Skillnets Network Series
No.8

Information Technology & Knowledge Networks

This guide looks at the impact and potential use of information and communications technologies on the development of networks and takes a visionary look at how networks can evolve into" knowledge organisations"

Information Technology and Networks

The impact of the internet and the consequent growth of e-commerce presents both an enormous opportunity and a huge challenge for Networks, especially those comprised mainly of SMEs. On the one hand small firms working collaboratively in networks have tools available to them which enable them, not only to compete in the global marketplace, but compete effectively with large companies. On the other hand these opportunities require significant investment in technology and, perhaps even more important, new strategies and training, if they are to be realised at all.

However, the level of usage of information and communication technology (ICT) applications by SMEs lags behind practice in larger organisations, and their ability to compete is adversely affected as a result. The effect of ICTs upon organisations can be radical, altering structures as well as relationships within organisations. There is widespread concern that SMEs are ill equipped to manage these changes, much less marshal their potential for competitive advantage.

The majority of small companies are unable to make good use of ICTs because of:

- high costs of acquiring and installing ICTs;
- low levels of confidence in applying and using ICTs especially on the part of individual owner- mangers - the "technology gap";
- ignorance of ICTs, and
- low levels of awareness of their potential applications and benefits.

Where common needs exist between companies, and where they do not compete directly with each other, there is an enormous opportunity for collaboration in the investment of effort in testing and adaptation of equipment, joint training, the use of distance learning and multimedia, and in building
and sustaining commitment at all levels in the firm to adopting and using the new technologies.

Potential for the use of ICT in Networks

Unquestionably a strong focus on technology, developing and using it, is essential to the growth of networks in Ireland. There is a need to invest in developing the major technologies and capabilities that cut across the industries in a network. Such investment will have the greatest leverage in deepening and broadening the network and should include development of indigenous technology as well as acquiring best practice technology from abroad.
The emergence of Electronic Commerce via open computer networks on common platforms is rapidly changing the way firms do business with their customers, how they manage the internal organisation of the firm and how they relate to other firms. There is enormous potential for networks in effectively using this technology.

For example, it can facilitate:

- How network partners are identified and how networks are formed;
- How networks access and use market and technical information;
- How network members communicate with each other;
- How the network manages inter-firm learning;
- How the network takes decisions and keeps members informed;
- How the network delivers services or programmes such as training, much of which can now be transferred on-line;

- How networks expand beyond national boundaries; How networks promote themselves;

- How networks can become fully-fledged" Knowledge Networks".

The development of the knowledge driven economy has also been associated with changes in the organisation of firms. ICT has given companies the scope to contract out more of their activities, particularly where these depend on knowledge that is codifiable. Contracting out has been encouraged where the ease of communication facilitates the monitoring and negotiation of contracts, or reduces the costs of choosing between suppliers.

Developments in ICT have also affected the physical location of production. They influence the relative costs and benefits of supplying markets, either locally or at a distance, in different ways. ICT facilitates production from one central office by reducing the cost of advertising and search on the part of consumers, and by reducing transportation costs.

Shape of Things to Come

A striking example, albeit on a grand scale, of how E-Commerce is impacting business to business relationships and creating new forms of networks in new ways is the recent establishment of an electronic purchasing network by the top three car manufacturers in the United States.

In November 1999 General Motors and Ford launched a two separate schemes to set up an electronic marketplace (automotive parts exchange) to buy car parts from their suppliers. They then set about convincing the suppliers to sign up. But the suppliers balked at the idea, either of signing up for one exchange in preference to the other, or, because of the cost and operational implications of doing so, of taking part in both. A third exchange, operated by the third largest car maker, Daimler Chrysler was also on the cards.

The suppliers reluctance caused the three companies to abandon the idea of competing exchanges to form one single exchange as a separate entity with each taking equal equity stakes in the operation. Since then Nissan Motor, Renault and Toyota have also expressed their intention of joining the network.

What is interesting is the speed at which the new network was formed and the depth of co-operation and knowledge sharing that is taking place as a result between the three car manufacturers. It is also interesting to note that the total value of transactions in the network, estimated at $240 billion, is greater than the entire projected volume of shopping on the internet by 2005. GM claims that the network will reduce the cost of making a purchase from $100 to $10.

Knowledge Networks[2]

The only thing that gives an organisation a competitive edge - the only thing that is sustainable - is what it knows, how it uses what it knows, and how fast it can know something new.

The information industry is in a state of flux as the traditional roles and functions of players are increasingly affected by the digitisation of information, the commercialisation of the Internet and the World Wide Web and the globalisation of markets and competition. Although new patterns have not yet clearly emerged, innovative exploitation of the available technologies by organisations to develop
products and services to meet the needs of growing new markets consisting of knowledge workers and knowledge intensive organisations, is emerging.

The needs of the new users extend beyond access to information to interactive communication, [knowledge sharing and project-based collaboration - in short, knowledge management. New knowledge work environments or infrastructures are required to meet the needs of the new generation of knowledge workers and knowledge-based enterprises.

The trend seems to be towards prototype knowledge networks based on Internet and Web-based intranets, extranets and knowledge portals with sophisticated information retrieval, communication, and knowledge repository, organisation, and representation functionality.

Several approaches to knowledge management can be discerned in the literature.

Organisational Learning

The first is the organisational learning approach which focuses on the issues of developing a knowledge sharing culture and converting the knowledge of individuals to collective organisational assets in order to accelerate the learning cycle of the enterprise.

Core Competencies

A related approach is the development of core competencies which differentiate the enterprise from its competitors. A core competency implies mastery of a complex set of related and interdependent knowledge, skills, processes and technologies. Such a core competency provides the enterprise with the capacity to deliver a complete product or process which is central to its business, better than the competitors. Sometimes a core competency can be used to change the
nature of the competition in that field or to compete in new fields. No enterprise would be able to maintain more than one or a few core competencies.

Tacit Knowledge

A third approach focuses on the conversion and optimisation of the existing knowledge resources of the enterprise especially through the explication of tacit knowledge.

Intellectual Capital

The intellectual capital approach seeks to apply financial management concepts to knowledge management and to develop suitable concepts and techniques for the management of knowledge as intellectual capital.

Knowledge Engineering

Finally, mention must be made of the knowledge engineering approach that focuses on the quantitative and technological aspects of knowledge representation and organisation.

Knowledge Processing

The technologies of knowledge processing qre still at a relatively early stage of development but it is clearly becoming a high priority for enterprises and software providers. The characteristics of these applications are that they utilise the open systems infrastructure of the Internet and the World Wide Web to enable and empower knowledge workers to access information, communicate and share knowledge, and to work collaboratively irrespective of time and location.

Examples are email, chat, forums, electronic conferencing, electronic publishing, document management, workflow, hypermedia, knowledge organisation and representation, data warehousing, knowledge repositories, data and text mining, group decision making, project management, distance education, intelligent agents, etc. The basic technological infrastructure for knowledge management

at the enterprise level is the intranet/extranet.

Information management and knowledge management, although related concepts, are not the same. The concept of knowledge management includes the notion of access to information, but in addition also the notions of organisational learning, intellectual capital, knowledge development, conversion, sharing and application, collaboration, innovation and adaptive change. Apart from information managers and technologists, human resource practitioners and marketing specialists have much to contribute to the practice of knowledge management. This implies that the ability to manage the processes of knowledge acquisition, absorption, and application across the organisation and beyond in communities of practice such as partnerships, disciplines and industrial sectors will be crucial for success in competitive markets (Chawla, S. and Renesch, J. eds. 1995).

Although the current generation of knowledge networks have moved decisively beyond information access in order to meet the broader knowledge management requirements of organisations, they still tend to emphasise the information access and communication functions at the expense of collaborative work. Much of the development work seems to focus on knowledge organisation and representation rather than collaborative project management, and other forms of collaboration using I CT.

Traditionally information managers have regarded information as a production factor capable of enhancing the efficiency of other production factors like human resources, capital and equipment. The knowledge management approach views information and knowledge as innovation factors capable of enhancing the capacity of the organisation for ongoing learning and adaptive change.
Knowledge networks are novel knowledge work environments or infrastructures designed to enable effective knowledge management in firms and more specially in networks of firms.

The Knowledge Organisation

During the last decade more and more public and private sector enterprises have had to revise their competitive strategies drastically. This was in response to the increasing globalisation of markets and the changes in the nature of competition brought about by the digitalisation of information, the informatisation of work, open systems and affordable connectivity. These factors in combination are effecting fundamental changes in the nature and organisation of work and organisation structures.

Organisations which display these ideal typical characteristics are referred to as knowledge organisations and their workers or members as knowledge workers.

The main characteristics of this organisational transformation are:

- Information processing becomes an increasing part of the job content of workers at the operational level. This happens when the information generated in the physical production process is de-coupled from the interaction of workers with the material resources and stored in an information system. The information system becomes an interface between the worker and the material and other inputs in the production process.

- The worker interacts with the material inputs by means of the manipulation of the information.

- Workers on the operational level are empowered through training, the development of a conducive organisational culture and access to information 'to take and act on decisions.

- Service contracts of workers are flexible and vary from full time permanent employees to part time, temporary contractors who work from home.

- The new organisational culture and value system encourages and rewards the sharing of knowledge so that people can learn from the experience of others.

- Work is organised around core business processes which focus on client needs. these business processes are performed by self managing multi- functional teams. The team members are not necessarily co-located or members of the same organisation.

- Non-core processes are outsourced.

- Organisational structures are becoming flatter as levels of middle management which are regarded as mere information channels and information filters are phased out. This practice seems to be prevalent in western countries. This is in contrast to Japanese companies where middle managers still fulfil an important facilitating role as knowledge managers. Japanese companies use a middle-up- down management model which positions middle managers at the intersection of vertical and horizontal communication in the company where their knowledge of the organisation make them invaluable as knowledge facilitators.

- Organisations form alliances and partnerships with suppliers, clients and even competitors in order to share knowledge, do collaborative research and product development in order to provide clients with a total service or solution. In this way the organisation becomes an inter-organisation connected and served by a network.

- In some cases the organisational distinctions between the collaborating organisations are de- emphasised or disappear. The network becomes the personification of the inter-organisation.

- The geographical location of individual members become less important and the inter-organisation or network becomes a virtual organisation.

- The development, exploitation and protection of intellectual assets is regarded as a core competence which should be developed in order to accelerate innovation and ongoing adaptive change. The organisation, inter-organisation or network thus becomes a learning organisation.

- The enterprise is served by excellent information and knowledge sharing networks to enhance communication, knowledge sharing and collaboration.

Source: Fouche.[3]

Examples of Networks using New Technologies

Here we give some examples of networks established under the EU Adapt Initiative which have creatively used information and communication technologies:

DITRIS - Greece

DITRIS produced a range of interactive multimedia training tools, which can be used to encourage small firms to adopt open and distance learning techniques. Q,uality and quality assurance systems were the main focus of the training programme. The three transnational partners in the project, DIMITRA (Greece), VDAB (Belgium) and CSEA (Italy) each worked on specific packages. DIMITRA on producing a Quality and Quality Assurance product, VDAB on Training in the Use of PLC (IMPACT), and CSEA on The ABC of Computers. These materials were piloted and evaluated to determine the effectiveness of the delivery method, and the validity of the content and the learning structure.

Euro-Vision – Finland

Promoted by the German-Finnish Chamber of Commerce in co-operation with the Vantaa Institute for Continuing Education at the University of Helsinki, Euro-Vision links SMEs from different sectors, enabling their workers to receive key qualifications and training in the development of change management skills.
For Euro-Vision, the learning organisation has three elements: the concept of Virtual Company Environment (VC), which enables participating companies to project their development into the future, to develop new ideas, and to plan their staff development; a telematic toolkit, consisting of a network for communication and debate between the participating small firms, a platform for simulated
business communication and transactions, and an information system; tailored learning modules, developed on demand for the participating small firms.

Comuntech – Germany

The virtual workplace was the focus of the German ADAPT project Comutech. Small and home offices, linked via PC networking, e-mail and videoconferencing are the workplaces of the future. Virtual companies can be formed by partnerships between several very small enterprises, joining forces for a specific project. The project delivered initial training in the use of information and communication technologies. This was followed by tele-team-business-simulations in conducted in video-conferencing sessions. The trainees were digitally linked in a virtual enterprise. A whole network of experts in various fields provided them, through tele-coaching, with expertise and counselling. The project stimulated regional development, and the creation of new jobs. Trainees have established new SMEs. ICT and networking have enabled the creation of virtual enterprises. These new enterprises deliver high quality services for SMEs in which information and communication technology playa central role.

End Notes

1. Enright, M.J. (1992), 'Why Local Clusters are the Way to Win the Game'. In Clancy; P, E. O'Malley; L. O'Connell, andC. van Egeraat,(1998);Culliton's Clusters: Still the way to go? Report prepared for the NESC Seminar: Sustaining Competitive Advantage. Dublin:NESC.
2. FouchE, B. (1999). Knowledge networks - emerging knowledged work infrastructures to support innovation and knowledge management - Quarterly Newsletter of the International Council for Scientific and Technical Information. N032, Novembet: Department of Information Science, University of Stellenbosch, South Africa.
3. FouchE, ibid.