

Knowledge management systems and open innovation in second tier UK universities

Ian Chaston
CENTRUM Catolica University, Lima, Peru

The purpose of this paper is to examine the performance of second tier UK universities in relation to the effectiveness of their knowledge management systems and involvement in open innovation. Data were acquired using a mail survey of academic staff in social science and business faculties in second tier institutions. The results indicate that certain key factors influence the effectiveness of knowledge management systems. Universities engaged in open innovation appear to have developed more effective systems. It is concluded that universities seeking to survive in the face of government spending cuts could benefit from optimising the effectiveness of their knowledge management systems and giving greater emphasis to the acquisition of new knowledge by exploiting open innovation.

Keywords: universities, funding, knowledge management systems, open innovation

Introduction

One consequence of Western governments facing increasing problems funding public sector service is the university sector has faced either a freeze or reduction in government financing (Lundsgaard & Turner 2004). In the UK, the 2008/09 recession which followed the global banking crisis has caused the Government to reduce significantly the level of student funding made available by the Higher Education Funding Council for England and to permit an increase in the level of student fees from £3,290 to a maximum of £9,000 in 2012.

In an increasingly volatile world, organisational performance can often be enhanced by the exploitation of new knowledge (Goh 2002). Drucker (1985 a, b) posited that survival of organisations in turbulent times will be higher among those which exploit innovation to sustain performance. One possible approach for responding to public sector funding problems is to place greater emphasis on innovation as the basis for developing new service propositions or enhancing organisational productivity (Chaston 2011). The purpose of this paper is to examine the validity of this perspective in relation to the UK university sector by examining knowledge management and innovation practices within these institutions.

University funding

By the 1990s many governments began to freeze or reduce the level of funds being made available to higher education (HE) institutions (McPherson et al. 1989). Many universities responded by slowing their rates of spending and, where permitted, increased the share of costs borne by students by raising tuition fees. In Australia and New Zealand, as government funding decreased, universities attempted to improve productivity to close their funding gap and greatly expanded their efforts to attract more overseas students (Scott 2003).

Australian and New Zealand governments also created a student loan scheme for their domestic students (Dobson 2001). Within Europe, there has remained a more embedded philosophy that young people should continue to be provided with free university education. In the UK in the 1990s, however, the government decided that to sustain the delivery of a high quality learning experience (Johnes & Johnes 1994), it was necessary to introduce student fees (Peters 1999). By the 21st century more nations wishing to create a skilled and educated workforce to sustain economic growth have accepted a 'study now, pay later' funding philosophy (Lundsgaard & Turner 2004).

In the UK Lord Browne recommended a lifting of the cap on student fees (Browne 2010). English universities were permitted to increase student fees up to a maximum of £9,000. A key factor influencing this decision was that, following the 2008 banking crisis and subsequent recession, reduction of the UK public sector deficit required a drastic reduction in university funding via the Higher Education Funding Council for England.

University reform

Even before the UK Government's recent actions over increasing student fees, policy initiatives had been introduced with the aim of enhancing productivity and reducing operational costs with the HE sector. A common thread associated with these policies has been the use of New Public Management philosophies which emulate commercial market systems through state-induced competition (Chaston 2011). To achieve this aim, there has been heavy reliance upon indicator-based performance assessment models (Orr et al. 2007). A number of key performance indicators (KPIs) now exist in the university sector. Examples include profiling student recruitment, course quality assessments, monitoring course completion rates and measuring employment outcomes following graduation. However, in assessing the benefits associated with the provision of more data

to assist in the management of change, Todnem et al. (2008: 21) concluded that, in relation to the HE sector in Europe,

audit culture and managerialism have created an environment that encourages opportunistic behaviour such as cronyism, rent-seeking and the rise of organisational psychopaths. This development will arguably not only lead to a waste of resources, change for the sake of change, further centralization, formalization and bureaucratization but, also, to a disheartened and exploited workforce, and political and short-term decision-making.

The performance assessment indicator which has possibly received greatest attention in the literature is the Research Assessment Exercise, first introduced in the UK and subsequently in Australia and New Zealand. The key justification for the RAE indicator was that this assessed whether universities were sustaining a knowledge ethos. Heald and Geaghan (1994) suggested the assessment system reflected a government desire to expand outputs without increasing financial inputs. The estimated incremental cost of conducting the RAEs was £27m to £37m being spent on the 1996 UK RAE (Ball & Butler 2004).

Taylor (2001) suggested that research assessment exercises resulted in a strengthening of the 'publish or perish' ethos to the detriment of teaching quality. Craig (2002) noted the RAEs changed career expectations and lowered morale among those academics whose primary job satisfaction is teaching. Ball and Butler suggested that some Vice Chancellors' commitment, especially in the second tier institutions, to upgrading their research activities was motivated by a wish for higher personal prestige.

Cutt et al. (1993) considered that where research is given priority this can have a detrimental impact on teaching quality. This effect can arise because resources are withdrawn from teaching by university management willing to accept a 'satisfactory' rating in the place of excellence in teaching as an appropriate strategic goal. Concern about

a possible decline in teaching standards caused Mathews (2007: 238) in his assessment of RAE outcomes in Australia to propose that:

perhaps we would be better served, in whatever country we reside, by re-thinking whether our universities should all seek to emulate the prestigious, sandstone universities and be research powerhouses. Should the newer universities have different charters? Should there be a more diverse set of expectations regarding the performance of academics within our university systems?

Knowledge management

In an increasingly complex and volatile world, newly appointed senior managers are unable to fulfil their role in ensuring performance goals are being met unless systems exist within the organisation that permit the creation and transfer of knowledge (Nonaka 1994). The existence of effective knowledge management systems has become a critical factor in determining organisational performance. Chaston (2004), Blumentritt and Johnston (1999) and Smith et al. (2009) concluded that where new knowledge is required, the greater is the need for effective information utilisation inside the organisation. The need for new information is especially important within knowledge-intensive sectors (Merona et al. 2007).

The effectiveness of knowledge management systems is dependent upon the willingness of managers and employees to work together, sharing key knowledge of mutual benefit (Goh 2002). Interaction aimed at providing and obtaining knowledge is usually accompanied by higher organisational performance (Jones & Crompton 2009). Barriers to implementing knowledge management are usually people related (Ruggles 1998).

Most studies undertaken in this area have been qualitative (e.g. Liebowitz & Chen 2003; Wiig 2002), reducing the researcher's ability to empirically determine which factors are critical in creating

effective knowledge management systems (Beesley & Cooper 2008; *Syed-Ikhsan & Rowland* 2004). Wong and Aspinall (2004) used both qualitative and quantitative data as the basis for identifying the Critical Success Factors (CSFs) influencing knowledge management programs within organisations. They concluded that successful knowledge management requires proactive leadership from top management committed to exploiting innovation to sustain performance.

Taylor and Wright (2004) examined knowledge management practices in the UK's National Health Service. They identified the three key variables influencing process: (i) 'organisational climate' which reflects the organisational culture based upon open leadership and a willingness to learn from mistakes, (ii) 'infrastructure and process' which is determined by the quality of information and a performance orientation, and (iii) strategy implementation which involves the existence of a strategic vision and workforce satisfaction.

In view of the importance of effective knowledge management systems and in light of questions raised in the literature concerning the adequacy of a KPI philosophy with emphasis on research outcomes for assessing performance in the HE sector, an aim of this research study is to examine the current state of knowledge management systems within UK universities. Specific objectives of the study are to utilise the *Taylor and Wright* (2004) knowledge management model to assess the following hypotheses:

- H1: Prevailing organisational climate influences the effectiveness of knowledge management in universities.
- H2: Prevailing infrastructure and processes influence the effectiveness of knowledge management in universities.
- H3: Prevailing strategy implementation influences the effectiveness of knowledge management in universities.

H4: Highly effective knowledge management systems exist in universities.

Open innovation

Drucker (1985a , b) posited that a key attribute of successful managers in both private and public sector organisations is their ability to exploit innovation to provide an effective response to significant external environmental change such as an economic downturn. The importance of innovation has been validated by studies of private sector organisations which survive recessions (Gilbert 1990; Ghemwar 1993; Trott 1998). The ongoing validity of this viewpoint has recently been endorsed by a survey of chief executive officers of major businesses conducted by IBM (2008). Innovation is also critical in service sector organisations (Lin & Chen 2007). The activity is often orientated towards the enhancement of internal organisational processes and development of new products (Freel 2006; Tanabe & Watanbe 2005; Hine & Rynan 1999).

The traditional approach to innovation in most organisations is to retain ownership and confidentiality of proprietary knowledge by using a closed innovation approach. Chesbrough (2003), who coined the phrase ‘open innovation’, concluded that some organisations, especially in the private sector, have now moved towards collaborating with external organisations to achieve competitive advantage. Huang et al. (2010) posited that open innovation enables organisations to achieve improved value-added outcomes.

Not all organisations apply the same approach in involvement in openness (Chesbrough 2007). Christensen et al. (2005) argue that organisations manage open innovation in different ways depending on (i) their position in the innovation system, (ii) the stage of product/service maturity and (iii) the scale of the value proposition. A characteristic of open innovation is that the process does not necessarily take place within the boundaries of the organisation

(Lichtenthaler 2008). Elmquist et al. (2009) proposed open innovation is influenced by the number of partners involved and an internal versus external focus. Although open innovation can provide access to a larger pool of ideas, the costs can be considerable, practical problems over intellectual property ownership can arise and lack of trust may frustrate achievement of optimal project outcomes (Birkinshaw et al. 2011). National and corporate cultures influence the willingness to engage in open innovation (Lundvall 1998). Gerard et al. (2009) concluded the two most critical factors influencing successful collaborative innovation were corporate culture and the scale of investment undertaken to maximise the expertise of an organisation's own workforce.

Successive UK governments have sought to 'bridge the gap' between academia and business (Lee 2005). Perkmann and Walsh (2007) concluded that these actions have increased open innovation between industry and universities in the development of new products and industrial processes. Malik et al. (2011) noted that university-industry relationships are now much more common in many European countries and these activities are perceived as increasingly important in the sustaining of national economic growth.

Mohannak (2007), Moensted (2010) and Ojala and Tyrvained (2009) posited that the creation of knowledge management systems which encompass involvement in collaborative activities is critical for effectively managing changing market environments. Wiklund and Shepherd (2002) concur with this view. The research of Camison and Villar-Lopez (2010) and Palacios et al. (2009) indicated an ability to access new knowledge is a key influencer of market performance. Leidner (2000) proposed the highest priority should be given to the acquisition and exploitation of knowledge when organisations are engaged in innovation. Chen et al. (2006) determined that, where knowledge management systems are reliant upon acquiring knowledge from external sources, the effectiveness of such systems

enhances the capability of service providers to respond rapidly to changing external environments. Bate and Robert (2002) reached a similar opinion in relation to the use of knowledge management in the public sector.

These various observations provide the basis for the following hypothesis, namely:

H5: Universities engaged in open innovation will have established more effective knowledge management systems.

Methodology

A focus group was carried out involving academics from both the older, established institutions and second tier universities. Academics from the former institutions felt there had been few, really fundamental, strategic changes as a consequence of the RAE. In contrast, academics from the second tier colleges reported that the advent of performance indicators had significantly altered strategies, policies and working conditions. Hence, in order to reduce the impact of inter-organisational variance complicating data analysis, it was decided to restrict the research to assessing views of academics from second tier universities.

Response rates tend to be higher among individuals who are familiar with the topic and terminology being used in a research study. Hence the sample frame was limited to academics from social science or business faculties. A sample frame of 500 academics was constructed by selecting individuals from the data provided on institutions' websites. Prior to the mailing of a survey, a small-scale pilot study involving 25 academics was undertaken.

In relation to an assessment of knowledge management practices, the survey design is based upon the methodology validated by Taylor and Wright (2008). Their approach involves asking 27 questions to assess the factors influencing perceptions of knowledge management

processes. Respondents are provided with a five-point scale ranging from 'very strongly disagree' through to 'very strongly agree' in relation to each of the questions. Overall system effectiveness is based upon the overall mean for these 27 questions.

Lazzarotti et al. (2010) have validated a scale on open innovation. It was decided to use their scale in this current study. The scale uses the following factors to calculate an overall mean to provide an indication of the level of open innovation:

- Three items which assess the use of open innovation to extend skills, competences and creativity.
- Two items which assess the aims of sharing risks and costs.
- Five items which assess the organisation's level of orientation towards involvement in innovation.
- Five items which assess managerial and organisational behaviour.

Results

The total of useable surveys received was 138, a response rate of 27.6% percent. Cronbach's alphas were calculated to assess reliability of the 27 measurement variables used to assess aspects of management system effectiveness. In all cases the values were greater than 0.70 which is the lowest limit for acceptance of reliability for each variable (Hair et al. 1998). Hence all variables were used in a multiple regression analysis. The results are summarised in Table 1. All six factors were significant at $p < 0.05$ in relation to the dependent variable of knowledge management effectiveness. The overall mean for all variables, which provides an assessment of overall system effectiveness, was 2.43.

Table 1: Regression of factors in relation to the dependent variable of knowledge management effectiveness

Factor	Beta	T	Significance	
Open leadership	0.415	6.912	0.00	
Quality of information	0.215	3.121	0.00	
Workforce satisfaction	0.201	2.991	0.00	
Learning from mistakes	0.196	2.834	0.02	
Vision	0.114	1.731	0.03	
Performance orientation	0.119	1.572	0.04	
Analysis of variance				
	Sum of Squares	Mean Square F	Significance	
Regression	101.11	16.89	14.32	0.00

To assess reliability of the 15 multiple measurement variables associated with assessing open innovation, Cronbach's alphas were calculated. All values were greater than 0.70. Hence all variables could be used to calculate the overall mean for involvement in open innovation that was utilised in subsequent statistical analysis. The respective mean scores for extending skills, competences and creativity, sharing risks and costs, level of technological aggressiveness and managerial, and organisational and behaviour were 2.13, 1.82, 2.07 and 2.18 respectively. This yielded an overall mean score for involvement in open innovation of 2.05. A regression analysis of involvement in open innovation and knowledge system effectiveness was statistically significant at $p < 0.05$ (adjusted $R^2 = 0.31$; $F = 3.65$; $t = 1.98$).

Conclusions

Taylor and Wright (2008) posit that the key factors influencing the effectiveness of the knowledge management process are

organisational climate, structure and process, and strategy implementation. As summarised in Table 1, a statistically significant relationship at $p < 0.05$ was found between effective knowledge management and the variables of open leadership and quality of information. Hence it seems reasonable to suggest that these results support the validity of hypothesis H1; namely, that prevailing organisational climate influences the effectiveness of knowledge management in universities.

Also as shown in Table 1, a statistically significant relationship at $p < 0.05$ was found between effective knowledge management and the variables of workforce satisfaction and learning from mistakes. This suggests it is seems reasonable to conclude that these results support the validity of hypothesis H2; namely, that prevailing infrastructure and processes influence the effectiveness of knowledge management in universities. Finally, as also shown in Table 1, a statistically significant relationship at $p < 0.05$ was found between effective knowledge management and the variables of vision and performance orientation. Thus it seems reasonable to suggest that these results support the validity of hypothesis H3; namely, that prevailing strategy implementation influences the effectiveness of knowledge management in universities.

The reported value for overall knowledge system effectiveness at 2.05 is somewhat below the 3.0 mid-point of the measurement scale utilised. This result would suggest that, on average, management knowledge systems are not well developed in this UK university sector. In view of this outcome, it seems reasonable to suggest that this study was unable to validate hypothesis H4; namely, that highly effective knowledge management systems exist in universities. Most published studies of public sector system effectiveness tend to be qualitative in nature (Chaston 2011). This means that any comparison of results from this current study with previously published outcomes is virtually impossible. Nevertheless, it can be noted that

congruence of opinion exists in relation to a qualitative examination of systems within the HE sector undertaken by Loudior et al. (2008). They concluded that, despite colleges being knowledge intensive organisations, systems for supporting management processes in relation to involvement in teaching and research are usually poorly developed. As a consequence, they believe universities are not exploiting the opportunities offered by knowledge management systems to undertake strategic planning activities such as Value Stream Analysis which could assist decision-making with respect to optimising an institution's future service provision portfolio.

Collaborative learning is a measure of the degree to which firms utilise new knowledge as the basis for evolving innovative solutions capable of sustaining market performance. The regression analysis of involvement in open innovation and knowledge management system effectiveness was statistically significant at $p < 0.05$. This outcome indicates the likelihood of universities which are more involved in open innovation will have evolved a more effective knowledge management system to assist in collaboration with external parties to acquire new knowledge. On the basis of this result it seems reasonable to propose this research supports hypothesis H5; namely, that universities engaged in open innovation will have established more effective knowledge management systems. This finding is congruent with an earlier conclusion by Chaston (2011). He proposed that, in the face of difficult market conditions, public sector organisations can be expected to place greater reliance upon systems that support the effective accessing and exploiting of new knowledge. Furthermore, collaboration is of little benefit unless internal systems exist which permit the effective interchange of knowledge between managers and employees inside the organisation (Goh 2002).

Discussion and further research

Zanra and Pearce (1990) considered that there is often a significant time lag between the adoption of a new strategy and a resultant observed change in organisational performance. In view of this situation, they suggested that merely examining the nature of environments confronting organisations at a single point in time may often lead to inconclusive results when seeking to align a strategy with a specific performance outcome. To avoid this problem, they recommend researchers undertake longitudinal studies measuring performance in relation to strategy of a period of several years. Hence this current study could be further enhanced by a longitudinal project to assess UK university performance following an upturn in economic conditions and the introduction of higher student fees in 2012.

Another methodology issue raised by Charhi (2000) is that many public sector organisations are often multi-departmental entities in which variation in managerial processes being utilised will be encountered. She suggests this variation can cause problems in assessing overall organisational performance in relation to factors influencing strategic outcomes. For example, the identified overall strategy used by most departments within an organisation may be very conservative, with only a minority of departments whose behaviour is innovative contributing to any improvement in organisational performance. However, as the minority component within the organisation, although activities of this latter group are the cause of improved performance, their existence in the survey data will be masked by the fact that the majority of departments are exhibiting a more conservative managerial orientation. Hence there is the need for further research to determine the degree to which inter-departmental variation in managerial behaviour can be identified within HE institutions.

The focus of this study was on second tier universities in the UK. This is a country which faces the problem of needing to reduce

a much larger public sector deficit than some other developed national economies. Hence there is the need to research whether the conclusions of this study are equally valid in relation to the performance of publicly funded universities in those countries facing smaller public deficit problems.

The near-term actions required by the UK Government to reduce the nation's massive public sector deficit means that all publicly funded organisations can expect to face either frozen or reduced annual budgets over the next few years. Hence there is a requirement for further research concerning organisations elsewhere in the UK public service sector. The aim would be to determine whether conclusions reached in this study about knowledge systems and open innovation are also applicable to these other organisations.

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About the author

Ian Chaston is currently a Visiting Professor in Marketing and Entrepreneurship at Centrum Catolica in Peru. His primary research interests are entrepreneurship, marketing, public sector management and small business management. Prior to this appointment, he was based in the University of Plymouth UK Business where the primary focus of his educational research was the development and delivery of the University's distance learning programs.

Contact details

CENTRUM Catolica, Av.
Email: ichaston@pucp.edu.pe