

Engagement in an Era of Industrialisation

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Introduction

The demise of the university as we know it, as a result of the dramatic expansion of the economic role of knowledge, has been a recurrent theme over the past fifteen years. Thus the eminent commentator Sir Douglas Hague wrote:

Universities will be forced to share, or even give up part of their role as repositories of information and as power-houses for ideas...To compete, universities will have to organise and operate in ways more like those of knowledge businesses themselves. (Hague, 1991, p.9)

The only means of salvation, it is claimed, is through increased permeability:

The best universities of the 21st century will bring together brain-power *where it is*, not where it can be institutionalised. (Hague, 1991, p.14)

Others have argued that even greater changes are needed for universities to survive. In an article entitled 'The Inevitability of a Business Model for Higher Education', it is claimed that the combined pressures of new commercial competitors, the emergence of virtual universities, Internet-based delivery of learning, and the steadily rising demand for accredited courses will fundamentally challenge the traditional role of universities. (Abeles, 1999, p.10, p.15)

However, it should be noted that the majority of dire predictions have not been realised, at least within this time-span. Private universities, whether modelled on Disney or the essentially virtual University of Phoenix, have captured only a very small proportion of the growing global market for higher education. The combined experience of the limitations of Web-based learning and the 'dot.com' crash of e-based companies has raised serious barriers to the move to virtual learning.

Meanwhile existing universities have responded in various ways, and with varying effectiveness, to these new challenges. One response has been the establishment by elite universities of off-shore campuses, using their brand recognition to reach a far larger market. International consortia of universities have also been formed but thus far their impact is yet to be felt.

Beyond the pressures of competition, from existing and new higher education providers, and the demands of the knowledge economy (which we will explore further), a broader challenge has been identified: that of maintaining and renewing the largely unwritten social charter between universities collectively and the larger society.

This charter underpins the provision to universities of public funds, a significant, if somewhat diminished, level of autonomy, and high standing. In return there is an expectation not only of the delivery of quality learning, accredited professionals, reliable knowledge, and innovation, but also of a larger role in developing economically sound and equitable futures for the supporting society.

This 'engagement' - the variety and vitality of interactions with society - has been described as the crucial measure of the future performance of universities. Thus:

As universities, we are called to play a central role in the 'knowledge economy' by engaging with, not preaching to, the wider society. The academic qualities of independence, objectivity and care for students will serve us well in collegial, national and global engagement. Our interactions with stakeholders and the wider world, around teaching and research, and as good citizens, can allow universities and society to evolve together. (Association of Commonwealth Universities {ACU}, 2001, p.1)

Engagement, in the sense used in this report is a very broad concept. It implies:

strenuous, thoughtful, argumentative interaction with the non-university world in at least four spheres: setting universities' aims, purposes and priorities; relating teaching and learning to the wider world; the back-and-forth dialogue between researchers and practitioners; and taking on wider responsibilities as neighbours and citizens. (ACU, 2001, p.1)

This breadth has considerable value, in projecting a broad all-encompassing objective, applicable across all universities and societies. It also enables many previously unrecognised connections to be made between different areas of university policy, process and practice.

However it also suffers from two shortcomings. The first is that if the very breadth of the concept allows its application to essentially all activities of universities, in what way does it provide guidance in measuring the achievement of engagement and hence the prioritisation of policies and investment to pursue that objective?

The second shortcoming results from the focus on engagement with 'society'. Society is represented by and at many levels, including among others the framework of law, legislation and regulation, economic activity, institutions and structures, cultural values and practices and community interests. Engagement with all of these represents a huge challenge for universities, not in terms of overall importance, but in terms of relative priorities, appropriateness of vehicles for different purposes, and equity.

In order to contribute to both a refinement and a fleshing out of the concept of engagement, this chapter will focus particularly on the economic, and in particular knowledge-management challenges emerging for universities in this era of the global knowledge economy. In particular a model will be developed to assist in clarifying the relative appropriateness, and importance, of community-based, organisation-based and market-based initiatives by universities to meet the challenges and pursue the opportunities of the global knowledge-economy. The argument is developed in general terms, but draws strongly from, and is illustrated by, Australian experiences.

The Changing Policy Context for Higher Education - an Australian Exemplar

Australia's universities have moved to becoming more entrepreneurial in recent years in response to both the push of government policies and incentives, and the pull of new market opportunities. New markets include different courses, delivered in different ways, and to new types of student (eg overseas, industry sector based, professionals interested in updating, professionals meeting required personal development investments, etc), intellectual property (IP) identification, management and income generation, and contracted research.

This move to entrepreneurialism has taken a number of forms:

- i) adopting modern commercial management practices, while striving to preserve longstanding academic values and collegial processes;
- ii) contributing knowledge to the national innovation system, while continuing to value the pursuit of broad knowledge;
- iii) preparing graduates for work, while aiming to enable people to develop broad foundation learning skills for life; and
- iv) as emergent organizations, taking on new forms with flexible internal and external networks, while seeking to consolidate a coherent identity and establish cohesion within their scholarly communities. (summarised from Gallagher, 2000, pp.1-2)

While the entrepreneurial university has emerged in response to a range of interacting factors, two distinct phase of government policy were particularly influential. The **first phase**, operating from 1988-1995, involved adoption of a supply-side central planning approach with a consequent shift of power from the universities to the Government. This was strongly resisted, on the grounds that it favoured economic rationalism and managerialism at the expense of collegiality. (eg Bessant, 1992)

However the policy intention behind the increase in Government power was not centralisation, but rather to ensure universities played a greater role in developing the skills required for competition in the market-place. This was part of a series of policies (of a Labour government) to enhance Australian integration into, and competitiveness within, the world economy. Thus

The society we want requires ...a shift in the traditional profile of our economic activity. Our industry is increasingly faced with rapidly changing international markets in which success depends on, among other things, the conceptual, creative and technical skills of the labour force, the ability to innovate and be entrepreneurial. (Dawkins, 1988, p.6)

Major policy initiatives included government-driven amalgamations of universities and colleges of advanced education, central allocation of block operating-grants for student places at a pre-determined price, requirements for reporting planning and performance, and the introduction of fees supported by income-contingent loans repayable through the tax system.

On the research front, the policy aim was to increase the national return on the investment in science by directing resources to the best researchers through a policy of selectivity and concentration:

Research funds should be allocated competitively, and should go to those institutions, research groups and individuals best able to make the most effective use of them. (Dawkins, 1989)

After the big policy hit of the 1988 White Paper, it is claimed that:

The practice of policy became less prescriptive and more driven by incentives than mandates. National targets for graduate output by fields of study were abandoned, data collections were reduced and requirements for mandatory research management plans were disbanded. Project-specific capital works financing was replaced by a 'roll-in' of capital funding into general operating grants... Detailed approval and accounting processes for course shifts across fields of study were relaxed...

The universities were encouraged to internationalise their research, curricula and student experience, as part of Australia's effort to better understand the cultures and expand economic links with other nations. They were also encouraged to develop markets for overseas fee-paying students, as part of a broader policy shift from aid to trade in foreign relations. (Gallagher, 2000, p.9)

The **second phase** of government policy, introduced in the mid-1990s, is characterised by a strong emphasis on enhancing the operation of market forces. This involved three major punitive (as opposed to incentive) policies: a reduction in operating grants, hence forcing universities to seek alternative sources of revenue; the almost complete withdrawal of public subsidy for postgraduate coursework places; and the withdrawal of automatic full supplementation for staff salary increases. Each of these policies sent a clear signal that continued reliance on Government funding would make for a very difficult future for the universities.

More recently the focus has shifted towards encouraging links between institutions and the national innovation system, further concentrating research in centres of excellence, and establishment of a national quality audit and accreditation body.

That shift has required an approach different from the central planning of the earlier phase:

The present approach relies more on benchmarked competition, neutral incentives and transparency of information. Funds for research training are to be separated from funds for other courses and made contestable through a performance-based funding formula that rewards student completions and research income. Research and research training management plans are required. Indicators are to be published annually and their claims verified periodically through external quality audits. (Gallagher, 2000, p.12)

The government has been able to claim a significant outcome of the application of their policies. In 1992, Government grants represented 60 per cent of university revenue. By 1999 that had fallen to 43 per cent. Fees from fee-paying overseas students increased 145 per cent over the same period, to represent over 8 per cent of total revenue and higher in many individual institutions. Numbers are projected to increase to 112,000 EFTSU in 2003. That most cherished measure of economists, productivity (measured in this case as student load per employee), increased by a startling 5.6 per cent p.a. over the five years 1997-2001, compared with an all-industry average increase of 2.4 per cent. This followed years of little or no productivity increase. (Ruthven, 2002, p. 6)

Of course productivity is normally measured as output per hour worked, but as so much of the output of academics is intangible, and capable of assessment only in the long term, that measure cannot be applied. There is some reason to suspect, to judge from anecdote and surveys of working hours, that much of the apparent productivity increase has been achieved by academics working longer rather than smarter, and delivering less, proportionately. The productivity increase may turn out to be illusory, or, worse, even counter-productive.

But it is plain that the level of engagement of Australian universities, against any indicator considered relevant, has substantially increased - more market-oriented processes, more consideration for students as customers, more contract research, more university-industry research/commercialisation linkages, more community outreach. What is less clear is the extent to which this represents "the whole orientation and tone of a university's policy and practice". (ACU, p.1)

Rather, the impression formed is one of a wide variety of responses to a myriad of triggers, which are transforming university operations, but not always in consequence of clear statements of vision and mission and supporting strategies.

As an example, a number of US universities have identified as a core objective the economic advancement of the region in which they operate and set in place policies, structures and processes to pursue that end. No Australian university has yet adopted such a mission, though some of the regional universities clearly regard engagement with their local economy as of great importance. Thus the pursuit of engagement may still be largely a consequence of other decisions than a direct and important objective.

These developments include:

- The multiplication of demands from, and purchase of services by, multiple government agencies has replaced the single link with a Department of Education.
- The emergence of not one, but a number of markets to which universities, research groups and individual academics can respond. This requires clear strategy and resource allocation by the university, and recognition by government that, in a market place, government cannot ordain which markets should be pursued.
- The increasing establishment of centres for research and teaching as nodes at which a variety of disciplines, problem specifications and intellectual opportunities can interact. These are usually designed to escape from some

limitation in the university's processes, so they are inherently destabilising, if not subversive. To this, may be added the fact that many are (or should be) ephemeral, commonly providing useful interaction and focus for just a few years.

- A growing number of academics are becoming relatively free agents with a variety of employers and sources of income.
- Universities are increasingly collaborating, networking and partnering. More efficient use of resources, particularly for 'back office' functions can be expected. The building of larger-scale capacity in key research areas is also likely.
- The emergence of a new generation of researchers, research managers and research commercialisers who combine an understanding and respect for the processes of research with a detailed knowledge of the environment of application and of the processes of extracting commercial value from knowledge.

However, the effects of these trends and the nature of the changes occurring can be understood only within the broader context of two distinct but connected drivers in the emergence of the global knowledge economy and the industrialisation of higher education.

The Industrialisation of Higher Education in the Context of the Knowledge Economy

Around the world governments and universities are acknowledging that knowledge has become the central asset in economic competitiveness. As a consequence there is a premium on the establishment of mechanisms that can align knowledge-production with economic objectives, and can provide the commercial sector with relevant knowledge, where, how and when required.

Gibbons et al (1994) have identified the intensification of international competition in business and industry as the driving force behind a markedly accelerated supply of, and demand for, 'marketable knowledge'. Faced with turbulent market environments, companies have sought to increase competitive advantage by shifting their strategic focus, at least in part, from markets and customers to organisational capabilities. (Johnston, 1998) This places the emphasis on knowledge management, both within and outside the organisation:

Ability in acquiring, assimilating, sharing and creating knowledge is the ultimate organisational capability, a meta-competence which allows an organisation to consistently outperform its rivals. (Jordan, 1997)

The crucial element is widely regarded as linkages between knowledge generators and knowledge users. Thus:

The nation that fosters an infrastructure of linkages among and between firms, universities and government gains competitive advantage through quicker

information diffusion and product deployment... The performance of an innovation system now depends, more than in the past, on the intensity and effectiveness of the interactions between the main actors involved in the generation and diffusion of knowledge. (OECD, 2000)

It is important to recognise that this new emphasis on linkages (commonly referred to as industry-science relationships – ISRs in Europe) is not just ‘business as usual’ ie that oft-repeated objective of getting a better return on all the public funds invested in research through more effective commercialisation of those ideas nationally.

Rather, with knowledge having become the crucial asset in commercial and economic competitiveness, the premium is on the establishment of mechanisms that can most effectively shape knowledge production to align with economic objectives, and can provide the commercial sector with relevant knowledge, where, how and when required.

Thus:

ISRs are not simply transactions that mirror a clear-cut division of labour in the production of knowledge. They represent an institutionalised form of learning that provides a specific contribution to the stock of economically useful knowledge. They act not only as knowledge transfer mechanisms but also in other capacities eg building networks of innovative agents, or increasing the scope of multidisciplinary experiments. (OECD, 2000, p.163)

As a result knowledge is increasingly being seen as a commodity that has exchange value. Governments, convinced that knowledge is now an important factor of production, and a major driver of economic growth, see higher education as a primary producer of *commodity* knowledge that is available to industry for use in the production of goods and services:

The powerhouses of the new global economy are innovation, ideas, skills and knowledge. These are now the tools for success and prosperity as much as natural resources and physical labour were in the past century. Higher education is at the centre of these developments. Across the world, its shape, structure and purposes are undergoing transformation because of globalisation. At the same time, it provides research and innovation, scholarship and teaching which equip individuals and businesses to respond to global change. World class higher education ensures that countries can grow and sustain high-skill businesses, and attract and retain the most highly skilled people. It endows people with creative and moral capacities, thinking skills and depth of knowledge that underpin our economic competitiveness and our wider quality of life. It is therefore at the heart of the productive capacity of the new economy and the prosperity of our democracy. (Blunkett, 2000)

It would be hard to conceive of a more glowing testimonial for universities in this new age!

Hence, an important focus of public policy has become the funding of universities to generate commodity knowledge, encouraging them to protect it through the intellectual property system, and promoting its application through a variety of

linkage mechanisms with industry. Considerations of market and institutional failure provide the basis of this policy with a consequent focus at the broad industry level.

The OECD has recognised that knowledge was acquiring more of the properties of a commodity through codification and suggested that this allowed for the acceleration of its diffusion:

Codification is reducing the importance of additional investments to acquire further knowledge. It is creating bridges between fields and areas of competence and reducing the '*dispersion*' of knowledge. These developments promise an acceleration of the rapid growth of stocks of accessible knowledge, with possible implications for economic growth. They also imply increased changes in the knowledge stock due to high rates of scrapping and obsolescence, which will put greater burdens on the economy's adjustment abilities. (OECD, 1996, p.13)

This observation points to one of the paradoxes associated with consideration of knowledge as a commodity and as a product. At the level of the economy and industry, free and unrestricted access to knowledge will provide a collective benefit leading, it is thought, to enhanced industry competitiveness. But in a commercial environment, firms compete, not industries, and industry leadership can usually be traced to a relatively small number of highly competitive firms. Businesses focus on the manufacture and delivery of distinctive products and services and generally endeavour to avoid a commodity orientation. This distinction between 'commodity knowledge' and 'product knowledge' has implications for the suppliers of knowledge as well as distributors and acquirers of knowledge product in a commercial environment

Turning commodity knowledge into knowledge products is a far more complex process than the linear model described above. Thus:

Knowledge and information tend to be abundant; what is scarce is the capacity to use them in meaningful ways. Nor is knowledge easily transformed into the object of standard economic transactions. To buy knowledge and information is difficult because by definition information about the characteristics of what is sold is asymmetrically distributed between the seller and the buyer. Some kinds of knowledge can be easily reproduced at low cost to a broad set of users, which tends to undermine private ownership. Other kinds of knowledge cannot be transferred from one organization to another or between individuals without establishing intricate linkages in terms of network and apprenticeship relationships or investing substantial resources in the codification and transformation into information. (OECD, 1996)

These observations point to the need to recognise knowledge as a form of capital which can be created, owned, licensed and sold in an exchange relationship. The debate needs to move on from a presumption that knowledge is abundant and freely available. The fact that knowledge can be communicated quickly, cheaply and abundantly through information and communication technologies does not mean that it will be transmitted or effectively received. Extracting a use value from knowledge

will usually require access to a range of complementary knowledge assets as well as to material assets.

The emergence of the knowledge economy has in part paralleled, and in part had a powerful influence upon, a distinct historical process - the industrialisation of higher education. Historically, both agriculture and manufacturing have been industrialised, in the 18th and 19th centuries, respectively. The last twenty-five years has seen the progressive industrialisation of the service sectors, led by the finance industry. Over the same period there has been a process of public-sector reform of government departments and agencies, but also of public sector activities like energy provision and health care delivery. And now, the inexorable industrialising process has arrived at the gate of the universities.

An industry is characterised by the existence of producers of commodities (goods and services) for which there is a market (consumers) and for which there is an exchange value. In these terms, the higher education industry can be defined as a group of institutions, generally identified as universities, engaged in producing knowledge products and services. Industrialisation involves a process of turning a use value into an exchange value, commonly called commodification.

Courses and programs when provided to students in return for fees clearly have an exchange value. Similarly, the income from advisory and research services provided by academics under contracts with businesses reflects an exchange value. The recognition of an exchange value for certain assets is generally referred to as *capitalisation* of those assets. Securing intellectual property rights in knowledge assets is therefore referred to as the *capitalisation of knowledge*. (Jones, 1998; Etzkowitz, 1999)

Within an emerging market environment competition occurs between suppliers who compete not only on price, but also on quality, reputation, brand and a range of intrinsic characteristics. As competition expands so do the “rules” for market engagement, as reflected in trade practices legislation and quality certification and accreditation.

Quite clearly, the industrialisation of higher education has involved both the *commodification* and *capitalisation* of some (but by no means all) of the knowledge creating activities of higher education institutions. Knowledge can now be seen as a commodity with an exchange value and, from that perspective, involves production, distribution and exchange. In that respect the concept of knowledge *creation* has moved to knowledge *production*.

There are still a large number of activities undertaken and services provided that do not, and will not, have an exchange value. But as higher education is coming to resemble an industry, universities, or more specifically, parts of universities, are beginning to act like “firms” in a market environment (Allen and Acres, 2001). The evidence of commercialisation is reflected in the growing number of patents granted to universities, and their subsequent licensing to businesses, the increase in university-business partnerships, the creation of start-ups companies and the incubation of spin-off companies.

Industrialisation is associated with substantial changes in the methods and focus of production, distribution and exchange. These changes generally involve moving from an extensive mode of production to an intensive one aided and assisted by technological invention and an environment that encourages and supports entrepreneurship. (Jones, 1988) For example, the “agrarian revolution” involved changes in methods of production that made more effective use of land. Industrialisation in textile manufacturing involved moving from the putting-out system to the factory system where it was possible to exert greater control over the quantity and quality of output.

Large-scale production also requires the input of people (managers) who can coordinate a division of labour based on specialisation of task. The division of labour relates not only to production, but also to marketing and distribution ie managing exchange relationships.

These are essentially supply side issues, but demand considerations have been equally, and perhaps more, important in driving industrial change. That is, increasing population, rising real incomes and changing tastes and preferences 'pull through' the processes of industrialisation.

The industrial revolution involved a change from a society based on agriculture and craft to one based on automation, scientific development, division of labour, and the replacement of barter with money exchange. There was also a change in the social relations within industry – between the owner, the employer and the employed. In higher education some see a similar “academic revolution”. This involves a shift from the creation of knowledge in a community environment that values scholarship and sharing of knowledge among a community of scholars to the production of knowledge in a commercial environment, where knowledge is 'propertised', valued and exchanged through market transactions. The metaphor of a new 'enclosure of the commons of public knowledge' has been used.

As with “revolutions” in other industries, those who create knowledge in this new academic industrial order are not necessarily those responsible for its dissemination and application. This applies in teaching as well as research where global providers have introduced a separation between course design, course delivery, and course assessment. Venture capital emerged as an asset class for the commercialisation of knowledge assets. While the early venture funds in the US has close links with universities, the finance sector has since entered this area and, in the process, is encouraging scientists to have a greater commercial focus in presenting their discoveries to them for commercialisation.

The visible indicators of this industrialisation are the new expanded cadre of non-academic managers, a pervasive ethos variously entitled managerialism or corporatism, and increasing levels and processes of accountability.

As with the reform of the public sector, key shifts have been devolution of management responsibility from the centre (government) to the deliverer of services (university, Faculty, Department), the engagement of senior staff under contract arrangements, streamlining employment terms and conditions and industrial relations practices, a focus on efficiency and accountability for outcomes, the introduction of

systems of cost recovery for services, aggregation and outsourcing of support services, corporatisation of trading enterprises and sale of non-core assets.

It is within this context that engagement needs to be understood, planned and implemented and models to explain it developed.

Models of Engagement for an Industrialised Higher Education Industry

In a series of papers Etkowitz and colleagues have developed the concept of the *triple helix of university-government-industry relations*. (Etkowitz and Leydesdorff, 1997) They argue that it is no longer the case of considering university-industry linkages to achieve commercial outcomes, and university-government relations addressing investment in research and education. Rather, the three are not only converging but are now in continuing dynamic interaction, reshaping each other.

The same argument has been developed in different directions to identify the emergence of a new model of the university - from the research university to the entrepreneurial university:

The entrepreneurial university is a result of the working out of an 'inner logic' of academic development that previously expanded the academic enterprise from a focus on teaching to research. The internal organisation of the Research University consists of a series of research groups that have firm-like qualities...sharing qualities with a start-up firm even before it directly engages in entrepreneurial activities.(Etkowitz, 2002)

An alternative view characterises the evolution as one *from sponsorship to partnership in university-industry relations*. (Jacob et al, 2000). The evolution is characterised through four stages: the science-society contract as captured by Vannevar Bush, the era of strategic research, the Science Park, and the knowledge partnership. This last model, which corresponds substantially to the much-discussed Mode 2 model of knowledge production, (Gibbons et al, 1994) emphasises the joint creation of knowledge between researcher and user, as opposed to the transfer of knowledge from researcher to user.

A new model has been developed (Howard, 2003) to provide insights into the operation of universities in the knowledge economy based on identification of the institutional factors and characteristics that impact on the production, distribution, exchange and management of knowledge.

Three basic socio-cultural and economic frameworks with the following broad characteristics are identified:

- Knowledge communities – primarily, although not exclusively, universities, often referred to as the academic community or community of scholars, built around open interactions and the sharing of knowledge;
- Knowledge-based organisations and 'knowledge-creating' companies, built around roles and relationships and the management of knowledge;

- Knowledge markets, involving the exchange of knowledge products.

Knowledge communities, like that of science, are structured around the rules of a gift economy. Scientists give, or present, papers to their peer community via conferences and journals. This gift economy has been explained in terms of a ‘cycle of credibility’ which allows conversion of one form of capital into another in order to make scientific progress. The forms of research capital include money, data, prestige, credentials, problem areas, conceptual developments and publications. (Latour and Woolgar, 1982)

The observation is made that:

If science followed the rules of an exchange economy, scientists would not give papers; they would seek to get a good deal by selling them or trading them in such a way that they got more knowledge than they gave. They would gain status not by giving away knowledge, but by hoarding it. If scientists had followed the rules of the exchange economy we might not have escaped the Dark Ages. (Pinchot, 1998)

The community dimension stresses the importance of social capital, ie the stock of trust, mutual understanding, and shared values and behaviours that bind members of communities and make cooperative action possible. It is characterised by high levels of trust, robust personal networks, vibrant communities, shared understandings and a sense of equitable participation in a joint enterprise – all of the things that draw people to a group. This type of connection supports collaboration, commitment, ready access to knowledge and talent and coherent organisational behaviours.

The concept of *communities of practice* has emerged from considerations of social capital. These communities grow out of practical need, ie they are drawn together by common activities. They cannot be managed into existence.

Parallel to the emergence of knowledge markets has been that of managed relationships between universities and businesses, based on alliances or networks with many of the characteristics of communities. These are an alternative, or complement, to market-based transactions.

During the 1990s, with government support, the business-university alliance emerged as a way to cultivate expertise in early-stage research that might not bear fruit for many years. This development in the US has been characterised as follows:

By bankrolling academic projects, firms saved much of the equipment and overhead costs of maintaining their own research in risky areas. They got a leg-up on identifying and training future hires (SIC) while cultivating a wider breadth of knowledge about fields outside, but related to, their main businesses. Such alliances were sent into orbit by the rise of biotechnology...but the trend expanded into just about any field. (Buderi, 2000)

These developments have been associated with new forms of organisation and new ways to acquire knowledge. There is no longer a presumption that the productive

factors and capabilities that a business needs to produce competitive goods and services will be owned and directly controlled.

These alliances are also a means of reducing, or managing risk, in an environment in which new knowledge is being produced at an unprecedented rate:

For companies that are defining the S&T frontier in their industry the risk that a competitor will achieve a fundamental breakthrough (possibly via research collaboration with academia) is viewed as a major business risk. Such companies view their investment in academic research as a key means of reducing this risk by helping them to avoid being unaware of potential threats to the company's market value and allowing them to put in place appropriate defensive tactics. In some companies the value of this aspect outweighs the anticipated benefits from the specific research projects they fund. (Australian Academy of Science, 2002)

Knowledge organisations - with the emergence of a more competitive global environment and a shift away from mass production as the major driver of industrial development, analysts have come to regard an organisation as a collection of resources that is managed to achieve particular purposes, results or outcomes. (Dosi, 1995) These resources embody a range of distinctive capabilities that allow organisations to survive, develop and retain competitive advantage in a commercial context. These resources include:

- tangible assets such as buildings, facilities, equipment, property and patentable inventions
- intangibles, such as brand, image, reputation, human skills and knowledge
- financial capital that the organization is able to access
- management capacity and capability.

Organisations are choosing to adapt to their changing environments by deliberately externalising some capabilities, and in the process, retaining a certain degree of influence outside their boundaries. As a result, externalisation of capability, involving inter-organisational collaboration through networks, such as outsourcing, subcontracting, franchising are tending to increase. Conversely, firms may decide that they wish to protect their current physical and intellectual assets by building more internal capability. These considerations are important for addressing how and why corporations seek to acquire knowledge through market and managed arrangements with universities. In these environments the management of knowledge and innovation creates important challenges.

Knowledge markets - economists have promoted a view that the market is the ideal way to organise all economic activities and that organisations are a special case to address problems of market failure, due largely to limited information and a propensity for people to behave opportunistically.

The market system emphasises voluntary exchange between parties. Firms compete to;

seize and keep for themselves as much as they can of the value embodied in the products and services they deal with, while allowing as little of this value to fall into the hands of others. (Ghoshal, 1999)

Markets force companies to eventually transfer most of the newly created value to others, driving a process of creative destruction.

Over the last 20 years, however, there has been a substantial growth in the scale, reach, complexity and popular legitimacy of market institutions and market players. The extension of markets is seen to flow from a complex of factors, summarised as scope, sophistication and legitimacy. (Donahue and Nye, 2001) Public policies of privatisation and deregulation have seen the expansion of markets in utility services, education, health care, telecommunications, aviation, banking and insurance.

In all of these cases, however, de-regulation has been accompanied by the introduction of more rules to govern the operation of the markets created. Where rules have not been introduced, unexpected consequences have arisen and governments have quickly responded by re-regulating. New organisations have been established to advise on and administer rules.

The development of the market system has also seen a proliferation of intermediaries to stand between buyers and sellers as brokers, advisers and arbitrageurs. The greater the information asymmetry between buyers and sellers the greater is the demand for an intermediary.

Economist William Baumol argues that market for knowledge has become widespread, pointing to IBM's revenue from licensing fees amounting to 20 percent of the corporation's profit in 2000. He refers to a market space characterized by a:

profusion of conferences, websites and organizations devoted to technology transfer along with wide media coverage of licensing agreements between individual companies. (Baumol, 2002)

Market forces power the movement of knowledge, working in a similar way to markets for tangible goods:

Like markets for goods and services, the knowledge market has buyers and sellers who negotiate and reach a mutually satisfactory price for the goods exchanged. It has brokers who bring buyers and sellers together and even entrepreneurs who use their market knowledge to create internal power bases. Knowledge market transactions occur because all of the participants believe they will benefit from them in some particular way. (Davenport and Prusak, 1997, p.25)

Within firms, research and development is increasingly being organised on a market basis. Corporations are creating market-type mechanisms that impose market tests on research and development. R&D units are being set up as profit centres, and they charge different divisions for the results they produce. This can be in the form of formal licensing of IP or through inter-company transfer arrangements.

The emergence of science based innovation and the possibility that scientific discoveries in a research environment could be transformed almost directly into economic returns has been associated with the creation of small, start-up firms to commercialise discoveries and inventions. In this context, commercialisation involves capturing income through exchange transactions. There is a growing practice among universities to package research discoveries, licences and associated knowledge capital (ie the expertise of the researchers) in start-up companies. This largely accounts for the observed increase in the number of start-up companies in recent years. (Yencken and Gillin, 2002, Johnston et al, 2002)

Thus, universities are now constituted by, and operating under the influence of knowledge markets, organisations and communities. Universities have long been knowledge organisations. But they are using a variety of alternative organisational forms to operate in knowledge markets, such as the company to provide language or pre-university courses, the start-up company to capture a higher share of economic return on technology developed in-house, and the venture capital organisation to fund these new businesses.

The scale of the knowledge market has become apparent, offering both threats and opportunities to universities. There is an imperative to operate effectively in a competitive market, while not destroying the components of the organisation, and its community, which gives universities such a special place, and brand image, in the market. There is great potential for generating revenue by contracting services to industry.

But the most important relationships with the world of business may not be contractual. Academic and scientific communities have thrived for centuries and provide the basis for high levels of competition within strict rules, and at the same time a high level of collaboration, and community allegiance. Increasingly, the community is being extended, or new communities formed between universities and businesses, in the forms of alliances, networks and clusters. It is this form of interaction that was captured by the 'Mode 2' model. (Gibbons et al, 1994)

Implications of Knowledge Markets, Organisations and Communities for Engagement by Universities

The expansion in the scope and scale of engagement of universities with business and the community creates challenges for the way in which relationships are managed. Increasingly, market relationships involve the intermediation of brokers, intermediaries and advisers in areas such as finance, intellectual property, corporate structure, and marketing. The challenge, and the imperative, is to build trust based relationships in these areas to ensure that credible, expert and independent advice is available and that universities are not exposed to unnecessary risks.

Similarly, cooperative and collaborative arrangements and ventures between universities, business and public organisations require increasingly sophisticated management processes and systems. The practice of management in a collaborative knowledge worker environment is complex - requiring not only skills necessary for the motivation of scientists and technologists, but also capabilities for ensuring that milestones and results are achieved, stakeholder interests and views are

accommodated, budgets and plans are created and monitored and accountability is assured. Experience with cooperative arrangements between universities and businesses suggest that management is one of the greatest challenges.

Finally, the community of science is undergoing fundamental change as many scientists earn less in the way of peer “credit” for their work and more from the capitalisation of their discoveries and inventions in the form of intellectual property assets. Although many fear that the “enclosure of the knowledge commons” will result in impediments to the creation of knowledge, it may well be that the creation of knowledge assets, and attaching value to those assets, will result in their *more* productive and effective utilisation. Moreover, there can be no suggestion that all forms of knowledge creation will be, can be, or should be, capitalised.

As with the human genome, there are many forms of knowledge that are too important to be enclosed into complete and restricted private ownership. This, in turn, creates another set of public policy challenges, and in particular, the disposition of the outcomes of publicly funded research. The definition of a knowledge asset, in the form of intellectual property, is a separate issue from that of access to and availability of that asset for further use. By defining an asset, notice is placed about its existence; it follows that the definition of the asset should also extend into provisions regarding rights of access.

Whether those rights of access to knowledge assets are determined by legislation or the legal system, and in a national or international context, are important issues in the evolution of the knowledge economy. Universities, as key players in the creation of knowledge assets, should have a place at the table in these deliberations.

References

- Abeles, T. P., 'The Inevitability of a Business Model for Higher Education', *Foresight*, **1**, 1, pp10-16, February 1999.
- Allen, G., and Acres, D., *Education as Industry and Universities as Firms*, 2001, available at <http://www.org.uva.nl/eair/porto/papers/Allen%20Track%202.pdf>
- Association of Commonwealth Universities, *Engagement as a Core Value for the University*, 2001 available at <http://www.acu.ac.uk>
- Australian Academy of Science, 'Submission to the House of Representatives Committee on Innovation and Science Inquiry into Business Commitment to R&D in Australia', Canberra, 2002.
- Baumol, W.J., *The Free Market Innovation Machine*, Princeton University Press, Princeton, 2002.
- Bessant, B., 'Managerialism, Economic Rationalism and Higher Education' in Marshall, N., and Walsh, C., *The Governance and Funding of Australian Higher Education*, Federalism Research Centre, Australian national University, Canberra, 2000.
- Blunkett, D., (UK Secretary of State for Higher Education), quoted in Gilbert, A., 'The Idea of a University Beyond 2000', Bert Kelly Lecture, Melbourne, 2000, <http://www.unimelb.edu.au/vc/present/bertkellylecture.pdf>
- Buderi, R., *Engines of Tomorrow: How the World's Best Companies Are Using their Research Labs to Win the Future*, Simon and Schuster, New York, 2000.
- Davenport, T., and Prusak, L., *Working Knowledge: How Organisations Manage What They Know*, Harvard Business School Press, Boston, 1997.
- Dawkins, J.D., *Higher Education: A Policy Statement*, AGPS, Canberra, 1988.
- Dawkins, J.D., *Research for Australia: Higher Education's Contribution*, AGPS, Canberra, 1989.
- Donahue, J.D. and Nye, J.S., 'Market Ascendancy and the Challenge of Governance', in Donahue, J.D. and Nye, J.S, eds., *Governance Among Bigger, Better Markets*, Brookings Institution, Washington, 2001.
- Dosi, G., Nelson, R., and Winter, S., eds., *The Nature and Dynamics of Organizational Capabilities*, Oxford University Press, New York, 2000.
- Etzkowitz, H. and Leydesdorff, L., *Universities and the Global Knowledge Economy: A Triple Helix of University-Industry-Government Relations*, Cassell, London, 1997.
- Etzkowitz, H., Webster, A., and Healy, P., *Capitalizing Knowledge: New Intersections between Industry and Academia*, State University of New York Press, New York, 1998.
- Etzkowitz, H., 'Research Groups as Quasi-Firms: the Invention of the Entrepreneurial University', *Research Policy*, 2002.
- Gallagher, M., *The Emergence of Entrepreneurial Public Universities in Australia*, Occasional Paper 2000/E, Department of Education, Training and Youth Affairs, Canberra, 2000.
- Gibbons, M, Limoges, C., Noworthy, H., Schwartzman, S., Scott, P., and Trow, M., *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*, Sage, London, 1994.
- Ghoshal, S., Bartlett, C., and Moran, P., 'New Manifesto for Management', *Sloan Management Review*, **40**, 3, 1999.
- Hague, D., *Beyond Universities: A New Republic of Intellect*, Institute of Economic Affairs, London, 1991.

- Howard, J.H., 'The Industrialisation of Higher Education', PhD Thesis, University of Sydney.
- Jacob, M., Hellstrom, T., Adler, N., and Norrgren, F., 'From Sponsorship to Partnership in Academy-Industry Relations', *R&D Management*, **30**, pp255-262, 2000.
- Johnston, R., *The Changing Nature and Forms of Knowledge: A Review*, Department of Employment, Education, Training and Youth Affairs, Canberra, 1998
- Johnston, R., Howard, J.H., and Grigg, L., *Best Practice Processes for University Research Commercialisation*, Department of Education, Science and Training, Canberra, 2002.
- Jones, A.B., *Knowledge Capitalism: Business, Work and Learning in the New Economy* Oxford University Press, London, 1999.
- Jones, E.L., *Growth Recurring: Economic Challenge in World History*, Clarendon Press, Oxford, 1988.
- Jordan, J., 'Competing through Knowledge: An Introduction', *Technology Analysis and Strategic Management*, **9**, 4, 1997.
- Latour, B., and Woolgar, S., 'The Cycle of Credibility' in Barnes, B., and Edge, D., *Science in Context*, Open University Press, Milton Keynes, 1982.
- OECD, *The Knowledge-Based Economy*, GD(96)102, Paris, 1996, p.13.
- OECD, *Science, Technology and Industry Outlook*, Paris, 2000.
- Pinchot, G., 'Building Community in the Workplace', in Heselbein, F., et al, eds., *The Community of the Future*, Josey Bass, San Francisco, 1998.
- Ruthven, P., 'Productivity in the Higher Education Sector', *Business/Higher Education Round Table News*, Issue 15, November 2002, pp6-9.
- Yencken, J., and Gillin, M., 'Australian Spin-off Companies', Swinburne University of Technology, Melbourne, 2002