DRUID Working Paper No. 06-6

Knowledge Management in the Learning Economy

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www.druid.dk

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Abstract:
The purpose of this paper is to show why to build 'learning organisations' must be a central element of knowledge management. The paper argues that the wide use of information technology has a contradictory impact on knowledge management. On the one hand it extends the potential for codifying knowledge. On the other hand it makes tacit knowledge scarcer and it contributes to the formation of 'a learning economy'. The argument is supported by an empirical analysis of survey data from Denmark showing that firms that introduce several organisational practices, assumed to characterise the learning organisation, are more innovative than the average firm. The paper contributes to the empirical foundation for the argument that learning organisations stimulate innovation and competence building and it makes an original conceptual contribution of practical relevance by linking knowledge management to HRM and innovation management.

Key words: Knowledge management, learning economy, interactive learning, organisational change
JEL Codes: D83, O32

ISBN 87-7873-196-8

Introduction

Taken in its broadest sense, knowledge management is an ancient phenomenon. The competence of employees and how competences are combined into organisational capabilities has always been a key to economic performance and wise managers have always been aware of the need to utilise and develop knowledge in the interest of the organisation. But it is only recently that knowledge management has become explicit in the management literature. According to Larry Prusak (2001), the first conference that focused on 'knowledge management' took place 1993. Today it has become commonplace all over the world. The major impact of making 'knowledge management' explicit is that this aspect of management is given more attention.

According to Prusak, the concept has roots in three different management traditions; information management, the quality movement and human capital. These different perspectives give different emphasis to what knowledge management should accomplish. Their definition of what is valuable knowledge is different and the idea about what 'managing' knowledge means is different and Prusak (2001) concludes that the future direction of knowledge management is difficult to predict.

There is little doubt that the information technology revolution has changed fundamentally the role of knowledge in the economy. It has given cheap and worldwide access to some types of information. It has also offered new tools both for handling information and for advancing processes of knowledge creation and innovation. Therefore it is not surprising that knowledge management for some scholars and experts primarily signifies the use of advanced software, the codification of tacit knowledge and knowledge sharing through information systems.

But as we shall argue below, the impact of the wider use of information and communication technology is complex and contradictory (Lundvall 1997). One of the major impacts is that tacit knowledge becomes scarcer and that therefore managing this kind of knowledge becomes more important. Another consequence is the speed up in the rate of change that brings us into 'a learning economy' where the capability to learn becomes more important than given sets of specific capabilities (Lundvall 2003).

This implies that knowledge management, especially in sectors with rapid technological change, needs to focus more on the process of learning than on locating and allocating a given set of knowledge assets. At the end of the paper, we present an empirical study based upon Danish Survey

data where it is shown that there is a strong correlation between the introduction of multiple management techniques associated with ‘the learning organisation’ and the innovative performance of the firm. Danish firms that use many of these techniques are much more prone to introduce new products than firms that use few of these techniques, also after we control for size, sector and form of ownership.

We conclude that one of the most important tasks of knowledge management is not to steer in detail the processes of knowledge creation but rather to create ‘framework conditions’ that stimulate agents within and outside the organisation to engage in interactive learning. Information technology is a helpful tool in this process but it is seldom ‘the solution’ to knowledge management problems. We end up by proposing that knowledge management is more of a ‘social art’ than a scientific discipline. Neither can knowledge management be reduced to a set of techniques. The fact that knowledge management operates close to the human mind makes it necessary for managers to operate with finesse and on the basis of intuition and wisdom.

On the contradictory impact of information technology

There is a normative bias in Western civilization in favour of explicit and well-structured knowledge and there are permanent efforts to automate human skills. One historical example is the effort to transfer the knowledge of skilled workers into machinery connected with Taylorism. Present efforts to develop general business information systems and expert systems may be seen as symptoms of this bias. For the knowledge manager, codifying knowledge may be seen as a way to make the organisation less dependent on the employees (Lundvall, 1997).

But the business experience of firms that should be assumed to be world champions in managing knowledge, be it IBM, Hewlett Packard or Microsoft, is rather mixed, with ups and downs in performance (Eliasson, 1996). As can be seen from their history none of these organisations have been able to develop the perfect expert system to manage the firm. They remain highly dependent on the skills, know how and intuition of their top managers. Actually management is an area where codifying knowledge is most difficult and this is especially true for the management of knowledge (OECD, 2000).

So far automating human skills has proved to be quite successful in relation to tasks taking place in a stable environment. The success of chess programs demonstrate that in games where the rules remain constant even very complex decision making may be programmed and automated. The most

important delimitation on codification efforts is a high rate of change in the environment. Where the rules or the problems encountered change the benefits from codifying knowledge are limited since codification tends to create routines that are unsustainable and inefficient in the long run. Highly automated process industries may be extremely cost-efficient as long as technologies and markets remain stable but at some time when the products loose their competitiveness because of more attractive substitutes they leave behind them rust-belt problems.

The wider use of ICT enhances both the incentives and the possibilities to codify knowledge (David and Foray 1995). The share of knowledge that can be transformed from being tacit to become information grows. The capacity to codify and to handle codified knowledge becomes more important in the firm. In this light it seems natural that knowledge management should be seen just as a further development of information management. It might even be considered that as a consequence the era of tacit knowledge is over.

But this is only one side of the coin (Johnson, Lorenz and Lundvall, 2002). The other is that the very growth in the amount of information made accessible to economic agents increases the demand for skills in selecting and using information intelligently. So, as more skills are transformed into a codified form, demand will grow for complementary tacit knowledge. This is one reason why experience based learning becomes even more important than before.

But the most important reason is that the widened use of ICT speeds up change and the acceleration makes it less meaningful and attractive to engage in the development of codification and information systems. ICT speeds up change through different mechanisms. First the rate of innovation within ICT is high and its diffusion to all sectors of the economy imposes change on these sectors. Second ICT has become an important tool in speeding up innovation in several sectors including drug design in pharmaceuticals and physical design in most other sectors.[1] Third it makes it easier to communicate over long distances and hereby it fuels the globalisation of the world economy.

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[1] New applications of information technology change the character of knowledge-creation at certain stages of the innovation process. Developing and testing drugs, and the design of aircrafts with the help of computers and the use of computer aided design in many other areas illustrate a successful transfer of problem-solving from human skills to computers. One consequence is a dramatic speed up formerly time-consuming trial and error processes and of testing new combinations. (Foray and Lundvall, 1996, pp 14-15)

While the potential for codification of activities may be growing, more and more activities operate in contexts where rules and problems change more rapidly than before. Automation and introduction of codified routines in such activities will be costly and give dubious results. The capacity most in demand is to cope with new tasks and problems. This is why skills and know-how becomes scarcer and more important for performance than before.

If the main impact of ICT is a speed-up of processes of change, the use of information technology may be regarded from a different perspective where the emphasis is upon its potential to re-enforce human interaction and interactive learning. Here the focus is not upon its potential for substituting for tacit knowledge but rather upon how it can support the creation, use and sharing of tacit knowledge. E-mail systems connecting agents sharing common specific codes of communication and frameworks of understanding can have this effect. Communities of practise and epistemological communities tend to become increasingly important for the creation of use of knowledge both locally and globally. Wide access to data and information among employees can further the development of common perspectives and objectives for the firm. Interactive learning in external networks may be re-enforced by the intelligent use of ICT-technology.

A taxonomy of knowledge

One reason why it is difficult to design successful knowledge management is that ‘knowledge is a slippery object’ (Winter, 1987). If it is difficult to agree on what knowledge means it is of course even more difficult to agree on how to manage it. There have been different attempts to work out what are the most important distinctions between different kinds of knowledge and different taxonomies have been proposed (Lam 2000).

Knowledge may be embodied in people or built into artefacts. Much knowledge is collective rather than individual and it may be embedded in organisations or networks (Arrow 1994). Standing alone it is intangible and difficult to grasp. The very meaning of knowledge differs depending on context. A classical taxonomy makes a distinction between the four categories:

- Data
- Information
- Knowledge
- Wisdom

It is assumed that data are raw facts without internal organization. When structured and put into context they carry some meaning and become information. It is only when the human mind

activates information that it gets the status of knowledge. Wisdom is assumed to bring in a deeper understanding and ethical grounds for action.

In relation to knowledge management I do not find this taxonomy very useful. Actually it fails to make some of the most important distinctions and by doing so it sometimes results in a biased understanding of knowledge as basically a cognitive category referring to the individual. This is problematic since procedural knowledge (know-how) both individual and collective (as shared routines) is a key to economic performance.

More than a decade ago we introduced a different set of distinctions (Lundvall and Johnson, 1994):

- Know-what
- Know-why
- Know-how
- Know-who[2]

Know-what refers to knowledge about 'facts'. How many people live in New York, what are the ingredients in pancakes and when was the battle of Waterloo are examples of this kind of knowledge. Here, knowledge is close to what is normally called information - it can be broken down into bits.

Know-why refers to knowledge about principles and laws of motion in nature, in the human mind and in society. This kind of knowledge has been extremely important for technological development in certain science-based areas such as for example chemical and electric/electronic industries. To have access to this kind of knowledge will often make advances in technology more rapid and reduce the frequency of errors in procedures of trial and error.

Know-how refers to skills - i.e. the capability to do something. It might relate to the skills of manual workers. But actually it plays a key role in all activities in the economic sphere. The businessman judging the market prospects for a new product or the personnel manager selecting and training the staff have to use their know-how. It would also be misleading to characterise know-why as science-related and know-how as being for practical people. One of the most interesting and profound

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[2] At least two of these categories have roots back to Aristoteles' three intellectual virtues. Know why is similar to Episteme and know-how to his concept Techne. But the correspondence is not perfect since we will follow Polanyi and argue that scientific activities always involve a combination of know-how and know-why. Aristoteles' third category – Phronesis - relates to the ethical dimension and to current debates on the importance of trust and social capital in the context of learning. Flyvbjerg (1991) includes an interesting discussion of the relevance of Aristoteles for modern social science.

analyses of the role know-how is actually about the how the advanced scientist makes research on the basis of personal skills (Polanyi, 1958/1978 and Polanyi, 1966). And conversely not all know-why knowledge is scientific. In everyday life, when interpreting what is happening, models of causality that have very little to do with science are applied by ordinary people.

Know-how is typically a kind of knowledge developed and kept within the border of the individual firm or the single research team. But as the complexity of the knowledge base is increasing co-operation between organisations tends to develop. One of the most important rationales for the formation of industrial networks is the need for firms to be able to share and combine elements of know-how. Similar networks may be formed between research teams and laboratories.

This is one reason why *know-who* becomes increasingly important. The general trend towards a more composite knowledge base where a new product typically combines many technologies and each technology is rooted in several different scientific disciplines, together with the speed up of change, makes it crucial to have access to many different sources of knowledge. Know-who involves information about who knows what and who knows to do what. But it also involves the social capability to co-operate and communicate with different kinds of people and experts.

These distinctions are closer to everyday language than the first taxonomy. We prefer to use 'information' as part of knowledge rather than as something distinct from knowledge. We define information as knowledge that has been transformed into codes so that it can be saved in a computer and sent through electronic media. In the next section we will discuss what elements of knowledge that can be transformed into information and what are the consequences for knowledge management of the wider use of information and communication technologies?

The impact of the information technology revolution on the four kinds of knowledge

Know-what is a kind of knowledge that can be brought into databases and search machines in a rather simple way. These are still far from cost less to use, however. Still it may take many attempts to surf the net before the precise information looked for pops up on the screen. ICT has made this kind of knowledge much more accessible all over the world. Even so, having direct access to persons (know-who) who are experts in a specific field may save a lot of time and lead to more precise results. For specialised kinds of 'Know what' such as seldom addressed medical and legal cases the only reliable source of information may still be a human expert and his personal memory.

Know-why with roots in science may already exist in a codified form. Sometimes the code is so complex that it has meaning only for a handful of outstanding scientists but in principle there is

open access to the information through the internet and other channels. In other fields ‘know-why’ is experience based and there is no scientific causal analysis to explain why a certain factor regularly triggers specific effects. Here information technology may play a role in speeding up analytical processes. The growth of codified knowledge may be dramatic in certain fields such as pharmaceuticals and even experts will get growing difficulties to follow the new developments. In order to make this kind of knowledge useful it is again crucial to have access to human expertise (know-who) that can sort out the most promising directions in which to go.

Know-how is perhaps the kind of knowledge where information technology and codification has the most to offer but also the one where the greatest barriers have be overcome. Work on 'expert systems' shows that even when tasks are reasonably simple the operation of the expert system developed will differ from the actual operation of the expert (Hatchuel and Weil, 1995). Firms that have over-emphasized the use of business information systems in their decision-making process have often run into trouble (the problems of the business system’s giant IBM to develop a successful management strategy illustrate the point) (Eliasson, 1996).

Know-who sounds somewhat pedestrian as compared to know-why and know-how but actually it may have become the most important kind of knowledge in the learning economy. The combination of increasing complexity and rapid change makes it crucial to know who knows what and who knows to do what. Information technology has a role to play since it makes informal networks more directly connected overcoming distance in time and space.

The increased importance of ‘know-who’ type of knowledge makes it necessary to take into account the social dimension of economic processes. This kind of knowledge is strongly intertwined with trust and what has increasingly been defined as ‘social capital’ (Woolcock 1998). And trust is a very peculiar resource. According to Kenneth Arrow ‘it cannot be bought on the market and if it could it would have no value whatsoever’ (Arrow, 1971). Therefore, in this area, the role of ICT can only be to operate as a superstructure that must be built upon a basis of social relationships.

Summing up on the impact of ICT on knowledge creation

It follows from the analysis of the four kinds of knowledge that information technology increases the stock of codified knowledge and that skill and competencies (tacit and explicit) related to the use of the new technologies become increasingly important. But it also follows that the rapid change that is a major consequence of the wide use of ICT gives an even stronger weight to tacit skills. This is one reason why outstanding experts in management, finance and science get even

better paid in the learning economy. If their skills could readily be transferred to expert systems we would expect to observe a very different development of income distribution.

Individual knowledge remains important and attempts to gather it and codify it into data banks to be shared among a big number of employees will often prove costly and result in information overflow. Only if organisations are involved in a rather homogenous and stable set of activities is such a strategy attractive. But since the long term economic success of firms increasingly reflect the capability to adapt to change (flexibility) and the capability to impose change (innovation) tacit knowledge remains crucial for economic success.

Collective tacit knowledge also tends to grow in importance. Especially in fields where the rate of innovation and knowledge creation is high there will be a growing tendency to take over other organisations with the collective tacit knowledge that they embed. This is often the only way of

The learning economy as context

We see the information technology revolution as one major factor behind the formation of 'the learning economy' (Lundvall 2003). The term marks a distinction from the more generally used term 'the knowledge-based economy'. The learning economy concept signals that the most important change is, not the more intensive use of knowledge in the economy, but rather that knowledge becomes obsolete more rapidly than before. Therefore it is imperative that firms engage in organizational learning and that workers constantly develop new competencies. The increased rate of change can be illustrated by the fact that it is claimed that half of the skills that a computer engineer has obtained during his education will have become obsolete one year after the exam has been passed, while the 'half-life' of skills for all educated wage earners is estimated to be eight years (Ministry of Education 1997, p. 56).[3]

A learning economy is thus one in which the ability to attain new competencies is crucial for the success of individuals and for the performance of firms, regions and countries. The background for the crucial importance of learning is that the combination of globalisation, information technology and deregulation of formerly protected markets leads to more intense competition and to *more rapid transformation and change*. Both individuals and companies are increasingly confronted with

[3] The outlines of the learning economy perspective were first sketched in Lundvall (1992). The analysis has much in common with ideas developed in Drucker (1993) but it was developed without direct inspiration from this source.

problems that can be solved only through forgetting old and obtaining new competencies. The rapid rate of change is reinforced by the fact that intensified competition leads to a selection of organizations and individuals that are capable of rapid learning, thus further accelerating the rate of change.

The transition to a learning economy confronts individuals and companies with new challenges. We see the growing emphasis on new organization forms and networking as a response to the challenges posed by the learning economy. In a rapidly changing environment it is not efficient to operate a hierarchical organization with many vertical layers and with departments and functions operating separately within the firm. In a rapidly changing environment it takes too long to respond when the information obtained at the lower levels has to be transmitted to the top and back down to the bottom of the pyramid. This is why we see a drive toward flat organisations with strong focus on decentralisation and horizontal communication. In many instances relational contracting and networking enhance functional flexibility since it gives access to complementary external competence that it would take too long to build in-house.

One important result from the empirical analysis that follows is that the new organization forms which tend to support competence building through ‘learning by doing’ and ‘learning by interacting’ enhance the capability to pursue product or service innovation. As we shall see in the next section innovation, learning and knowledge creation are interrelated. Knowledge is both a crucial input and a crucial output of innovation processes.

Innovation and knowledge creation

A problem with linking organisational forms to economic performance is that it is difficult to develop valid and reliable indicators both for organisational forms and for economic performance. Do specific management techniques promote learning? Do they contribute to knowledge creation? Without some systematic analysis of these issues we have to rely on ‘story-telling’ about the success of specific changes in specific organisations. But it is well-known that transferring a ‘best practise’ from one context to another is highly problematic (Lundvall and Tomlinson, 2002).

One way to overcome this problem is to link to each other innovation, learning and knowledge creation. Innovation represents – by definition – something new and therefore adds to existing knowledge. Actually, many authors using the concept of knowledge creation and knowledge production refer to technological knowledge and to technical innovation as the output of the process

(Antonelli, 1999; Nonaka and Takeuchi, 1995). In new growth theory, the output of the R&D sector is viewed either as a blueprint for a new production process that is more efficient than the previous one or as a production of new semi-manufactured goods that cannot easily be copied by competitors (Verspagen, 1992, p. 29-30).

A striking characteristic of knowledge production resulting in innovation is that knowledge, in terms of skills and competencies, may be perceived as the most important input. In this sense, it recalls a 'corn economy', in which corn and labour produce more corn than is used up in the process. But it differs from such an economy in one important respect. While the corn used to produce corn 'disappears' in the process, skills and competencies improve with use. Important characteristics of knowledge reflect that *its elements are not scarce in the traditional sense*: the more skills and competencies are used, the more they develop. This points to knowledge production as a process of joint production, in which innovation is one kind of output and the learning and skill enhancement that takes place in the process is another.

It is tempting to see innovation as a linear processes and to assume that new scientific results are the first step in the process, technological invention the second step, and the market introduction of innovations as new processes or products the third. There is now a rich body of empirical and historical literature that shows that feedback loops are fundamental and that the one-way road from new scientific results to the new product is the exception rather than the rule (Rothwell, 1977; von Hippel, 1988; Lundvall, 1988). The recent models of innovation emphasize that knowledge production/innovation is an interactive process where the interaction of firms with customers, suppliers and knowledge institutions is crucial for the outcome. Empirical analysis confirms that firms seldom innovate alone (Christensen and Lundvall, 2004).[4]

One important implication is that any analysis of innovation and knowledge production at the firm level needs to take into account the network positioning of the firm and to what degree the firm can

[4] This is also the background for developing a systemic approach to knowledge production. Innovations systems are constituted by actors involved in innovation and by relationships between actors. The actors include firms, technological institutes, universities, training systems and venture capital. Together they constitute the context for knowledge production and innovation. The specific constellations differ across sectors, regions and nations. Innovation systems are typically specialized in terms of their knowledge base, and the specific mode of innovation will reflect institutional differences (Freeman, 1987; Lundvall, 1992; Nelson, 1993; Edquist, 1997; Lundvall 2002).

draw upon competence from outside its own borders. Learning organizations combine inter- with intra-organizational processes.

Competence as the outcome of knowledge production

The change from a linear to an interactive view of innovation and knowledge production has also been a way to connect to each other innovation and the further development of competence. The innovation process may be described as a process of *interactive learnin*g in which those involved increase their competence though engaging in the innovation process.

In economics, there are various approaches to competence-building and learning. One important contribution is Arrow's analysis of 'learning by doing' (1962), in which he demonstrated that the efficiency of a production unit engaged in producing complex systems (airplane frames) grew with the number of units already produced and argued that this reflected experience-based learning. Later, Rosenberg (1982) introduced 'learning by using' to explain why efficiency in using complex systems increased over time (the users were airline companies introducing new models). The concept of 'learning by interacting' points to how interaction between producers and users in innovation enhances the competence of both (Lundvall, 1988). A more recent analysis of learning by doing focuses on how confronting new problems in the production process triggers searching and learning, which imply interaction between several parties as they seek solutions (von Hippel and Tyre, 1995).

In most of the contributions in economic theory, learning is regarded as the *unintended outcome* of processes with a different aim than learning and increasing competence. Learning is seen as a side-effect of processes of production, use, marketing, or innovation. The management literature has a more instrumental perspective and points to the importance of establishing 'learning organizations' (Senge, 1990). According to this literature, the way an organization is structured will have a major effect on the rate of learning that takes place. The appropriate institutional structures may improve knowledge production in terms of competence building based on daily activities.

It follows from our analysis of innovation and competence-building that a move towards learning organizations needs to be reflected in changes both in the firm's internal organization and in its inter-firm relationships. Within firms, the accelerating rate of change makes multi-level hierarchies and strict borders between functions and departments inefficient. It makes decentralization of responsibility to lower-level employees and formation of multi-functional teams a necessity. This is

reflected in the increasing demand for workers who are at the same time skilful, flexible, co-operative and willing to shoulder responsibility. But in order to speed up the response to changes in markets and technologies relationships with suppliers, customers and knowledge institutions may need to become both more selective and more intense.

Learning organizations and innovation – the Danish case

In what follows we will show that the probability of successful product innovation increases when the firm has organized itself in such a way that it promotes learning. Second we will demonstrate that organizational forms promoting learning are multi-dimensional - they typically combine several of a number of internal and external relationships and activities.

Methodology

The empirical analysis is based on a survey addressed to all Danish firms in the private sector – not including agriculture - with 25 or more employees, supplemented with a stratified proportional sample of firms with 20-25 employees. 6991 questionnaires were sent to the firms selected. This survey collected information from management. In total, 2007 usable responses from management have been collected and integrated in a cross section data set. This makes the overall response rate of the survey 29%. A closer response analysis, broken down on industries and size, show acceptable variations on response rates. Non-respondent information on some of the potential dependent variables together with comparison to other surveys, do not indicate unacceptable bias (Lundvall and Nielsen 2005).

Obtaining a meaningful quantitative measure of innovation and innovative behaviour on the basis of information collected in firms belonging to industries with very different conditions, is not unproblematic. The phenomenon that firms refer to may vary in relation to conditions and configurations. Our data indicate that we are confronted with incremental qualitative change rather than radical change when firms declare that they, in the period of 1998 - 2000, have introduced new products or services on the market. Three fourths of the innovations introduced within the period 1998-2000, were already known at the national as well as well as on the international markets. 13% of the firms have introduced at least one innovation innovations new on the national market, although already existing in world markets. A small group of firms (6%) have introduced at least one innovation new both on the national and the world market.

In the survey, we measured the incidence of an array of organizational dimensions, which all directly or indirectly refer to contemporary theories dealing with innovation and functional flexibility in organizations: Cross occupational work groups, integration of functions, softening demarcations, delegation of responsibility and self directed teams are empirical indicators, referring to Moss Kanter's theory of integrative organization and Burn's & Stalker's organic organizations. Quality circles and proposal collection systems are indicators of Quality management (TQM) and Knowledge Management (Nonaka & Takeuchi 1995). Tailored educational system and Educational planning indicate Human Resources Development and cooperation with external actors refer to innovation as an interactive process (Lundvall 1992). In table 1 the dimensions are classified in relation to theoretical aspects.

Table 1: Theoretical perspectives and organizational characteristics and practices

Theoretical perspective	**Organizational characteristics and practises**
The organic and integrative organization – focus on internal functional flexibility	Cross occupational working groups Integration of functions Softened demarcations Delegation of responsibility Self directed teams
Quality management – focus on engaging employees	Quality circles/groups Systems for collection of employee proposals
Human development – focus on competence building	Education activities tailored to the firm Long term educational planning
Compensation system – focus on incentives	Wages based on qualifications and functions Wages based on results
External communication – focus on external functional flexibility	Closer cooperation with customers Closer cooperation with subcontractors Closer cooperation with universities & technological institutes

Here we will analyse to what degree the organizational characteristics and practises complement each other and thus increase the chances of P/S innovation cumulatively. This might reflect that there are 'bundles' of organizational techniques that support each other and that it is only when the firm has got several of the elements working together that it will harvest the full benefits in terms of innovative behaviour. Building on such arguments, an additive index has been constructed based upon all the fourteen organizational characteristics. The empirical distribution of observations (firms) in the additive index of organization, quality control, human development, compensation and external communication is shown in the table below:

Table 2: Distribution of firms in terms of the number of organizational practices in terms of integration, quality, human development, compensation and external communication (N = 2007).

Index	Frequency	Percent	Cumulative perc.
0	32	1,6	1,6
1	64	3,2	4,8
2	105	5,2	10,0
3	135	6,7	16,7
4	210	10,5	27,2
5	202	10,1	37,3
6	224	11,16	48,43
7	250	12,5	60,9
8	213	10,6	71,5
9	210	10,5	82,0
10	165	8,2	90,2
11	90	4,5	94,7
12	63	3,14	97,81
13	30	1,5	99,3
14	14	0,7	100,00

On the basis of table 2 we have classified the firms in three groups, according to how many dimensions they have adapted in their organizations - in other words - how many organization, quality, human development and external cooperation facets are built into the firm's organization. We have thus divided the firms into three groups:

- Low level learning organization – firms that have introduced zero to four of the dimensions
- Medium level learning organizations - firms that have introduced five to eight dimensions

- High level learning organizations - firms that have introduced nine to fourteen dimensions.

This quantitative bundling may be assumed to reflect the degree of organizational sophistication. Applying many dimensions signals consciousness in terms of knowledge management. In other words it signals a culture of change and learning in the firms. In table 3 results of this construction is shown. Table 3 shows how frequent high level learning organizations are in different categories of size, industry, ownership and production.

Table 3: Learning organization development by firm size, industry, group ownership and production (percent horizontal)

Variables:	**High (9-14)**	**Medium (5-8)**	**Low (0-4)**	**(N)**
All firms	28,5	44,3	27,2	2007
Less than 50 employees	18,1	45,9	36,0	1048
50 - 99 employees	35,0	42,3	22,7	437
100 and more employees	45,1	43,3	11,6	490
Manufacturing	36,3	42,9	20,8	725
Construction	14,5	42,8	42,8	318
Trade	24,5	48,3	27,2	563
Other services	19,6	45,1	35,3	184
Business service	41,2	40,3	18,5	213
Danish group	30,1	44,7	25,3	701
Foreign group	40,7	43,8	15,5	388
Single firm	22,3	44,5	33,2	903
Standard product	29,2	45,1	25,7	725
Customized product	29,8	44,9	25,3	1192

By grouping all the firms according to the index of learning organization development we get 27% in the low category, 44% in the medium and 28% in the high category. Table 3 shows that this distribution is size dependent. Among firms with less than 50 employees, only one out of five fims have developed a learning organization at the high level while the same is true for every second of the bigger firms. With growing firm size, the share of highly developed firms increases.

Table 3 shows that the frequency of high level learning organisations varies across industries. More than 40% of the firms in Business service are in the category of highly developed learning organizations, while the same is true for 36% of the firms in Manufacturing. The rest of the industries lie below the average. Another interesting result is that firms owned by foreign groups have high share in the category of most developed. Firms owned by Danish groups are closer to the general average and single - stand alone – often family firms - are below the average. The presence of foreign owned firms seems to constitute ‘a progressive element’ in the Danish economy while the often cherished family owned stand alone firms seem to be lagging behind both in terms of technological and organizational sophistication.

Organisational practises and product innovation

How does the frequency of use of organizational dimensions affect knowledge production and learning in the firms, as indicated by product and service (P/S) innovations? In table 4 the different categories, representing increasing levels of learning organizations are tested in a logistic model with P/S innovation as dependant variable, and with control for firm size, industry, as well as form of ownership.

Table 4: Logistic regression of learning organization level categories, size, industry, ownership and production on P/S innovation (odd ratios, 95% confidence interval, estimates and P-values)

Variables:	**Effect**	**Lower**	**Higher**	**Estimate**	**Chi-sq**	**P-value**
High level	5,18	3,90	6,90	0,82	127,30	<.0001
Medium level	2,20	1,71	2,83	0,39	37,11	<.0001
Manufacturing	2,35	1,62	3,40	0,54	38,69	<.0001
Construction	0,69	0,45	1,08	-0,68	28,35	<.0001
Business services	2,27	1,46	3,54	0,51	15,40	<.0001
100 and more	1,61	1,26	2,07	0,30	14,23	0.0002
Danish group	0,76	0,58	1,00	-0,14	3,93	0.0475
Single firm	0,58	0,44	0,76	-0,28	15,85	<.0001

We find a five times higher chance of P/S innovation in the high level category, and even in the medium category the chance is twice as high as in the low category. Among the other factors included in the model, Manufacturing and Business services remain significant with 2.3 higher chance of P/S innovation and Construction is negatively significant with a chance of 0,7. The effects of large size (100+) is positive but moderate. Danish group ownership and single firms have a chance below the benchmark category (foreign-owned firms). In sum, the model has shown important and significant effects of the development of what we call learning organization on P/S innovation.

This illustrates that ‘learning organization’ that combine functional flexibility with investment in human resources, incentive systems and networking are much more prone to innovate irrespective of sector and size. It also illustrates that there is no clear distinction between ‘innovation

management' and 'knowledge management'. The organisational characteristics that promote adaptive learning also promote innovation. To instal them is an important an important task both for 'knowledge managers' and 'innovation managers'.

It does not follow from the analysis that the instalment of any single of the characteristics used to classify the learning organisation will enhance the capacity of the firm to innovate, learn and create new knowledge. The context matters and we find that in certain sectors where change is slow such as in construction and transport firms may survive and prosper with little effort to engage in innovation and learning. But it indicates a general direction for how knowledge management may enhance the dynamic performance of firms in sectors where there is rapid change in technologies and customer needs.

It is interesting to note that organisational forms that are often thought of as stimulating 'learning as adaptation' also seem to be supportive of knowledge creation and innovation. As argued above innovation, competence building and adaptation are intertwined and promoting one is a way of promoting the other. The distinction between HRM, knowledge management and management of innovation as different analytical fields and as the responsibility of distinct professions may therefore be worth to reconsider.

Conclusions

In his seminal paper on knowledge and competence Sidney Winter (1987) makes an attempt to specify in what sense and to what degree knowledge is an 'asset' and I believe that the reason he tries to do that is that most management scholars would prefer knowledge to be something that can be thought of as one among other kinds assets. The efforts to bring annual reports on company knowledge on line with the accountancy and reporting systems of other assets may also be seen in this light.

A focus on knowledge as 'a set of assets' may be too static in the rapidly changing world we have indicated by the concept 'the learning economy'. Here the key to long-term competitiveness is the learning (and forgetting) capability of the firm rather than what it already knows. Therefore a key element of knowledge management is to enhancing the learning capacity of the firm. One way to do so is to build a learning organisation. This is more related to designing organisational procedures and routines than it is to managing assets.

Soft-ware programs and specific techniques such as the use of the balanced score-card may be useful ways to organize an increasingly complex knowledge base in firms. They are not efficient substitutes for managers with experience-based skills in handling human relationships, however. To leave it to inexperienced managers to implement and use such tools may be not only inefficient; it might actually be damaging for the learning capability of the firm. For instance, one outcome of using the balanced score card-technique might be a characterization of people within the organization once and for all, based upon who they are and what they can do at a specific moment of time. This might lead to a 'freezing' of the competence profile of individuals that is not at all useful neither for the individual nor for the learning capability of the organization.

Therefore it might be a good idea to think carefully about what should be meant by 'managing' in the context of knowledge management. If management has the ambition to give managers complete control of what employees learn, 'knowledge management' would make a lot of damage to the dynamic performance of the organisation. Little space would be left for individual and collective creativity and for the use of intuition. The alternative to establish 'framework conditions' – both organisational and cultural - that promote efficient use, creation and diffusion of knowledge and then to leave the process to evolve as best as it can. Actually, I have argued that this second model is much closer to representing 'best-practise' for organisations exposed to strong competition and operating on the basis of on-going innovation.

As illustrated by the data presented above and by many other empirical studies of 'learning organizations' or 'high-performance workplaces' there are lessons to be learnt from successful firms operating in turbulent environments that introduce specific organizational characteristics such as job rotation, inter-divisional teams, delegation of responsibility and reducing the number of levels in the organizational hierarchy. The idea behind such changes is to enhance the learning in the firm and to make the firm more responsive to changes in its environment. As far as they work well they may also reduce the need for daily management, including knowledge management.

Specialist 'knowledge managers' may play a role in initiating processes of organizational change in the right direction together with managers in charge of human resources, R&D and innovation. But each single person with a management responsibility from the foreman at the factory floor to the top manager can contribute to, or block, the kind of organizational change that is required. Our data and case studies indicate that it is not always the employees that block and the top management that

promotes change. Often the necessary changes take place in connection with a change in top management (Gjerding, 1996; Lund and Gjerding, 1996).

But, again, the use of such techniques, while helpful, cannot substitute for skilful knowledge management where the focus is on people and on relationships between people. Even in a science-based economy with wide use of information technology the social dimension remains crucial for learning. To make sure that people get recognition both for what they do and learn and for what they are and want to be is crucial. Employees need to know who to contact and collaborate with in specific situations and they need to have the confidence and incentive to do so when necessary. To establish a ‘learning culture’ is a difficult management *art* that needs to be based on personal experience and wisdom.

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