academicJournals

Vol. 7(24), pp. 2293-2300, 28 June, 2013
DOI: 10.5897/AJBM10.872
ISSN 1993-8233 © 2013 Academic Journals
http://www.academicjournals.org/AJBM

African Journal of Business Management

Review

Will the knowledge economy signal the end of academic freedom?

Neil Foster

University of Nottingham, School of Veterinary Medicine and Science, Sutton Bonington Campus, Sutton Bonington,

Accepted 19 June, 2013

The emergent industrialisation of China and India has led to a fundamental rethink of policy in all Western industrialised nations and trading blocks including the UK and EU. This has led to the concept of a 'knowledge economy' (KE) in which the utilisation of knowledge capital will replace traditional methods of employment (a 'brains versus braun' market place). A large number of documents have now been published which set out measures to steer the UK and EU towards development of a KE. Universities are at the heart of this, not only in research and the development of ideas but also in training of the KE workforce (undergraduates). However, funding of the KE by central government and greater industrial/governmental partnerships may have a serious impact on academic freedom with increased stakeholder interest, controlling not only the type of research which can be done at universities but also the curricula taught within universities. This essay sets out to highlight how academic freedom may be eroded by the funding of a KE in the UK and argues that such erosion may lead to a stagnation of ideas which is counter-productive to its future development.

Key words: Higher education, university funding, knowledge transfer.

INTRODUCTION

The advent of globalisation and the development of countries such as China and India as world manufacturing powers have forced a rethink in the direction of older industrialized nations. At the heart of this rethink are two important questions: How can older industrialized nations create wealth in the future and how can older industrialized nations create employment for its citizens? This has led to the concept of a knowledge economy (KE) which, according to a Department of Trade and Industry (DTI, 1998) definition, develops when knowledge can be exploited for economic benefit. Thus the knowledge economy will be developed via higher education/business partnerships and will require a more the concept of KE has been driven forward by the development of the 10 year Science and Innovation Investment Framework (HM Treasury, London, 2004) and the Lisbon treaty which set out an agenda for the development of KE throughout European member states (Europa, 2000). The UKs position concerning KE and Lisbon was later reinforced in a 2005 speech by Peter Mandelson (European commissioner for trade) given to the European parliament. This speech focused on the need to protect intellectual property rights, and stated that the EU needed to 'Use trade policy to contribute to developing Europe's knowledge economy educated workforce. Since 1997, under 'New Labour,' recommendations of the Dearing report in 1997, the strengths by promoting intellectual property protection. The priority regions for action are the EU's immediate neighbourhood as well as China. This is of utmost importance for the promotion of innovative products and to sustain the EU's position in the knowledge economy' (Strengthening the

*Corresponding author. E-mail: n.foster@nottingham.ac.uk. Tel: 0115 9516433.

Lisbon Strategy, 2006). There is therefore serious long term commitment by the UK and other European states to developing a KE which can compete in global markets.

However, some academics have questioned their role in a KE and have expressed concerns over academic freedom. For example, an article by Phillip Moriarty in the Times Higher Education raised the concern that 'Science for the public good is not compatible with the entrepreneurial methods increasingly expected by university research by governments and funding agencies' (Moriarty, 2008). This perception of 'moral bankruptcy' is also echoed by Vogt et al. (2007) who argue that core values upon which publically funded science was built have been eroded and, in a recent essay, David Turner explored the idea that knowledge for the public good is being commercialized for the private good and that this will have to occur to develop a high tech KE (Turner, 2012). Furthermore, the Eurozone crisis and austerity programme currently employed throughout the Eurozone has impacted on the UK, which itself has stringent austerity measures including a significant decrease in public spending. While increased interaction of academics with the private sector is not only encouraged much more but is actually insisted upon by many research funding schemes.

Therefore, how can academic freedom be maintained in an atmosphere of business/academic partnerships when critical academic funding may be channeled by governments in the direction of business and industrial progress, or may be provided less by government and more by industry and venture capitalism? In an attempt to answer these questions, the author has mostly used examples from his own academic background and experience (Science and Engineering). However, he recognizes that the debate about academic freedom within a KE is as interesting and relevant to other academic disciplines such as the Arts, Humanities and the Social Sciences.

What might a UK KE look like?

The UK already has a strong KE in the services sector. In 2005, 48% of the UK work force were employed in the knowledge sector, and most of these were employed in health and education (Brinkley and Lee, 2006) but business, financial and communications exports have also increased such that the services sector accounted for 68% of total UK export in 2005, a rise of 14% in the 10 year period 1995-2005 (ESRC, 2007). It seems likely that these businesses will continue as long as a market exists. It is also true that the very heart of the KE (the university itself) has become a service industry. Education has been a particular success in terms of export, since UK education generated £3 to 6 billion in 2003-2004 (Universities UK, 2006). This actually signals a worrying trend for many academics who believe that the core principals of education and learning are in complete discord with the idea of education as an export business. However, this notion of UK universities selling education has also great prominence in the UK. Expansion of the HE sector was highlighted by Brinkley (2010) in the 'Knowledge Economy Strategy 2020's report. While this report highlighted the need for strategic expansion of HE to deliver a high tech KE it also acknowledged that this could not be paid for by government and suggested that the extra revenue would have to come from increased students' fees and also suggested a relaxation in the control of fees which universities charge. This lack of government funding has significantly increased tuition fees and from 2012 most new undergraduates will pay £9000 per annum tuition fees if studying in any of the top 20 UK universities (Russell Group Universities). Academics have therefore become part of an industry which sells its goods both at home and abroad. The role of universities as a contract research business could also be considered to be an example of a KE within the services sector. In this regard, the university is usually not involved in academic dialogue with the company and is merely paid to provide expensive equipment (which many companies do not have) and expertise to test a product or compound which the company believes may have marketable potential. According to a speech by Lord Sainsbury in 2004, contract research increased from £242 to 328 million in the period 1999 to 2002 and revenue generated by intellectual property licenses also increased from £23-33 million in the same time period. Contract research will probably be encouraged and increased in the future, particularly in universities and university departments which have little revenue from research grants.

However, the service sector is driven by the global economy rather than driving it and in this respect it is susceptible to economic down turn. The crisis within the Eurozone has reverberated around the world in many non-Eurozone countries including the UK. In July 2012, UK GDP figures showed a decrease by 0.7% (Office for National Statistics, 2012), signaling entrenchment of the 'double dip' recession. It is possible that selling education may become more difficult as fewer countries have the money to pay and fewer UK citizens can afford to pay £9000 per annum. Conversely, it is also possible that possible future falls in sterling may make UK educational export cheaper.

The future UK KE will, therefore, need to develop in other directions rather than the service sector alone. The development of knowledge based industries seems an obvious direction, particularly considering the previous role of the UK in the development of innovative manufacturing techniques and products which undoubtedly helped to shape the world. The current situation is, however, very different, according to the Institute for Manufacturing, with manufacturing in the UK set to fall to a mere 17% GDP with fewer than 2 million people

employed in the sector by 2014 (IFM, 2004). A more recent bulletin by the Confederation of British Industries (CBI Bulletin, 2012) has reported modest growth in UK manufacturing with 29% of manufacturers who took part in a survey of 398 companies stating that manufacturing had increased and 26% stating that it had decreased. However, over a number of years, a great deal of manufacturing developed in the UK has been relocated to countries with much lower wages and a 2003 IFM survey found that 25% of UK companies believed that manufacturing would continue to leave the UK and that about 75% believed that product design and development would leave by 2014 (IFM, 2004). It is possible that this concept may change in light of the 2010 work foundation report to the government which highlighted a specific need for design if the UK is to produce and export in the KE (Brinkley, 2010). Product design and development can be separated from the manufacturing process and if the bleak forecast in the IFM questionnaire is correct both may be lost from the UK. Similarly, in the electronics industry, the number of people employed fell by >50% in 10 years with many jobs being relocated to cheaper work forces abroad (Wilson, 2008). This seems to be a very unstable platform to launch the new knowledge based industries of the UK, particularly since electronics would appear to be an important sector in any modern industrial KE. Whether a large scale manufacturing KE can be developed and maintained in the UK is questionable. Across the EU there has been a significant loss of employment in high tech and low tech industry, possibly due to a halt in the information and communications technology boom and also the production of low tech manufacturing in countries with cheaper work force costs, in accordance with this overall decrease in EU technology companies, UK high tech jobs have fell by 27% (Brinkley and Lee, 2006). A rather scathing book, by Elliott and Atkinson (2007) asks the question what is Britain good at? The book highlights the fact that we are constantly told of the failing economic model of Japan and Germany, yet both of these countries had a trade surplus of more than £50 billion in 2006. They come to the conclusion that Britain is good at providing managers and people who write pot noodle jingles and in the current climate the author would agree that a future UK will rely more on the services sector, leaving industrial countries such as Japan and Germany, who have not only maintained but developed their manufacturing base, to develop and manufacture high tech goods in future.

That said, it would seem that the desirable goal for the EU must be the development of new high tech industries or a high tech knowledge base since low wage economies may be able to enter the medium tech manufacturing sector more rapidly if these economies have sufficient R&D budgets to increase their technological basis. In 2004, this was recognized by Lee (2004) who suggested that In order to compete with technological economies which have 40% less salary costs than the USA, the USA KE will have to 'refine and expand, core knowledge, process knowledge and international knowledge' (Career, globalization and the knowledge economy) (Association for Asian Research, 1996).

However, for the EU to increase its share of the high tech sector, there would also need to be an increase in R&D spending, to somewhere near the 3% level agreed by the Lisbon treaty, which in 2004 was a mere 1.79% GDP in the UK; and across the EU as a whole from 2000-2004 R&D spending was static (Brinkley and Lee, 2006). Partnership schemes may help to bridge this gap, at least in certain sectors of the KE such as biotechnology, this would be the refinement and expansion of international knowledge according to Leon Lee. Many USA biotechnology companies have either collaborated financially and intellectually with UK companies or have opened UK offices, particularly in London and Scotland (Thuermer, 2003). It must be noted here that most commentators regard the biotechnology industry as a service KE rather than a manufacturing KE. It seems logical that future UK governments will encourage as much industrial R&D spending as possible since this will reduce the governments own financial input. Many of these companies are not actually spending R&D budgets within the university sector, instead they see the university as providing an educated workforce rather than a partnership of ideas, and many of the smaller high tech companies do not see R&D as being very important at all (Fagerberg, 2006). It is, therefore, possible that a significant proportion of the 3% EU R&D spending agreed in Lisbon in 2000 could be met, in future, by large high tech industries themselves but universities may have little involvement, apart from providing an educated workforce. On the other hand, if more university/private sector partnerships are forged but the bulk of R&D spending is due to the private sector partner, it seems likely that academic freedom will almost certainly be lost in the drive to market products and due to the economic commitment that private sector companies have to shareholders.

Government spending and academic freedom

To underpin the development of a UK KE, government direction has been given to the research councils. The Biotechnology and Biological Sciences Research Committee (BBSRC), which is possibly the major funding council in biological sciences, has for the past decade had a 'Young Entrepreneurs Scheme', designed to help scientists convert their research into a marketable product. This has led to scientific 'spin-off' companies in many UK cities which now have science parks. This scheme is, therefore, assisting scientists who want to become entrepreneurs achieve this aim and the development of the scientific products creates employment for employees with high knowledge capital (university science graduates). Schemes such as this may not exist in the future as research funding becomes more directed by government policy. The Warry report in 2006

(Increasing the Economic Impact of Research Councils) set out four major recommendations for research council funding. These include funding of areas in which the UK 'wishes to become world leaders such as Energy, creative industries and eScience.' The report also said that funding should also 'reflect nationally important strategic goals' and 'engage economic stakeholders.' This report therefore indicates that Research Council funding will be channeled towards the generation of economic wealth (engaging economic stakeholders) and may even be channeled in a very specific way in the direction of areas in which the UK 'wishes to become world leaders.' Rather than allay the fears of university academics who perceive an end to academic freedom, this report appears to echo these fears. Certain disciplines outside of the government wish list and even sub-disciplines within may find future funding of research via the research councils extremely difficult to obtain, thus a loss of academic freedom will occur by disassociation, since many innovative ideas or 'blue sky' thinking simply will not be funded. A recent commentary has also highlighted the current immediate application approach of scientific funding councils, using the Engineering and Physical Science Research Council as an example, the editorial highlights the requirement of including an impact statement of 'national importance' over a 10-50 year time scale (Nature, Cell Biology, 2012). Worse still, many core research areas may also be destroyed by lack of funding in favour of energy, creative industries or eScience. Schemes such as the Young Entrepreneurs Scheme may also have to be directed in certain areas of research and it is possible that such schemes will only exist in research areas regarded by the government as being key to the future economic prominence of the UK.

Readings (1996) has suggested that universities are no longer sure of their place in society as globalization has changed the very raison d'etre of the university and Michael Peters in 2004 has indicated a turnaround in the role of the university, suggesting that instead of shaping society and culture it is being shaped by society and culture and providing a tangible product-based service. Most UK universities now have central departments who manage and oversee commercialization and intellectual property with the sole purpose of driving academic endeavor to the market place. Very strict channeling of government spending will ensure that this type of education system will continue since it will provide increasing less room for disciplines outside of those earmarked for special attention.

Recommendation 33 of the Dearing report states that it is 'in the national interest' for government to encourage greater higher education partnerships with industry and a number of reports since Dearing has suggested ways in which this could be achieved. The Scottish Office Report of 1998 set out some of these mechanisms, using the term 'clustering' to describe the recognition and collaboration of business with academics who share common interests (Scottish Office, 1998). Although the report states the importance of 'maintaining academic principals' and is 'not intended to constrain academics freedom,' the reports recommendation of financial incentives for academics who take part suggests favoritism which in future may prevent many academics working in fields not recognized by clusters. The Aho report in 2006 also recognized the need for 'clustering' and the role of cluster co-ordinators for each sector (Creating an Innovative Europe, 2006). Although the concept of academic-driven economies seems favourable, so too is academic choice since free academic pursuit in all disciplines enriches humanity in many different ways other than simply development of a consumable product. Therefore, the development of a KE should not be to the detriment of academics who do not wish to have their research directed by government or the universities in which they are employed. A further concern, regarding the reports mentioned above, is that of compliance. What happens to those academics that do not have interests common to clusters or who have common interests but simply do not wish to be clustered? The question then is: Is academic freedom actually protected by university or government legislation and policy?

Protection of academic freedom

In a democracy the notion of prevention or inhibition of academic freedom is abhorrent to many, perceived as being a very short step towards the prevention of free speech for all citizens. In a 1937 paper, Fritz Veit compared academic freedom in the post Hitler (Weimar) government with the Hitler government and noted that in the Weimar Republic there were university professors but in the Hitler government these had become 'state officials' who encouraged and taught the practices of the state. Although it would be too Orwellian to suggest that the loss of academic freedom in future UK KE will be at a similar level, the point here is that loss of academic freedom can impact on all citizens, even citizens who may see academic freedom as an 'unjust privilege' (discussed in Neave, 2002). Nevertheless, the 2007 Scottish Parliament manifesto (Universities-Knowledge for Scotland) raised a concern over the initial draft of the Bill on Terrorism proposed by the Westminster government. The initial draft (as stated by the Scottish parliament manifesto) included the criminalization of 'legitimate academic teaching, study and research such as Chemistry.' Even librarians were mentioned as a possible source of literature deemed to be of use to terrorists. In the Manifesto, the Scottish parliament requested that all political parties ensure that such measures will not be imposed on Scotland by Westminster and it must be of concern to most academics that in the UK we have legislation in place

which can be used to prevent academic freedom but not to safeguard it, as will be discussed below.

The Magna Charta (Bologna Charta) was signed by 500 EU universities in 1988. This Charta was designed to instill a framework of parity between universities included in an expanding EU and highlighted the importance of academic freedom as a fundamental university requirement. However, Donald Braben has recently argued that many countries have taken steps to erode academic autonomy and that university autonomy in the UK began to be eroded as early as 1963 with the transfer of the universities grants council from the Treasury to the Department of Education. The UCG was eventually replaced in 1989 by the University Funding Council which Braben describes as an 'explicit instrument of government' (Scientific Freedom, 2008). Therefore, the way in which public money was spent by universities now came under much more stringent government control and, although, institutional autonomy is different to academic freedom the loss of institutional autonomy may severely impact on academic freedom if institutes pressurize academics to follow certain areas of study which are imposed upon the institutes themselves by government.

A recent analysis of the protection of academic freedom in 23 EU states has also shown large diversion from the Bologna agreement (Karran, 2008). In this study academic freedom is measured by five parameters. These parameters refer to legislative processes and governance rather than direct academic freedom. These are: (i) Constitutional protection; (ii) Specific legislative protection; (iii) Self-governance; (iv) Appointment of rectors; (v) Academic tenure. Some of these refer to institutional protection rather than academic freedom but as previously stated this may still have significant bearing. By these measurements the UK actually performs very poorly with no constitutional protection and very low protection in all other parameters, and the last of these parameters (academic tenure) is particularly important to discussion of academic freedom and KE. In 1988 the conservative government launched the Education Reform Act which stated that universities could dismiss academic staff by redundancy and redundancy was explained not only in terms of the institute (example, closure of a department because there was no longer a student interest in a particular discipline) but also in terms of an individual. The university now had the power to make an individual redundant (if their contract was post 1987) if the role in which they were appointed was diminished or ceased or was likely to do so or be so in future. In this environment academic employment could be jeopardised if academics refuse to accept programmes of study imposed by the academic institute. Similarly institutes could impose these programmes via performance review. Academics who refuse to accept government/institute controlled research direction would then be failing in their performance.

Another reason for dismissal in the post 1987 contract is 'good cause.' This is a fairly ambiguous statement and could be applied to academics who do not achieve sufficient funding (in the case of an academic who does not wish to be 'clustered'), since many academic appointments, at least, in Science are made on the ability to obtain grants, which may change over time as trends in strategic funding change. This would also likely be highlighted via performance review.

Therefore, future UK governments may prevent academic freedom not by introducing direct legislation which would insult democracy but by a simple lack of funding in areas which are not regarded as being 'in the national interest' and also by the rigorous pursuit of targets. The latter will ensure that future funding will only be obtained if very structured targets are achieved by previous awards. This will create a new style of academic who will be product driven, 'the corporate academic'. This should not be as difficult to achieve as it once was since all university students (and their parents) face the burden of tuition fees and do ask the question, 'what are we getting for our money?' In this product driven environment, it may be easier to direct future scientists and engineers into a corporate way of thinking in which the team (the university academic and the industry) both strive with equal passion to achieve the same goal, a saleable product. The incentive to a newly qualified graduate could be a guaranteed means of paying off their students' debt, which in future will almost certainly be proportionately much greater than it is now. This would of course be in total opposition to the idea of knowledge for knowledge sake and discovery for all, which most people would regard as an essential role of academia.

The emergence of 'Corporate Universities' could also impact severely on academic freedom. Neave (2002) argued that corporate universities are 'marginal to the mainstream enterprise of higher learning' (Academic Freedom in an Age of Globalization, 2010) and since academic freedom does not exist in most private corporations why should it exist in corporate universities? It would seem obvious that academics who seek employment in corporate universities have already resigned themselves to losing academic freedom and are already 'corporate academics'. In the UK, companies also exist which supply a branded corporate university for industry. The university in essence does not exist because degrees (although completely tailored to the needs of the industry) are delivered in partnership with a number of post 1992 universities and also with some large 'Russell group' universities. To what extent corporate channeling of courses occurs in this case is unknown but it could be suggested that the revenue generated by universities which agree to these schemes would place the industrial customer in a key bargaining position regarding factors such as course content. Corporate interference in academic areas such as course development, specific learning objectives and outcomes

would signal a very significant advancement in the erosion of academic freedom and there may be little will by economy driven institutes to counteract such change. The university would once again be a paid service provider but instead of providing contract research (as discussed earlier) it would provide contract teaching. The degree therefore would become highly specific to the company rather than the academic discipline and the value of the degree (outside of its company-specific worth) could also be questioned, since company-specific teaching would hinder the development of many transferable skills and the ability of students to develop the next generation of essential ideas. Students would be taught only to 'think in the box.'

FACTORS WHICH MAY PREVENT FURTHER DEVELOPMENT OF A UK KE (A WISE SKEPTICISM IS THE FIRST ATTRIBUTE OF A GOOD CRITIC)

In 1953 James Reeves used the famous quote by James Russell Lowell: 'A wise skepticism is the first attribute of a good critic' to describe his own pragmatic view of literature (The Critical Sense, 1956). The author would like to apply the same rationale and suggest that we would be wise to be skeptical regarding the development of a future UK KE, or at least a KE which is very different to the one we already have in the UK.

In the UK, the Labour Government drove many initiatives for the development of a UK KE, as mentioned in the first section; however, in many ways they undertook this half-heartedly. Andrew Donahue (2006) reported a speech by John Woodget, Managing Director of Intel UK, in which Woodget gave the example of the scrapping of the home computing service (HCI) as evidence of government failure. The HCI allowed the public and private sector to loan computers to staff tax free. Woodget stated that since the abolition of the tax break it will now cost companies around £200 per computer to loan to employees (Woodget, Luddite Government Slows UK Knowledge Economy). This seems to be completely at odds with the development of an information and communications technology (ICT)-based KE and one study in 2003 has previously highlighted the poor state of ICT in the UK. The UK is not within the top 15 countries which access the internet or even have home computers (Fagerberg, 2006). Another example of the half-hearted government approach to the development of a UK KE is in R&D spending and the failure to increase UK R&D spending to anything like the 3% level agreed in Lisbon. A radical re-evaluation of the importance of R&D is needed if new technologies developed by universities are to be translated into manufacturing and, as previously stated, this rethink needs to include companies that currently do not recognize R&D as being important. A UK KE may actually be predominantly driven by business itself rather than government, but if this occurs we may develop a KE with a very short term, insular view, which will benefit individual businesses and not necessarily the UK as a whole. To develop a diverse UK KE which has future mileage we need government foresight and management to recognize long term goals which produce long term benefit for the UK and EU. This will not only include greater direction but also greater amounts of public money. The fact that, in the UK, the emerging KE is rarely debated in mainstream media suggests that the government does not regard the use of significant amounts of public money in the development of a UK KE as being a vote winner; otherwise it would be much more fervent in getting the message across as it does concerning the national health service and primary and secondary school education. However, currently in the UK, there is a great deal of political rhetoric by the conservative/liberal coalition government, promoting the expansion of small to medium enterprises which will provide employment and many of these will be high tech university spin out companies. The Irony of this is that there is an almost constant, parallel political and media debate regarding the lack of will of the banking sector to support such companies, having been directed by the bank of England to build up an economic 'war chest.' The UK coalition government initiated a funding for lending scheme to increase lending by banks to business. The scheme became active in July 2012 but by the end of March 2013 bank lending fell by £300 million, although a number of banks had received significant funding from the scheme (Bank of England, 2013).

One obvious way in which the development of a more diverse UK KE may be prevented in future is by globalization itself. Globalization has exposed industry to cheaper labour costs and this has been a significant driving force in the development of KEs in industrialized countries; but why should we expect this trend to change when a KE is developed? It seems reasonable to suggest that if the development of a future UK KE in the industrial sector occurs it will need to be protected in two areas. Firstly, government involvement needs to protect any new inventions via patents which will ensure that government will at least obtain wealth from inventions which drive industrial sectors of the KE and, presumably, continue to do so even if the manufacturer relocates out of the UK. However, the government drive towards KE is also concerned with employment for UK citizens. Therefore, there would need to be some governmental control to actually prevent future KE sectors leaving the UK in favour of cheaper work forces abroad. The only way that this can be achieved is by government owning, or holding a very large stake in, any new technology which may have originally been developed via university knowledge. The reliance on business to fund a KE (or the majority of it) will obviously mean the drive for best return. In a globalized economy it is unlikely that venture capitalists will provide major funding with the knowledge

that they will be prevented from obtaining a greater return (example, by being prevented from relocating and keeping down labour costs).

The future UK KE will, therefore, most likely be service sector based with little UK owned technological design or manufacturing occurring in the UK. The KE may largely be driven and directed by business itself. Therefore, future UK KE may not be very much different to the current KE but during its development academic freedom may be eroded even further with the majority stake in the KE being owned by business rather than government. In this scenario, the potential loss of academic freedom will actually be to the detriment of the KE and the future of those businesses which will run it. We need to encourage free thinkers, academics who have the ability and economic resource to attempt non-mainstream research and who encourage their undergraduates to do the same. Likewise, we need to give graduates the academic (and financial) tools to be able to continue this process within the industries in which they are employed, or else have a user friendly framework in which graduates may develop spin-out companies and become employers within the UK.

The requirements for good translational research have previously been discussed by Donald Braben who was funded in part by British Petroleum's venture research unit. Braben argues that the catalyst for the achievements of this unit was almost complete autonomy to follow whatever pathways he and others, funded by the unit, chose. The research was derived, managed and performed by the scientists themselves. This unit closed after 10 years, not because of a lack of success but the perception of shareholders that BP may be neglecting core business. Braben (2008) states that: - 'All too often, understanding is being sacrificed in favour of tangible objectives' (Scientific Freedom). Unfortunately for a KE which restricts academic freedom there will come a point at which our lack of understanding of scientific disciplines will prevent the development of future 'tangible objectives'.

However, the future funding of industrial units, such as BP's venture research unit will most likely be hampered by similar concerns to share-holders.

Huxley (1964) describes the Robbins report of 1963 as a disaster due to its 'extension and reorganization' of higher education. Therefore, one must assume that educational reforms since 1988 would have been inconceivable to Huxley who regarded discovery and the dissemination of knowledge as being fundamental to the evolution of the human species. Huxley was of course an eminent evolutionary biologist and was attempting to answer the question of human evolution by inferring that humans may no longer evolve physically but that the human brain is the most potent vehicle by which humans have evolved and will continue to evolve in future. He captures his belief in one eloquent sentence:

'For me education is an organ of man in society, whose basic function is to ensure the continuity and further advance of the evolutionary process on earth by transmission and transformation of tradition' (Essays of a Humanist, 1964).

In agreement with Huxley (and Braben), it is suggested that a KE which inhibits academic freedom will not evolve and will not survive to produce future KEs; it will simply copy the technological achievements of others and by doing so will eventually become extinct.

REFERENCES

Aho E (2006). Creating an Innovative Europe. Report of the independent expert group on R&D and innovation appointed following the Hampton court summit and chaired by Mr Esko Aho. EU Publications office.

Bank of England (2013). Funding for Lending Scheme – Usage and lending data. Accessed June 4th 2013.

Braben D (2008). Scientific Freedom: The Elixir of Civilization (Wiley, UK)

Brinkley I, Lee N (2006). The knowledge economy in Europe. The work Foundation. London.

Brinkley I (2010). Knowledge Economy Strategy 2020. The work foundation. Accessed July 2nd 2012.

Confederation of British Industries bulletin (July 2012). Manufacturing orders and output growth steady. Accessed July 26th 2012.

Donahue A (2006). Government 'hindering knowledge economy.' ZDNet.co.uk.

Department of Trade and Industry (1998). Our Competitive Future: Building the Knowledge Driven Economy CM 4176, Department of Trade and Industry (The Stationery Office, London).

Julian H (1964). Essays of a humanist (1964) reprinted 1966, 1969, 1992: ISBN 0-87975-778-7.

Economic and Social Research Council (ESRC) (2007). Knowledge economy in the UK.

Education Reform Act (1988). Office of Public Sector Information.

Elliot L, Atkinson D (2007). Fantasy Island. (Constable. UK)

Europa (2000). Activities of the European Union, summaries of legislation. The Lisbon Special European Council (March 2000): Towards a Europe of Innovation and Knowledge. europa.eu/scadplus/leg/en/cha/c10241.htm

Fagerberg J (2006). Innovation, technology and the global knowledge economy: Challenges for future growth. Paper prepared for the 'green roads to growth' project and conference. Copenhagen March 1-2, 2006. imv.net.dynamicweb.dk/Admin/Public/DWSDownload.aspx?File=Files%2FFiler%2FRapporter%2FGG%2FGG_IMV_310806.pdf

Institute For Manufacturing (IMF) (2004). A future without manufacturing? www.ifm.eng.cam.ac.uk/service/cmr/04cmrautumn/future.html

Increasing the Economic Impact of Research Councils (2006). Research Council Economic Impact Group.

Karran T (2008). Academic Freedom in Europe: A Preliminary Comparative Analysis. Higher Educ. Pol. 20: 289–313.

Lee LZ (2004). Career, globalization and the knowledge economy. www.asianresearch.org/articles/1843.html

Mandelson P (2005). Strengthening the Lisbon Strategy: the Contribution of External Trade to Growth and Competitiveness in Europe.

Moriarty P (2008). Times Higher Education. Sept.

Nature Cell Biology (2012). Editorial comment. Science funding: championing research in tough times. 14: 439.

Neave G (2002). Academic Freedom in an age of Globilization. Higher Educ. Pol. 15: 331-335.

Office For National Statistics. Bulletin (July 2012). Accessed July 26th 2012.

Peters M (2004). Higher Education, Globalization and the Knowledge Economy, in M. Walker and J. Nixon (Eds) Reclaiming Universities from a Runaway World. Meaidenhead: SRHE/Open University Press.

Readings B (1996). The University in Ruins. Cambridge, Mass and London: Harvard University Press.
Reeves J (1956). The Critical Sense: Practical Criticism of Prose and Poetry. Heinmann Education Books (London).
Report of the National Committee of Inquiry into Higher Education. (1997).
Science and Innovation Investment Framework 2004–2014 (HM Treasury, London, 2004); not cited
Scottish Office (1998). Scotland: Towards the Knowledge Economy.
James R (1956). The Critical Sense: practical criticism of prose and poetry.
Thuermer K (2003). UK Gears Up for Additional High-Tech Growth. Expansion Management.com (eMagazine). www.expansionmanagement.com/cmd/articledetail/articleid/15821/default.asp
Turner D (2012). Higher education: Centre stage or in the wings of the knowledge economy-A review essay. Int. J. Edu. Dev. 32: 835-857.
Universities-Knowledge for Scotland (2007). A manifesto for the Scottish Parliament Election. www.ucu.org.uk/media/pdf/2/5/ucuscotlandmanifesto_dec06_1.pdf
Universities UK/University of Strathclyde.London (2006). The economic impact of UK higher education institutions. www.universitiesuk.ac.uk/Publications/Bookshop/Documents/economicimpact3.pdf
Veit F (1937). Academic Freedom in Germany before and after 1933 "Under the Republic of Weimar and under Hitler." Peabody J. Educ. 15: 36-44
Vogt T, Baird D, Robinson C (2007). Nature Nanotech 2: 329–332.
Wilson R (2008). Electronics weekly. Analysis: Manufacturing is essential for skills. www.electronicsweekly.com/Articles/2008/02/20/43176/analysis-manufacturing-is-essential-for-skills.htm.

.