The role of libraries in the knowledge economy

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The knowledge economy and the growth of knowledge manage-ment, as an essential competency of organizations, provides new opportunities for librarians and information specialists to expand existing roles and utilize the skills they have honed to meet corporate objectives. The key information manage-ment role of both internal and external information, alongside the contribution to information competence and the ability to contextualize information, contributes to organizational excellence, customer benefit and competitive advantage which can be achieved more effectively through collaboration and partnership.

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Tony Blair, speaking at the e-summit in November 2002, stated:

> "The fundamental challenge is to create a knowledge-driven economy that serves out long-term goals of first-class public services and economic prosperity for all. To do so we need to innovate. We need to use ideas and intelligence in new ways that create higher value-added products and better quality services … and we must extend the oppor-tunities of the information age to all."

The growth of the knowledge economy is being driven by business change and has put greater emphasis on the need for better management of institutional knowledge. This is not a new concept. Andrew Carnegie writes (and most managers agree with this statement): "The only irreplaceable capital an organization possesses is the knowledge and ability of its people. The productivity of that capital depends on how effectively people share their experience with those that can use it."[1] This is an issue that has concerned many CEOs as they measure the knowledge lost or hidden in organiza-tions. Lew Platt, former CEO of Hewlett-Packard, understood this when he said: "If Hewlett-Packard knew what Hewlett-Packard knows we would be three times more profitable."

According to a KPMG survey of 423 large com-panies, 67 per cent of respondents claimed that they had too much information to manage and 56 per cent complained of having to 're-invent the wheel' every time they started a new project.[2] There is a firm belief in business that if we could hold on to the knowledge we have this would present for companies a significant competitive advantage.

The idea of knowledge management has been around since Plato but the drivers over the past five years have added urgency and a lot of new terminology to this concept. The knowledge economy has three main drivers:

1. *Globalization – markets and products are now global.* Brands such as Nike, Virgin and Harvard are known worldwide. Universities, like other businesses, are now competing and collaborating on a global scale. Geographical boundaries are no longer important and as developed countries cannot compete on production costs they are competing on industries based on knowledge where 'know-how' and reputation are important.
2. *Technological advances and ICT.* Connectivity and networking are enabling new and greatly enhanced products to supplement and replace existing products and achieve new markets using electronic delivery, and existing pro-ducts are offered to a much wider market via the Internet.

3.   *Information and knowledge – recognition of its importance in the economy*. All business development relies on information and know-how. Over 70 per cent of workers in developed countries are knowledge workers from authors to librarians, teachers to zoo-keepers. Governments are keen to boost economies by educating knowledge workers and creating new opportunity through knowledge creation.

Knowledge management has been defined as "the capabilities by which communities within an organization capture the knowledge that is critical to them, constantly improve it and make it available in the most effective manner to people who need it, so they can exploit it creatively to add value as a normal part of their work."[3]

Lew Platt and Andrew Carnegie understood that an organization's greatest investment is in people; their skills, knowledge and creativity; however, there are barriers to the usability of that knowledge, even in sophisticated organizations. Apart from the economic and social barriers that are significant in underdeveloped countries, there are four major barriers to effective use of knowledge in most developed countries.

These are:

1.   *Content overload*
     In a connected world there is information overload that needs to be identified, managed and tailored to individual and group requirements.

2.   *Connectivity*
     Accessing information and the knowledge created may be impeded for technical reasons.

3.   *Competence*
     People need skills to competently evaluate and use information, and

4.   *Collaboration*
     There must be a willingness to contribute to the collective wisdom of our institutions and society and to contribute to the means for sharing it.

These are issues that librarians have been concerned with throughout history and it seems that everyone else is just cottoning on to it.

If we want to manage our knowledge better we need to overcome these barriers. The benefits of doing so for institutions include:

■ greater opportunities for collaboration
■ easier access to relevant, authoritative information when and where it is needed
■ better access to expertise
■ earlier discovery leading to innovation and acceleration of research
■ better learning experiences
■ greater re-use of information and knowledge that is created within the institution
■ the opportunity to critically evaluate and hence rationalize knowledge resources within the institution, thus focusing scarce resources on useful or business-critical knowledge, all of which leads to greater competitive advantage.

If we do not address the challenge of managing our knowledge assets better, real knowledge and innovation will remain in silos and will not benefit our institutions or the wider community. Even more troubling is that society has never needed a more educated, knowledgeable and enlightened community in order to address major global issues which are social and economic. One of the spectacular tragedies of this decade was the failure to recognize the importance of information that had been available to the CIA prior to September 11 and to connect the information to acts of terrorism. H G Wells in 1921 wrote: "Human history becomes more and more a race between education and catastrophe". Knowledge management is not about identifying raw facts but it is about applying proper intelligence to what is going on on the ground and using it effectively. Data can only become useful when it is combined with knowledgeable practitioners, often by interacting with other individuals or communities of practice. Knowledge is realized through practical application and knowledge networking.

In universities and all higher education institutions funding bodies recognize that learning and research directly benefit the economy, society and culture. Higher education institutions contain the raw material of a knowledge society. Carolyn Tuohy at the University of Toronto's 175th Anniversary symposium stated that: "A university has many communities and many souls, but only one drive, which is the love of knowledge."[4]

A university can be viewed as a knowledge factory creating new knowledge through research

and by educating knowledge workers, both of which are essential for the modern economy. It is hardly surprising that governments are increasingly interested in, and more directly intervening in, research and knowledge and the development of knowledge workers. It has been stated that the USA has led the world in university research funding and it is not accidental that half the growth in the US economy in the last 50 years has been due to this investment. In this context it is shown that libraries are major contributors to the knowledge economy and a study commissioned by the British Library using a technique known as 'contingent valuation' shows that for every £1 of public funding the British Library receives annually, £4.40 is generated for the UK economy. The public benefit of education and research and the contribution of libraries to this end has never been so clearly articulated. The role of libraries as a massive research and learning resource that could be better exploited if considered in the total knowledge context is also recognized through programmes such as The Wider Information and Library Issues Project (WILIP).[5]

WILIP aims to maximize the contribution made by library and information services to the economic, educational and cultural life of the UK, recognizing that all libraries and other information providers represent a rich storehouse of information which collectively can make a difference to people's lives helping people to access information seamlessly, when and where they need it. The aim of WILIP is to reduce fragmentation by joining all kinds of libraries together to achieve the full potential of the collective services and resources of libraries on a national scale.

It is the notion of working together to leverage collective wisdom that is at the heart of knowledge management and this requires a culture of collaboration and sharing supported by good management of information and people. The human and business end of the institution must be addressed synonymously. Knowledge management describes the capabilities by which people capture, use, improve and share knowledge so that they, and others around them, can exploit it as a normal part of their work. This is a role that libraries have undertaken from the time of Alexandria's great library in 245 BC when fragmented knowledge was brought together to advance scholarship through a culture of sharing.

The quality and experience of staff, technologies, libraries and cultural assets, representing an enormous investment in knowledge and scholarly activity throughout the history of higher education, has resulted in a wealth of information which is vast and held in many forms, but is not always easy to identify, locate, access and use. While published information represents a major proportion of this investment, knowledge assets include information created and kept in laboratory notebooks, classroom notes, pictures, sound recordings, large-scale digital resources, drafts kept in drawers and filing cabinets, background material and hypotheses on disc as well as information known in the minds of our staff such as teaching material, which is rarely made available for purposes other than that purpose for which it was created. Important information exists in our own institutions as well as in little-known archives that are held in other institutions throughout the world.

An example of one such archive is 40 years of the Gatt archive containing over 2.5 million documents and currently being digitized by the Stanford University Library for the benefit of researchers in economic history and related areas. Universities, while being great creators of knowledge, have been slow to realize the extent of their own knowledge assets and have established systems that do not encourage sharing knowledge as part of their culture. Attitudes and behaviours including well documented concerns about intellectual property, academic freedom and lack of time to share information or make it more widely available have often prevented better management of information. Universities are heterogeneous by nature with strong discipline-based loyalties that become weaker as they widen, so academics may possess strong group and departmental affiliations that become weaker at the broader institutional level.

Barriers to knowledge access go beyond the confines of content, connectivity and competence with which we are only too familiar and to situational, environmental, cultural or management barriers. Librarians can help institutions to overcome these barriers.

We must see ourselves as knowledge managers as well as information managers

As knowledge managers we have a role in helping to manage information for which we have direct

and even indirect responsibility and to tailor it to the needs of our communities. Just as we seek out collaboration beyond institutional boundaries in our professional affiliations, we need to seek out partnerships and collaborations with other members of our organizations and beyond institutional boundaries to assist people to make effective use of information that we and others make available.

This means abandoning nineteenth-century structures and hierarchies to manage information well. It means influencing the way in which the information, that we and others make available, can be made more useful using cross-departmental and cross-professional approaches to co-ordinate access to information.

In the networked organization people contribute to agendas beyond existing structures, knowing that different skills and different approaches lead to better solutions. Structures limit innovation and it takes different people to set aside existing frameworks to innovate:

- Librarians support academics in the creation of knowledge by developing and using systems and tools to support and facilitate the identification, capture and use of knowledge.
- Librarians work with IT staff as collaborators who have expertise in technology platforms to share knowledge.
- Learning technology and professional development staff have expertise in the sharing of tacit knowledge as well as the conversion of both explicit and tacit knowledge within the learning environment.

Online courseware combined with digital library resources allows information provision and learning to be brought together at the curriculum design stage.

The sharing of expertise of academics, library, IT and learning technology staff will increase the effectiveness of information use for learning and will enhance the capabilities of the university. Our future is as partner collaborator and co-ordinator in the e-enabled learning environment. Boundaries are blurring within our institutions and beyond our professional affiliations to a wider circle of friends.

People need to be able to make effective use of information

The ability to identify, access, evaluate, organize and communicate knowledge is a core capability of a knowledge society. Members of higher education institutions need to make effective use of information and information technology systems to create new knowledge. Our role is not only to identify and acquire highly relevant information and to add value to that information by making it more useable but to assist our users to develop the capabilities to become learners for all time.

Google is the search engine of choice for many students and staff particularly when they are out of familiar territory. At a recent conference on Open Archives in Southampton an academic in computer science stated that her library was her server and Google was her catalogue. At the same conference a physical chemist from Southampton University said that just because you have learned to access one database, it doesn't mean you know how to access another one. Another academic from Edinburgh said he had recently discovered an online database that was very useful but would not use it again as he found it difficult to access.

Information literacy is a critical skill for researchers who frequently only 'discover' library resources long after they have been acquired by the library. There is ample evidence to suggest that information literacy skills need to be introduced early, emphasized at point of need and reinforced regularly. Librarians need to work with suppliers to ensure that information provided to researchers is easy to use. Even when users have learned to access library resources, some academic staff assume that the material that is provided to them comes free of charge on the web and it is in both our interest and that of publishers to jointly brand material to avoid the perception that we no longer have a role in information provision.

For students, information literacy needs to be embedded in the curriculum at relevant and critical stages to ensure that value is achieved for the investment made in our resources and to ensure that when people leave higher education they are learners throughout life. Employers look for information skills in their recruits including the ability to master, understand, analyze and present information effectively. Information literacy is a critical skill in the knowledge economy.

Based on our knowledge of the resources we manage and the differing needs of our communities we need to help to design programmes and introduce information literacy skills supporting its application on an institution-wide basis.

H G Wells in 1937, in outlining his Idea for a Permanent World Encyclopaedia, wrote: "Few people as yet, outside the world of expert librarians and museum curators and so forth, know how manageable well-ordered facts can be made, however multitudinous, and how swiftly and completely even the rarest visions and the most recondite matters can be recalled, once they have been put in place in a well-ordered scheme of reference and reproduction"[6].

We must imbue our users with the expertise they need to become effective knowledge workers.

Existing information must be managed well

[Knowledge] "originates and is applied in the minds of the knowers. In organizations, it often becomes embedded not only in documents or repositories, but also in the organizational routines, processes, practices and norms."[7] Most of our experience is based on knowledge that is embedded in documents or repositories which is generally acquired at a cost to our institution. Beyond this, there is a range of knowledge that exists in our organizations that we could also provide the expertise to manage effectively.

Knowledge management is at the heart of what we do now as we identify and provide high quality information to support teaching, learning and research, making the right connections with our users at the right time, thereby creating new knowledge.

In the continuing development of our libraries much, if not most, future information will be acquired in electronic format and will be provided 'anytime anywhere' as e-learning continues to grow and as distance learning becomes a viable option for many new students. The US distance learning courses doubled from the 1997/98 academic year to the 2000/2001 year and the number of institutions engaged in distance learning rose from 44 % to 56 %. Much, if not most, usage will be of electronic resources as the preferred choice of both faculty and students. A study of the reading habits of academic staff by Donald King, Research Professor, University of Pittsburgh and Carol Montgomery, Dean of Libraries, Drexel University[8], shows that most academics prefer to locate items from electronic journals and find these articles easier to locate and obtain, which in turn increases their usage. Access to print and object collections will continue, and these collections will be digitized on demand as and when appropriate. Institutional collections from the past and present – records, archives and manuscripts, and objects in museums and galleries, printed and digital books and journals – will continue to form part of the knowledge we manage to support teaching, learning and research, and will merge within e-learning environments and research portals. We will continue to provide value by purchasing information through a variety of consortial partnerships, and we will find new opportunities for information resource sharing with aligned organizations. Most of this we already do well and we need to go beyond this to focus on what else we could do rather than what we can do a bit better. As knowledge managers our role will be to constantly imagine how we unlock the resources we do and do not hold or provide access to.

Librarians have realized the need to create systems whereby members of their university can store scholarly output so that it can be managed well and retrieved easily. Every year researchers produce thousands of research papers, books, theses, conference papers, reports, working papers, and what has recently been termed the 'data deluge'. Much of this material is not published commercially in books and journals. 'Learning objects' are produced for use in teaching and they are not easy to locate outside the course for which they have been developed. Much of this material is born digital so it is possible to capture it using web-based digital submission systems. Librarians have the expertise to create the file management, databases and archives to enable knowledge sharing for all of this material and to make it available to a wider audience. Our experience in organization of knowledge via metadata, understanding of user needs, knowledge of integrated and federated searching and professional skills must extend beyond commercial information.

In the digital environment data generated for one project purpose can now be regarded, if appropriately curated, as an academic knowledge asset, potentially re-useable as evidence by other scholars and available to others. By leading a culture of collaboration and sharing, librarians are supporting knowledge management for their institutions where knowledge sharing becomes a fundamental and routine part of everyday work.

Knowledge management must relate to organizational, unit and individual goals

Oosterlinck states that: "When you consider knowledge management, it is at the heart of higher education organizations seeing our mission as service to society, educational opportunity and research." [9]

The same drivers for knowledge management, *globalization*, *technological change* and the *information explosion*, are greatly influencing the way in which user needs are changing and it is important that the information needs of university members are understood. It is a major challenge to develop coherence in the management of the institution's collection of, and means of access to, scholarly information resources through rigorous evaluation of the needs of staff and students, both present and in the future.

As noted in the WILIP report, librarians collectively spend billions of pounds annually on information and yet there continues to be a need to undertake more research into the value and use of the information provided. Increasingly, library users fall into distinct communities with different needs. Students and staff fall into multiple categories. Many higher education students in the UK are in full- or part-time work, more students are returning to study after working and more are mature students studying for the first time; there are increasing numbers of international students and an increasing number of distance learners. As education costs more, students are becoming more discerning and demanding while, paradoxically, overall resources to meet these demands are diminishing. Students are deciding what they want and how they want it.

Only recently the Edinburgh University Student Association developed a discussion paper addressing issues such as information management, online information, computing facilities and e-learning support, stating what students require or desire from the university. They expect libraries and information providers to deal with information in ways that are familiar to them such as chat rooms and online debates and to allow multitasking and the ability to change parameters, explore and blend information to their own needs.

Research staff are also changing the way they access and use information and are less homogeneous based on teaching style, research interest,

discipline and skill level. Researchers are more time constrained and under increased pressure to publish while having less time to explore. Necessity and convenience have replaced serendipity and for many the opportunity to go to the library personally has become a treasured and distant memory. This will provide a challenge to libraries in seeking future support if we do not match services and resources to needs, and manage the information we provide well. Researchers want federated searching and networked repositories tailored to their research interests. They want to be able to drill down, track and trail provenance, connect to other data in an experimental world of combinational synthesis linked to full text and to do this quickly and easily. For academic staff the library provides a significant part of the information they require. In their study into the reading habits of academic staff, Donald King and Carol Montgomery show that 42% of faculty reading is from library-related articles, a major form of dissemination, while other reading relies on personal subscriptions and recommendations. Academics from the social sciences and humanities tend to want resources from archives, museums and galleries as well as libraries, in both print and electronic form, while academics in the sciences prefer online predominantly. All academics want tools to manipulate information from distributed repositories and sources, tracking from primary sources to various iterations of data as they develop. They want to be sure that they have access to the latest seminal information in their field and they are less patient and more pressured than ever before. If we do not understand these needs and constraints and provide better, more useful information access opportunities we will lose the support that has sustained academic libraries over two centuries of development.

The changing use of libraries is affecting our planning priorities. Study spaces, discussion areas, 'information commons' and after-hours help have become more important to many users than rows of serial back-sets and current periodicals rooms that take up large spaces for items that could be stored elsewhere. Most new journal issues achieve their best use in the first year and most government documents within the first six weeks of arrival while important issues like learning spaces and 24-hour access are pressing needs in space-constrained libraries. Information provision

is not about quantity but the quality of the experience we provide.

Within our own institutions we need to constantly ask questions such as: "What are the key information and knowledge sources that are needed and used for teaching and research?" "What barriers do researchers encounter to obtain these and use them well?" "In an ideal world what would users like the library to provide?" "Does the content, format and delivery mode meet the needs of researchers?" There are examples of libraries tracking the use of large numbers of titles to discover that millions of pounds have been spent on seldom used material. In 1991 the University of Sydney began tracking a $1 million investment in monographs to find that two thirds of this investment had been used less than five times. While certain material is acquired for the longer term we need to manage our regular purchases carefully to demonstrate that we have invested well. There is little point in purchasing 'big deals' if a large proportion of the information we purchase from these sources is under-utilized. Sometimes, less is best. Any duplication of resources needs to be subject to rigorous business case and serious consideration needs to be given to total cost of ownership when making decisions concerning print versus electronic access, taking into account VAT as well as binding, re-shelving, lending, stacks and space costs, etc. More importantly, the long-term vision of our institution, including for e-learning and distance learning and the ability to tailor information to user requirements, will be a determining factor in the decisions that we make.

We spend a great deal of time worrying about the high cost of serials and rightly so. In the UK between 1989 and 1999 the unit cost for journals rose by 364% while in the same period faculty salaries rose by 60%. We know that even the wealthiest universities cannot afford all of the information their researchers need. The current publishing model is being challenged as global Goliaths seek economic advantage that is out of proportion to other market trends and they could well be indirectly influencing the provision of funding to universities and promotion for those people whose intellectual property is contributing to their profits. However, as the quantum of research output and personal publication increases and opportunities to publish in recognized journals

are limited, researchers will publish on personal web sites and institution-led publishing programmes to achieve recognition and collaborate on a wider scale. There was once a journal for everyone, but Google is now how you get noticed. Lawrence asserts that 336% more citations are made for online articles compared to offline articles published in the same venue, showing that the impact of free online availability substantially increases a paper's impact. Whether this is accurate over broad categories or sustainable in the longer term, personalized web sites are growing and a trawl of most university web sites reveals thousands of self-published research articles and learning objects that are freely available. There is clearly a role for librarians in helping to co-ordinate and manage this information by creating the systems, structures and opportunities to self-publish.

Joseph Branin in his article on 'Building a Knowledge Bank at Ohio State University'[10] describes collection management in three phases, starting with collection development as a period of unbridled expansion. Collection management in phase two required greater attention to collection use alongside prudent acquisitions as budgets were reduced. Phase three is described as knowledge management as libraries move beyond traditional boundaries in a new information universe which is characterized by multiple and changing formats and by network access to databases and electronic texts, learning objects and an array of unpublished digital assets being created on university computers. New models will develop and exist alongside the old. Open Archive Initiatives will grow and, increasingly, funding bodies will begin to recognize the value of research freely provided by scholars who by their nature are collaborative and who are able to achieve recognition in different ways to the existing 'publish or perish' model. The Research Assessment Exercise does not encourage academics to move away from the current model of scholarly publishing but it is likely that in the future simple-to-apply alternatives to review based on publication in recognized journals will be developed. Perhaps academics will make the change when they obtain value from freely available open access publishing themselves and are prepared to provide their own contributions to the open access model also. Knowledge is more likely to be given freely where there are offers of sharing in return.

As knowledge managers, librarians need to manage knowledge actively by recognizing our role in the knowledge management agenda and taking the opportunities that this provides by

- fostering collaboration to achieve improved outcomes, making the best use of our resources and learning from best practice and bringing people together in communities of practice to solve problems and be creative including re-imagining how we can add greater value to the information we manage using the skills of those around us wherever these can be found.
- making available the knowledge embedded in our own organizations by identifying and capturing the assets that already exist and providing access to this knowledge held in multiple sources. This includes assisting members of our universities to build reputation through alternative publishing models, thinking outside existing systems.
- ensuring that information is easily accessible and managed according to need and constantly re-imagining how to unlock information that is created both internally and externally. Identifying barriers to access and developing plans to overcome impediments to information and knowledge creation wherever they exist.
- ensuring that all of our limited investment is well justified by outcomes in research learning and teaching by taking a business approach to selection and access.
- ensuring that users have the skills to use information well throughout their professional and personal lives.

The knowledge management agenda demands a response from us so that we continue to be the authors of change and do not fall victim to it. We can do it ourselves or become someone else's concept of it. We have a broader role to play, as advisors, managers and practitioners in the knowledge environment using the knowledge and skills we have developed to manage published information, to work with colleagues to manage other information and knowledge that is created in our own institutions or elsewhere.

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