contribution of knowledge codification to the rapid accumulation of human know-how is remaining at a low level
- there is a great deal of innovation without R&D (learning-by-teaching). However, two factors limit the economic value of these innovations: i) linkages and feedbacks between formal R&D and professional practices are weak so that the practical knowledge of the innovative practitioners is rarely drawn upon by professional researchers. ii) due to the absence of proper incentive structures, informational spillovers and diffusion of innovation are remaining at a low level; much innovation in education, unless it is mandated, does not go beyond the classroom where it has been generated.

Research reviews

The modest scale of educational research in contrast with other sectors has to be noted. Hegarty (1999) estimated that total expenditure on educational research in the UK is £50-60m a year, while R&D expenditures in the pharmaceutical industry are about £2b. But the efficient management of educational research knowledge is still at a relatively early stage with the result that there is often a lack of openness and accountability in the production and dissemination of knowledge in this sector.

Yet, as Prof Ann Oakley remarked, a society in which policy decisions affecting the lives of individuals are made on the basis of reliable, valid and appropriate knowledge is likely to be both economically more efficient and morally sounder than one in which such decisions are taken on a more ad hoc, secret and intellectually shakier basis. Prof Oakley is Director of the EPPI-Centre and Social Research Unit at the University of London Institute of Education which is working on to move towards a more open and explicit system for addressing important questions about educational knowledge and practice.

In 2000 the Department for Education and Skills (DfES) in England funded a five year programme at the Centre to promote the systematic synthesis of research evidence. The other main stream is funded by the Department of Health. The conjunction of the two funding streams is very interesting as in their daily work staff at the centre encounter concrete examples of the clash between two different epistemic cultures.

The aim of the interesting DfES evidence-informed education initiative is to provide training and methodological guidelines for people wishing to do research synthesis, to develop methods for involving a range of users, and to set up and maintain an infrastructure for supporting a number of review groups.

These are formally registered to undertake reviews on particular research topics and to contribute to an electronic database called REEL - Research Evidence in Education Library. In the first two years of the initiative, ten review groups have been set up in the areas of English teaching; assessment and learning; school leadership; gender and education; inclusive education; post-compulsory education; early years; thinking skills; modern languages and continuing professional development.

There are technical and intellectual/conceptual challenges involved. The first includes the lack of experience of the skills and procedures needed in systematic reviewing, the length of time such reviews take and the relatively low yield of usable studies (searching haystacks to find needles). The second includes the tricky issue of defining the initial research question for a systematic review, deciding how to define 'sound' studies which can be difficult when the field is relatively small and all the researchers know each other.

Learning Networks and Partnerships

A further way of disseminating good processes and good practice is through networks which have a key role to play in supporting innovation and development. Accordingly, networks need to be regarded as support structures for innovative schools - facilitative, too, of the dissemination of both 'good process' and 'good practice', overcoming the traditional isolation of schools, and challenging traditional hierarchical system structures through internal leadership and learning norms.

In the US, a case study by Elmore and Burney (1999) of the turnaround in District 2 in New York City is a prime example of building a culture of knowledge sharing and action. The District has a heavy reliance on peer networks and visits to other sites, inside and outside the district, designed to bring teachers and principals into contact with exemplary practices. Intervisitation, as it is called in the district, and peer consultations are routine parts of the district's daily life. Teachers often visit other classrooms in conjunction with consultants' visits, either to observe one of their peers teaching a lesson or a consultant teaching a demonstration lesson.

Other forms of systematic knowledge exchange are being carried out in several Local Education Authorities (LEAs). Fink and Resnick's (2001) description of how principals across the district are developed as instructional leaders provides another account. Five sets of interrelated strategies are used: nested learning communities, principal institutes, leadership for instruction (support and study groups), peer learning, and individual coaching. The effect is to produce large numbers of principals who are instructional leaders.

In England, the National College for School Leadership (NCSL) has introduced an initiative called the Networked Learning Communities (NLC). Each NLC comprises a cluster of schools working in partnership with others to enhance the quality of pupil learning, professional development and school-to-school learning. A key mantra for the initiative is "working smarter together, rather than working alone".

Dr David Jackson, Director of Research and School Improvement at the NCSL defined three levels of learning networks: -i) within school networks; ii) school-to-school networks; iii) networks of networks. In the first, teachers engage in enquiry

based around classroom practice, progressively seeking to study and improve what they do, to coach one another in the new practices that evolve. Through schoolwide action research, a school staff can develop the school as the centre of enquiry and knowledge creation so that it is perpetually self-renewing.

One of the beliefs underpinning the NLCs is that schools seeking to redesign themselves as enquiry-based professional learning communities will be able to do so more potently by working and learning together. Recycling the existing knowledge-base is an insufficient foundation for learning. There are many constraints on school-to-school collaboration but with the right conditions - supports, training, and committed leadership - its potential can be potent.

Network-to-network learning is new terrain for the NLC initiative. The challenge is to generate system-wide maps of innovative practice, and to encourage transfer of learning through grouped NLCs into networks of ten networks. The intention is that each grouping will have consultancy support, a researcher, facilitated on-line communities and access to web site dissemination, in addition to face-to-face groupings of network leaders, critical friendship partnerships, seminars, celebration and sharing conferences and newsletters.

In Denmark, networking and partnering are taken further with the setting up of a Ministry of Science, Technology and Innovation. Its primary aims are to underpin the creative knowledge society; support the structural change in the Danish economy; provide knowledge and competence to the learning economy; develop Danish growth and welfare. The instruments used are the integration of a diversity of knowledge systems, development of public-private dynamics and integration of cross-sectoral policy developments in the administration.

As a result of a new university act, business and industry are integral parts of university boards. Keywords for the universities are 'self-government' and 'autonomy' through professional leadership and enhanced economic responsibility. In addition, Learning Lab Denmark has been set up to find new research-based insights on learning, knowledge creation and competence development. As Rene B. Bertramsen, Head of Division at the Ministry, explained the changes emphasise de-bureaucratisation and rolling back the state with the aim of the universities becoming the drivers of knowledge communities.

There is still a long way to go, however, to realise the Danish Ministry's objectives. One reason is that most universities tend to consider themselves as highly individual institutions which hinders institutional collaboration and networking. What is true on the institutional level, is also true for each individual.

Prof André Oosterlinck, Rector, Catholic University of Leuven in Belgium argued that most universities have a structure which is relatively hostile to interdisciplinary developments. "This is strange, since most of society's major problems require an interdisciplinary approach (just think of ecology, for example) and many of our current scientific breakthroughs seem to be taking place precisely on the borderlines between disciplines. Looking at it from that angle, our traditional division in faculties, departments, etc., often with their very own policy-making authorities, might qualify for a thorough rethinking", he said.

MAIN LESSONS

What are we to make of the recent surge in knowledge sharing and development? Does this surge, as Fullan argued, represent only 'baby steps' in moving the teaching profession to one engaged in knowledge sharing with moral purpose and to be an evidence-informed profession? If so, what needs to be done to effect this transformation?

A very wide range of observations was made over the course of the two days Forum and were summed up by Director Tom Bentley, DEMOS and Counsellor Jarl Bengtsson, OECD/CERI. These covered some obvious points such as the low level investment in staff education/development to fundamental questions such as who is responsible for investment in organisational design and development - investment in technologies for knowledge management and in skills bases are only part of the requirement for good knowledge management. The organisational design should also encompass the design of buildings to promote lateral transfer of knowledge.

A related question is the incentive structure in higher education based on publication, not peer interaction as well as failure to bring educational research into practice. Teachers are furthermore often not trained in a research context and to reflect on their practices and to act as an evidence-informed profession. There is the danger that they will therefore believe that their methods of working will never have to change.

Some of the other points that emerged were:

- Advantages of introducing new policy interventions through networks with good feedback to measure impact (parallel - car industry where feedback loops operate to provide information on performance/problems)

- Evaluation should be planned before the intervention is made. Time should be allowed for evaluation

- There is a need for new instruments for measuring rates of return on investment in the public and private sectors which take account of short, medium and long-term investments. For instance, this would allow for an accurate analysis of the 'value added' of universities. Many universities will need to focus on those aspects of teaching and service to societies where they have a genuine 'value added'. These include their capacity to conduct truly interdisciplinary work and their independence.

It was stressed that the need for more leadership in schools. Within schools, the principal of the future has to be much more attuned to the big picture, and much more sophisticated at conceptual thinking, and transforming the organisation through people and teams (Fullan, 2001). In England, Hay Management Consultants (2000) compared 200 highly effective principals with 200 senior executives in business. They found that both groups were equally impressive and that "the role of headteacher is stretching by comparison, to business". The five domains of leadership they identified were: teamwork and developing others; drive and confidence; vision and accountability; influencing tactics and politics; and thinking styles (conceptual and analytical).

Finally, if supporting, developing and nurturing new leaders in education were largely neglected until recently so too was the question of sustainability. It still is, yet sustainability is essential if a school or education system is to continuously regenerate itself by the intelligent use of knowledge management.

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