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An Investigation into Different Approaches to University Business Partnerships in the UK

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ABSTRACT
This study investigates different approaches to University business partnerships in the United Kingdom (UK). The research documents links universities have with companies in terms of industrial research, knowledge transfer, and other forms of external collaborative partnerships, and what these links are. The objectives of the paper are to provide accurate information on university business partnerships for business professionals, industrial policymakers, management students, researchers, and academicians. The research was carried out in three stages including i) the nature of university business partnerships, ii) an overview of the university/business inter-organizational relationship, and iii) university-industry relationships and the different approaches to university business partnerships. Comparison is made between universities in order to benchmark and assess "good/best practice" and potential barriers. Investigation of the commercialization of Intellectual Property (IP) is undertaken with insights for improvements. Recommendations to improve the management of university knowledge transfer are given.

Keywords: benchmarking; university; business; partnerships; knowledge transfer.

INTRODUCTION

This paper investigates the general understanding of the links universities have with companies in terms of industrial research and other forms of external collaborative partnerships, and what these links are. Here external collaborative partnerships 'are partnerships where the achievement of … outcomes … are dependent on the arrangements made between organisations' (UoK, 2022). This has involved a small comparative study of universities in the UK including "old" and "new" institutions. Comparison has been made between universities in order to assess "good/best practice" and potential barriers. "Good practice" can be defined as a practice that has been proven to work well and produce good results, and is therefore recommended as a model' (FAO, 2024). "Best practice" is a standard or set of guidelines that is known to produce good outcomes if followed' (Tech Target, 2024). The paper seeks to answer the research question 'What are the typical approaches to university business partnerships in the UK?' The objectives of the paper are to provide accurate information on university business partnerships for business professionals, industrial policymakers, management students, researchers, and academicians. Several university business partnerships have been identified previously by the Association for University Research and Industry Links (AURIL) (2001) (Figure 1).

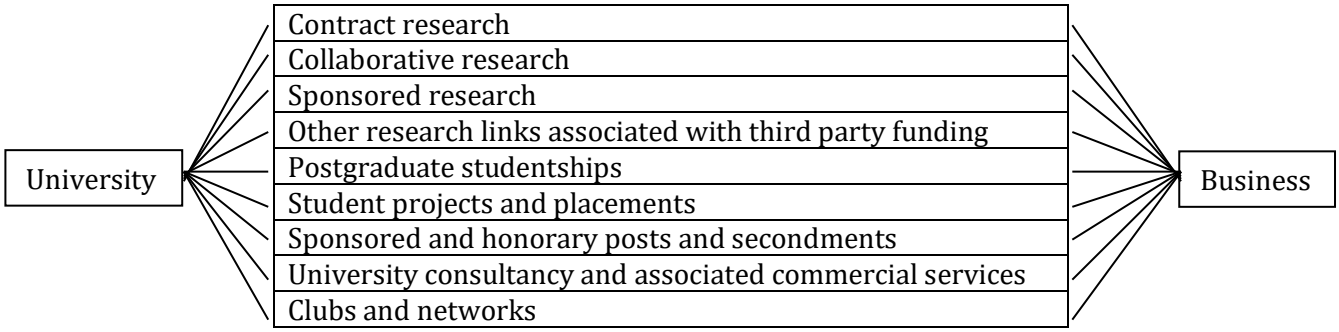

FIGURE 1: AURIL Model of University Business Partnerships.
Source: AURIL, 2001.

In comparison with this university business partnerships investigated in this research are illustrated in the model depicted in Figure 2.

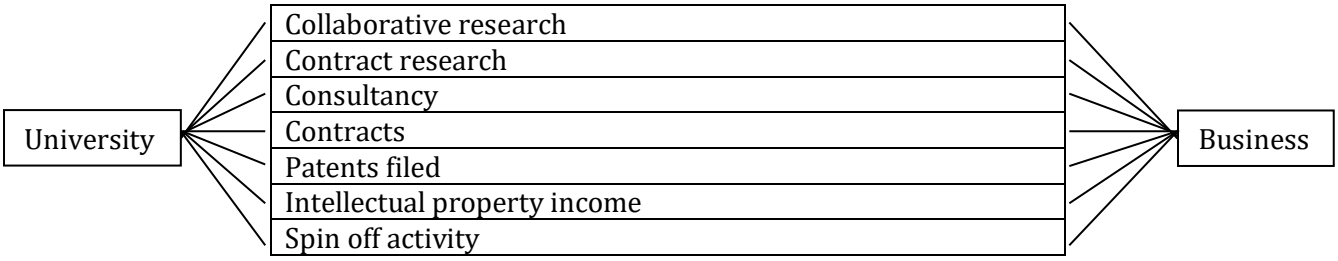

FIGURE 2: Model of University Business Partnerships investigated.

While there are many forms of university business partnerships the AURIL model tries to capture the main types, which vary according to the way universities and businesses deal with outcomes and benefits, manage resources, and define institutional goals (AURIL, 2001). Institutional goals can be seen as 'the objectives that educational institutions set for themselves in order to fulfill their mission and vision' (Akari, 2023). Findings concerning the management of the common types of university business partnerships (Thomas et al, 2013) are elucidated in terms of this model and compared with models identified from other universities in the UK. University business partnerships are important for universities since they provide an open exchange of ideas between partners and help modernise higher education (Ehl.edu, 2024).

There has been an extensive history for university/business collaboration (Bower, 1993) with a considerable increase for these types of partnerships in the United Kingdom (Duggan, 1997; Powers, 2003), European Union (Caloghirou et al, 2001) and the United States (Baldwin and Link, 1998; Mansfield, 1998), for example. This increase appears to arise due to a combination of pressures on both businesses and universities (Meyer-Krahmer and Schmock, 1998; Santoro, 2000). Pressures on universities include the growth of new knowledge, funding, and rising costs – resulting in resource pressures on universities seeking relationships with businesses for subject area market leadership (Hagen, 2002; Nimtz et al, 1995). Pressures on businesses include technological change, short product life cycles, and global competition (transforming the competitive environment) (Ali, 1994; Bettis and Hitt, 1995). Universities are seen as "engines for economic growth" due to societal pressure instead of their past social remit (Blumenthal, 2003; Cohen et al, 1998). These pressures have led to university/business collaborations for the enhancement of innovation and economic competitiveness (Ankrah, 2007). Here Autio and Laamanen (1995) report "the ability to recognise technical problems, the ability to develop new concepts and tangible solutions to technical problems, the concepts and tangibles developed to solve technical problems, and the ability to exploit the concepts and tangibles in an effective way" (p. 647). Knowledge transfer is considered different from technology transfer since knowledge transfer is a wider set of activities than technology transfer (Gopalakrishnan and Santoro, 2004).

As such knowledge transfer involves 'a very broad range of activities to support mutually beneficial collaboration between universities, businesses and the public sector' (UoC, 2024). Burati and Penco (2001) view technology transfer as an exchange process where a collaborative venture takes place with a technology donor and recipient working in partnership to adapt and develop technologies (aiming to deal with the customisation of technology required to develop specific applications, applying new technology to create value for the recipient taking into account both external and internal factors, and potential users' needs).

Ankrah (2007) reports that there is a large amount of research on university–industry partnerships especially with regard to knowledge and technology transfer. Therefore, considerable literature is in existence regarding mechanisms developed for interaction between university and industry and collaborative outcomes (Ankrah, 2007). Also, considerable literature is available regarding the university/business relationship. What has been published can be described as ad hoc in nature (Ankrah, 2007) and on a regional basis (Smilor et al, 1990). The literature shows that cooperation between universities and industry was perceived as less important before 1990 than later (Howells and Nedeva, 2003; Nimtz et al, 1995; Poyago-Theotoky et al, 2002). Due to university-industry, and particularly university–business relationships evolving, research papers have built on early literature findings (Blumenthal, 2003; Geisler, 1995; Howells et al, 1998, Newberg and Dunn, 2002). This paper therefore seeks to answer the research question "What are the typical approaches to university business partnerships in the UK?" To set the scene for the analysis of the findings the literature is initially investigated in terms of the characteristics of university business partnerships.

LITERATURE REVIEW

University/business collaboration: Organisational aspects

The literature reports various types of inter-organisational relationships undertaken in practice and these include alliances, consortia, interlocking directorates, joint ventures, networks, and trade associations which vary according to partnership linkages (Barringer and Harrison, 2000). Inter-organisational relationships can be defined as 'two or more orgnisations that establish a relationship for

the achievement of common goals' (IGI, 2024). Indeed, it has been observed in the literature that a number of terms are used to define different inter-organisational relationships (Chiesa and Manzini, 1998). Moreover, it is concurred that cooperative arrangements take various forms to varying degrees of partner involvement and complexity (Geisler, 1997).

Furthermore, it is posited that the possibility for university-industry relationships are fairly broad (Shenhar, 1993). In fact, forms of university-industry inter-organisational relationships in the case of technology transfer occur according to the technology flow and the length of the relationship (Figure 3) (Chen, 1994).

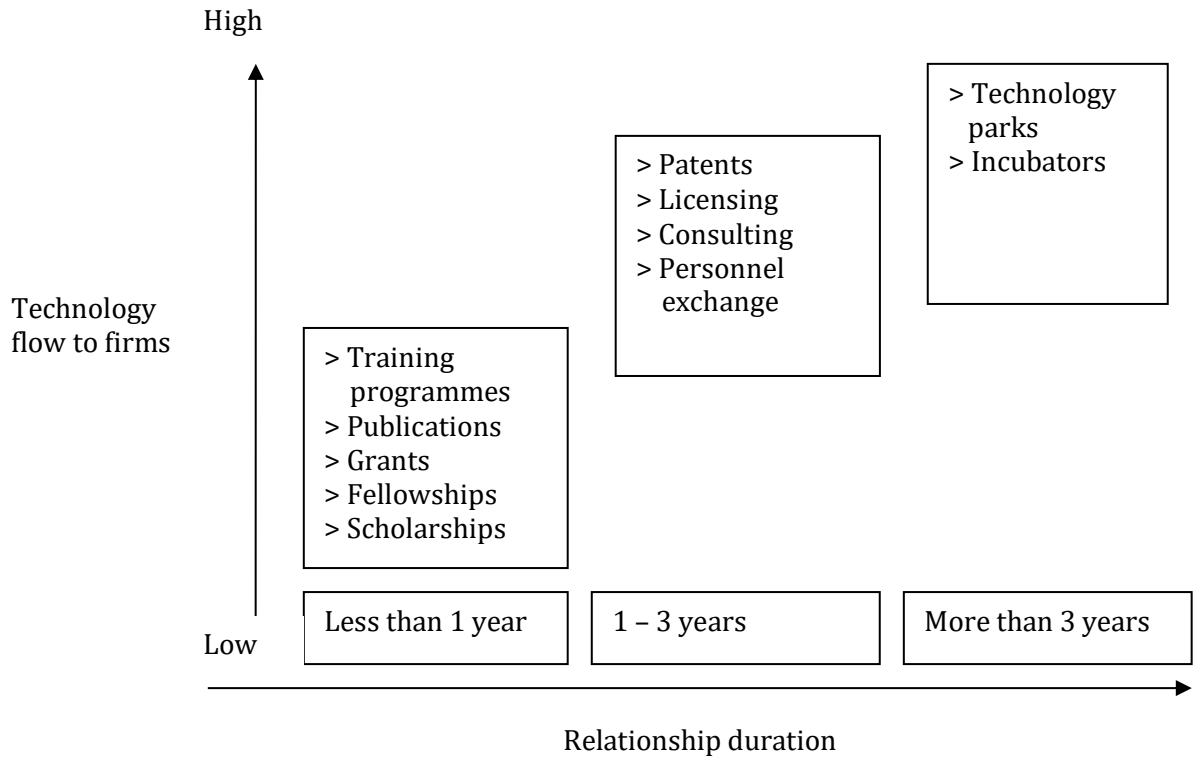

FIGURE 3: Technology transfer mechanisms (Source: Chen, 1994, p. 451).

There have been four classifications for university-industry inter-organisational relationships given which are cooperative research, knowledge transfer, technology transfer, and research support (Santoro, 2000). Support for research includes endowments and trust funds, co-operative research - informal intentions, institutional facilities, group arrangements, institutional agreements, knowledge transfer - co-operative education, institutional programmes, personal interactions, and technology transfer – commercialisation activities and product development through research centres at universities (Santoro, 2000).

The creation of a typology that illustrates the possible links between universities and industry, and more specifically between universities and businesses, has been considered not easy (Blackman and Seagal, 1991). The framework of Bonarccorsi and Piccaluga (1994) is reasonably wide involving the categories of the creation of personal informal relationships, personal formal relationships, formal non-targeted agreements, formal targeted agreements, and focused structures. Boanarccorsi and Piccaluga (1994) note that these six groups provide an increasing involvement level according to the organisational resource involvement from the university, length of agreement, and degree of formalisation.

Here a university's resource involvement progresses from formal personal relationships through the categories to focused structures with a university-wide involvement in industry collaboration structures (Bonarccorsi and Piccaluga, 1994).

For personal formal relationships and third parties formalisation of agreement can exist whilst in remaining groupings formalised relations will be evident (Bonarccorsi and Picaluga, 1994). Since formalisation and monitoring of inter-organisational relationships can cause disagreement the issue of formalisation is considered to be significant. Also, there can be a loss of trust amongst partners through them attempting to retain independence for their organisations in a situation where interdependence is increasing (Ring and van de Ven, 1994).

University/business relationship motivations

In the literature on inter-organisational relationships from 1960 to 1990 six critical contingencies are posited by Oliver (1990) across linkages, organisations and settings and these are asymmetry, efficiency, legitimacy, necessity, reciprocity and stability (Oliver, 1990). Oliver (1990) provides two delimiting assumptions behind the determinants being that deliberate decisions are assumed to be made to form an inter-

organisational relationship by organisations and an organisational perspective with a top management approach assumed (the determinants can also explain lower reasons) (Oliver, 1990). These six contingencies show a strong correlation with alliance strategy motives (Eisenhardt and Schoonhoven, 1996). University and business motivations engaged in inter-organisational relationships appear to closely align with the six critical contingencies/determinants (Oliver, 1990) as motives for organisations to embrace inter-organisational relationships.

Most governments encourage collaboration between universities and businesses, in a situation of international competition and rapid technological change, for wealth creation through improving innovative activity (Barnes et al, 2002; Schartinger et al, 2001). A significant issue for policy-making by governments, particularly with regard to research council budgets, is the operation of the university-industry interface which enables the exploitation of research to be transferred to industry for economic growth (Hall, 2004; Lopez-Martinez et al, 1994). University-industry relationships by universities are therefore encouraged in accordance with government and institutional policy (Howells et al, 1998). While industry provides expertise in commercialisation, market knowledge, product development (Sherwood et al, 1994), and graduate employment openings (Lee and Win, 2004; Santoro and Betts, 2002) universities provide expertise and research infrastructure (Sherwood et al, 2004). In order to take advantage of these mutual advantages, there is a motivation to develop relationships by universities with industry (Ankrah, 2007).

Against a background of government grants for university-industry initiatives, increasing pressure on public finance for universities, (Harman and Sherwell, 2002), has provided an incentive for universities to consider other revenue to fund equipment and research. As such this has been through the commercialisation of research, the exploitation of intellectual property rights, and licensing of patents to reduce university dependence on public funds (Logar et al, 2001). Relationships with industry appeal to universities since more bureaucracy is involved with public funding than with industrial funding (Blumenthal, 2003; Santoro and Chakrabarti, 1999). Academic staff will be motivated for personal financial gain to enter into relationships with industry (Siegel et al, 2003; Siegel et al, 2004).

Organisations tend to be motivated to enter into inter-organisational relationships to attain predictability and dependability to respond to environmental uncertainty (Oliver, 1990). Related motivations include the shift to the knowledge-based economy and the change in university-industry relationships to partnerships from sponsorship involving ongoing interaction (Jacob et al, 2000). Resource pressure due to the growth in new knowledge has affected universities, which has resulted in universities entering into alliances with industry to stay at the forefront of academic areas in terms of subjects and research (Ankrah, 2007). University academics consider such links to provide opportunities to enable them to test and develop theories, develop skills, and to place and train students (Cyert and Goodman, 1997). It has been posited that universities undertake collaborative arrangements with businesses and industry to enable academics and students to acquire exposure to industrial environments, obtain insights from industrial research, solve practical problems through project work, and undertake instructional case studies (Meyer-Krahmer and Schmoch, 1998; Santoro and Chakrabarti, 2001). Such activities contribute to curriculum development and the improvement of teaching quality (Santoro and Gopalakrishnan, 2001; Meyer-Krahmer and Schmoch, 1998). It has been suggested that a significant incentive for Higher Education Institutions (HEIs) to partner with businesses and industry is for journal publications (Harman and Sherwell, 2002).

Arising from the need for universities to enhance their image they will form relationships with businesses and industry (Lopez-Martinez et al, 1994; Mora-Valentin, 2000) and there are societal political, and public pressures for them to exhibit their economic relevance to society and to enhance entrepreneurship and social accountability (Cohen et al, 1998). Due to the need for technology knowledge transfer, and diffusion, they will be motivated to enter into collaboration with industry to drive economic development (Blumenthal, 2003; Hagen, 2002; Siegal et al, 2003; 2004). It has been found that a fundamental motive of university scientists is for recognition in the industrial scientific community (Hagstrom, 1965) which can be achieved by joint publications, presentations at international conferences, and research grants (through industry-supporting university research academic eminence can be achieved) (Siegal, et al, 2003; 2004).

Governments have taken action to support research interaction between universities and businesses due to the fast-changing technological and competitive environment since universities can support economic regeneration and through the dissemination of expertise and knowledge by higher education industry-linked partnerships act as engines of economic growth (Bettis and Hitt, 1995; Mora-Valentin, 2000). Regional and national research programmes have been created by governments and an example of these in the UK have been the Knowledge Transfer Partnerships (KTPs) (Caloghirou et al, 2001) and businesses have benefited from these programmes through collaboration with universities (Howells et al, 1998).

Financial gain from the commercialisation of academic-based technologies is a motivation for businesses to enter into inter-organisational relationships with universities and exclusive rights

to technologies will be required by many businesses (Siegel et al, 2003). Controlling the direction of academic research will be of interest to industry as well as control of the generated technologies (Newberg and Dunn, 2002; Rappert et al, 1999; Siegel et al, 2003). Additional motivations for firms to contribute to university-industry inter-organisational relationships will be to have access to hiring students and many collaborative research programmes will try to target the ablest students (Bloedon and Stokes, 1994). University staff and senior researchers according to the OECD (1990) will undertake consultancy work according to the time they are allowed to undertake activities outside the academic world.

From a standpoint of efficiency, there will be several motivations for businesses to have inter-organisational relationships with universities (Ankrah, 2007). University-industry research it is believed to increase firm sales, research and development (R&D), and patenting activity (Cohen et al, 1998). For cost savings, innovative activity, knowledge creation and exploitation, and research outputs, businesses will partner with HEIs (George et al, 2002). Businesses will have improved financial performance and competitive advantage as a result (Grant, 1996). Enhancement of R&D and technology growth through a legal environment underpinning R&D, grants, and tax credits is another government motivation (Barnes et al, 2002; Bramorski and Madan, 1993). Advanced expertise, continuing professional development (CPD), multidisciplinary leading technologies, and research facilities as part of human capital development will also be industrial motives due to the shortening of life cycles and enhanced competitive advantage (Bonaccorsi and Piccaluga, 1994).

An influencing factor for businesses to enter into relationships with universities has been considered to be the move to a knowledge-based economy (Santoro and Betts, 2002).

Also, it has been concluded that academic research has augmented the ability of businesses to resolve difficult problems (Pavitt, 1998). Howells et al (1988) and Klofsten and Jones-Evans (1996) report university-industry partnerships are a good way to influence technology-based firms, especially businesses to achieve growth. University-industry partnerships are considered important to achieve sustainable development goals (SDGs) and create a better world (Bodley-Scott and Oymak, 2022).

In their study on university-industry relationships, Lopez-Martinez et al (1994) have shown that a lack of in-house ability by the industry for technological research has been an important business executive motivation. For firms with an R&D capacity, it has also been found that collaboration is still appreciated since it reduces risk and enhances limited human and financial resources (Hicks, 1993). The potential for more complicated collaborative arrangements and research networks with other universities and firms such as consortia with universities and multiple businesses a motivation for businesses to enter into inter-organisational relationships with universities (George et al, 2002; Cyert and Goodman, 1997). By associating themselves with leading universities it has also been found that businesses can improve their standing (Siegel et al, 2003) and links with leading research universities are believed to increase a firm's position with regard to significant stakeholders (Mian, 1997).

The Process of Formation

From the models on the process of inter-organisational relationship formation (Tuten and Urban, 2001), the Mitsuhashi (2002) business-to-business alliance formation model is believed to be relevant for university-industry inter-organisational relationships formation and describes a five-stage alliance formation process (Figure 4).

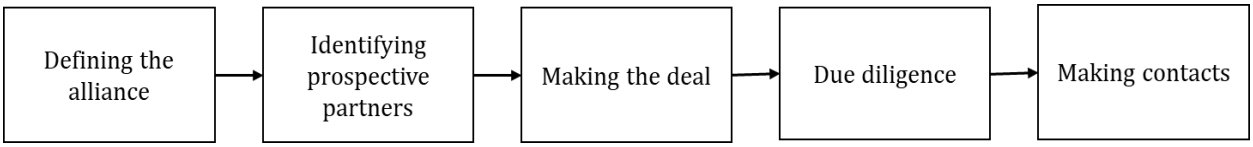

FIGURE 4: Alliance Formation Process (Source: Mitsuhashi, 2002, p. 113).

In the formation of a university–business inter-organisational relationship, the initial stage is determination of partnership purpose followed by finding an actual partner (Mead et al, 1999) with a number of criteria proposed for the selection of partners (Champness, 2000; Dodgson, 1991). No matter what partner selection criteria are adopted it is thought that efforts should be made to undertake prospective partner evaluation, with benefits including ensuring that there is appropriate collaboration (Barnes et al, 2002).

It is evident that if partners have previous experiences of co-operation then the outcomes of inter-organisational relationships are better (Dill, 1990; Geisler, 1995). Partners' existing relationships are critical since, where experience with an existing partner exists, trust will be developed and universities and businesses will adjust to the expectations, evolution and demands of previous alliances (Gulati and Gargiolu, 1999).

Former collaboration experience (Schartinger et al, 2001) will be important from earlier research, and technological and personal interactions will reduce personal and organisational obstacles and enhance university and business contact.

During the formation stage, it is essential to define administrative and managerial responsibilities for the inter-organisational relationship. This involves financial accountability, and a suitable partnership objective is for partners to select a project manager (equal collaborative participation by partners being important) (Peterson, 1995). A project plan with the specification of milestones needs to be agreed upon by partners (Buttrick, 2000). Partner differences need to be dealt with to avoid collaboration conflict, specification of interim, and end delivery provided, and measures of success identified (Peterson, 1995).

Due to the complex and formal nature of the inter-organisational relationship, it is important to have it legally bound by contract to underline the commitment of partners (Kanter, 1994; Burnham, 1997). With the inter-organisational relationship between businesses and universities, the intellectual property agreement will be the same as the legal document and will specify partner relationships and agreements during, and after, project collaboration partner approval (Ankrah, 2007).

University/business Inter-organisational relationships

University and business inter-organisational relationships enter an operational stage (Sherwood et al, 2004) following formation which involves constant evolutionary and learning processes (this relationship will be influenced by a number of factors) (Doz, 1996; Ritter and Gemünden, 2003). Several activities will take place between organisations during the operational phase which will have the objective of achieving the goals of the inter-organisational relationship (Ritter and Gemünden, 2003). The literature describes a number of factors found to induce or restrict inter-organisational relationships between universities and industry (Dean, 1981; Azaroff, 1982; Fowler, 1984). Factors include capacity and resources, institutional policies and contractual mechanisms, issues relating to technology, legal issues, management and organisational issues, political issues, social issues and other issues (Ankrah, 2007). Complex interaction with these factors, with resultant negative and positive impacts, determines the success of a collaborative project (Barnes et al, 2002). Here, organisational and managerial issues are critical factors inducing or restricting relationships between businesses and universities (Siegel et al, 2003). It is believed a considerable managerial effort is required for industry and university inter-organisational relationships to be successful taking into account the cultural nature of the partners concerned (Dodgson, 1991).

University/business inter-organisational relationship: Overview

With regard to the university/business inter-organisational relationship, there are a number of typologies that express the diversity of relationships employed in the collaborative process. Freeman (1991) distinguishes between the following: computerised data-banks for technical and scientific interchange; direct investment motivated by technology factors; government-sponsored joint research programmes; informal or personal networks; joint R&D agreements; joint ventures and research corporations; licensing and second-sourcing agreements; sub-contracting, production-sharing and supplier networks; and technology exchange agreements.

Contrary to many studies highlighting the importance of formal relationships for the transfer of technology, a number of investigations have also indicated the key role of informal relationships as a basis for information and sourcing ideas during the development process (Kreiner and Schulz, 1993; Shaw, 1993). In relation to informal exchange, this research has typically been anecdotal in nature. Freeman (1991) supports this view and argues that `although rarely measured systematically…informal networks are extremely important but very hard to classify and measure'. Systematic and more in-depth studies of informal interaction in the innovation process exist but have been largely exploratory and have not been examined in different technological or regional contexts.

In the literature, it has been noted that closely related to the subsequent benefits realised are the motivations (Geisler, 1995; Lee, 2000). Evidence is available that there is a positive relationship between outcomes and motivations (Lee, 2000). Even though the benefits of university and business inter-organisational relationships outweigh any costs it is necessary that both sides are aware of any limitations so that action can be taken to alleviate problems through management procedures and policies (Harman and Sherwell, 2002). It is possible through doing this to ensure that the relationship is successful and to make failure less likely (Ankrah, 2007). Here the goals of both universities and businesses will be met (Harman and Sherwell, 2002).

Analysis of the literature on university business partnerships

A review of business-university collaboration (Wilson Report, 2012) reported considerable progress in the cooperation of universities and businesses. This was evidenced through three main methods to stimulate university and business collaboration involving change through good management to improve an institution's performance to attain objectives, direct and indirect funding incentives, and regulatory requirements (Wilson Report, 2012). The Confederation of British Industry taskforce report (CBI, 2009) was an example of this which set an agenda to improve the collaboration of universities and businesses. Businesses appear to value partnership collaboration with universities to a greater extent than linear IP innovation process transactions (Perkmann and Walsh, 2007). Contrary to many universities' approach to knowledge exchange considerable contact between academics

and external organisations involve direct contact between the academic and the business rather than the university technology transfer or knowledge exchange office (PACEC/CBR, 2011). Networks between industry and academics are important and a study indicated that some 40% of academics interact with businesses in this way (Abreu et al, 2009). In the past, although these types of collaborations and partnerships had been through personal relationships and ad hoc cooperation (Melese et al, 2009), individuals have had involvement in the early stage development of technologies by universities and businesses (Termouth and Garner, 2009). In addition to the activities of individuals, internships, placements, and secondments are considered to be good ways to enhance knowledge exchange (CBI, 2009), although secondments for post-doctoral researchers have been low (CROS, 2011) and academics tend to be limited in their availability for placements (Wilson, 2012). In terms of global innovation environments, a HEFCE study reported higher education centres of excellence can offer access to expertise providing networking opportunities and interactions with corporate partners being made aware of centre technical themes (Knee and Meyer, 2007). A network of centres to commercialise research in the UK was advocated by the Dyson (2010) and Hauser (2010) reports which would aid the development of business sectors by facilities with public subsidies similar to the Fraunhofer German institutes although offering greater university-business collaboration. This was realised through the announcement of funding for six technology and innovation centres (TiCs) in 2011 (TSB, 2011). Analysis of the literature illustrates there has been much progress in university business partnerships built upon original developments evidenced in previous studies and the research findings of this study further substantiate this.

RESEARCH METHODOLOGY

The research was carried out in three stages and used the most appropriate methodology to address the main research question - what are the typical approaches to university business partnerships in the UK? The three stages are described below.

Stage 1: Nature of University Business Partnerships

This involved a review of the literature in terms of university/business collaboration, university business relationship motivations, the process of formation, and university/business inter-organisational relationships.

Stage 2: Overview of the university/business inter-organisational relationship

An overview of the university/business inter-organisational relationship was undertaken taking ino account a number of typologies that express the diversity of relationships employed in the collaborative process. This informed the investigation of university business partnerships reported in the research findings.

Stage 3: University-industry relationships and the different approaches to university business partnerships

A small comparative study was undertaken of "old" and "new" (post 92) universities in the UK to investigate the different approaches to university business partnerships from information that was available. The three "old" universities were anonymised as Uni A, Uni B, and Uni C, and the three "new" universities as Uni D, Uni E, and Uni F.

From the findings of the study, an analysis was undertaken of the state of university relationships in terms of industry partnerships and the current models that are in place for the exploitation of intellectual property. Models at universities in the UK have been contrasted in terms of efficiency and "good/best practice".

Through the research being of both academic and practical significance, it has contributed to the body of understanding of the processes involved in the university-industry inter-relationship with regard to industry partnerships.

RESEARCH FINDINGS AND ANALYSIS

Introduction

The research findings of the investigation into different approaches to university business partnerships, involving a comparative study of three "old" and three "new" universities, are provided below in the findings section. In order to investigate the different approaches to business projects and processes, the importance of university business partnerships and the range of practices of Technology Transfer Offices (TTOs) were considered.

Tang (2008) related six key findings with regard to business projects and processes which are: (i) the speed of response from academics in contract agreement is important when dealing with business; (ii) it is essential to have an effective incentive structure to encourage academics to engage with business; (iii) of particular importance are R&D research partnerships which help generate academic intellectual property and are a route to commercialisation; (iv) universities need to engage in active measures in order to increase the knowledge about the commercialisation process and the benefits that arise from it for students, researchers, lecturers and faculty heads; (v) for university business partnerships to be successful there is a need for expertise and commitment by university senior administrators to support and build partnerships who need to understand academia and industry technology/knowledge transfer dynamics; and (vi) in order for good practice there is a need for internal university cultural change especially at senior management level.

In a policy context, the importance of university business partnerships can be traced to the 1993 Government White Paper "Realising Our Potential" (OST, 1993) recognising the need for universities to identify 'potential users' of the results of their research in industry and other areas, and to ensure

successful exploitation. Additionally, the Lambert Report (Lambert, 2003) also identified the importance of universities working with industry to optimise the exploitation of outputs.

Tang (2008) reports there is a wide range of practices undertaken by university TTOs to enhance university business partnerships ranging from a relaxed approach to structured proactive business-facing strategies. Such practices include collaborative agreements, creating new businesses and supporting businesses, exploring new opportunities and R&D partnerships, market and sector research, projects, and regulatory developments to increase demand for products. Abdulai et al (2022) have also emphasised the role of TTOs with information mechanisms for information performance in firms. TTOs are normally established in a university to manage intellectual property (IP) and transfer technology and knowledge to industries (WIPO, 2024).

It is evident that university TTOs/business development units are central to the exploitation of university business partnerships and they undertake many activities to bridge the academic industry divide including the creation of industrial link networks.

Tang (2008) has identified three models of TTOs that have different approaches to university business partnerships with industry and these are:

i. Internal model – TTO integrated into the university administrative structure;
ii. External model – TTO operates outside the university either as a subsidiary or independent entity with autonomy over its operations;
iii. Hybrid model – A hybrid consisting of a combination of the above.

There is greater experience and professionalism of the TTO through working with industry (Rogers et al, 2000; Siegel et al, 2003).

Findings

By developing the work of Tang (2008), the three different approaches are illustrated with reference to the three "old" and three "new" UK universities' TTOs (Table 1) below.

TABLE 1: Different Approaches to University Business Partnerships for three "old" and three "new" UK universities.

University	Technology Transfer Office	TTO Model	Business Partnerships approach	Structure
Uni A (Old)	Project Office	External Model	Externally organised approach	Twenty-seven project managers
Uni B (Old)	Business Development Unit	Hybrid Model	Hybrid approach	Three units: Consulting, Innovation, Business Development
Uni C (Old)	Business Company	External Model	Externally organised approach	Four divisions and about forty staff
Uni D (New)	Ventures Unit	Internal Model	Internally organised approach	Director, Five business managers, marketing manager and administrative assistant
Uni E (New)	Research and Knowledge Transfer Services	Internal Model	Internally organised approach	Four managers of priority areas and a Business Development Manager
Uni F (New)	Intellectual Property and Contracts Services	Internal Model	Internally organised approach	Head of IP and Contracts Support and academics

Source: Developed from Tang (2008).

Table 1 shows there is a mixture of business partnership approaches among the UK universities investigated. Large research-intensive universities had an externally organised approach or a hybrid approach. Since the TTOs of newer universities were integrated into the university administration they had an internally organised approach. They had been mainly supported by the university and the Higher Education Innovation Fund (HEIF) but they were not all profit-generating. Furthermore, the TTO at one newer university (Uni E) did not have a central objective to be a for-profit organisation and neither did the business development unit at an old university (Uni B). All these universities had a mix of methods of exploitation practices (Tang, 2008) and all practiced the three phases of (i) opportunity recognition, (ii) opportunity development, and (iii) opportunity exploitation (Van der Veen and Wakkee, 2006). An important part of the metrics of business-related activities of universities involved licenses, patents, and spin-outs and they were the key proxies for university commercialisation activities resulting in them being grouped together (here spin-outs were the best mechanism for "disruptive" technologies) (Tang, 2008).

The building of good relationships between industry and academics can therefore underpin successful university-industry partnerships.

Analysis

Through networks existing university business relationships can be strengthened and they offer the possibility for new relationships to be developed with increased benefits from working with other industrial participants. This can lead not only to new collaborations and sources of expertise but also to awareness of company competition (Tang, 2008). SMEs that are excluded from networks can be helped by networking activities involving research-intensive corporations and universities (for example universities can target SMEs in their networking activities). Clubs/associations/societies that enable networking can link researchers with industry, a notable example being the Innovation Society of an old university (Uni A), and can result in the commissioning of studies by members (Molas-Gallart and Tang, 2007). Additionally, the use of the alumni office for networking can be beneficial through contacting alumnae to obtain research sponsorship and the commercialisation of university IP (one new university (Uni F) attempted to harness alumni with the aim of exploitation).

R&D collaborative projects are important university business partnerships and this form of "joint research" is a significant factor in knowledge transfer and connections with industry (Tang, 2008). Such types of research enable university researchers to increase the exploitability and applicability of university research, to keep up-to-date with industrial research, and to obtain access to industrial research expertise (D'Easte-Cukierman and Patel, 2005). Collaborative partnerships and projects were a significant form of exploitation of academic research for the research division of one of the old universities (Uni A), for example, and together with agreements were a major mode of exploitation for one of the new universities (Uni E) (Tang, 2008). They were also the second most important mechanism for one of the new universities (Uni F). Knowledge Transfer Partnerships in an area outside the company's business of the industrial partner enabled the university to exploit IP. With the innovation process moving towards an "open" model (Chesbrough, 2003a&b) it was vital to protect IP in collaborative projects (Tang and Molas-Gallart, 2009).

Collaborative projects undertaken for Research Councils and partnerships with industry were another important form of university business projects. Partnerships were networks of organisations aimed at improving innovation competitiveness and performance of UK industry through the exploitation of science and technology from the science base, knowledge transfer, and research and development, and involved Research and Technology Organisations, businesses, and universities (DTI, 2006a&b). The value of these partnerships was recognised by the Research Councils, and through a Business Engagement Strategy, which encouraged academics involved in Research Council-funded projects to work with industry.

CONCLUSIONS

This paper has investigated different approaches to University Business Partnerships in the UK. The paper has documented the links universities had with companies in terms of industrial research, Knowledge Transfer Partnerships (KTPs), and other forms of external collaborative partnerships, and what these links were. In answer to the research question 'What are the typical approaches to university business partnerships in the UK?' it was found that these included the externally organised approach, the hybrid approach, and the internally organised approach. Two "old" universities, unis A and C, used an externally organised approach, one "old" university, Uni B, used a hybrid approach, and the three "new" universities, unis D, E, and F, used an internally organised approach. In order to assess "good/best practice" and potential barriers comparisons were made between universities. There has also been a review of IPR policies and procedures with recommendations for improvements.

According to Tang (2008) good practices for identifying university business partnerships include: (i) adopting a transparent approach to explaining the process of commercialisation to academics; (ii) avoiding over bureaucratisation of processes and procedures for engaging industry; (iii) commitment to building and maintaining trust between academics and industrialists involving an understanding of the workings of academia and industry; (iv) establishing an incentive structure for academics to engage with – consultancies as an entry point to understanding how companies operate to develop client lists and joint R&D projects/partnerships to exploit university IP; (v) establishment of a professional TTO with a staff mix involving academic and business experience; and (vi) maintaining continual contact on an informal basis with academics.

For the successful exploitation of university business projects good practices (Tang, 2008) included: support from, and the ability of, the TTO to undertake university business partnerships through three activities: (i) opportunity recognition; (ii) opportunity development, and (iii) opportunity exploitation (Van der Veen and Wakkee, 2006). Also, licensing is important; spin-outs to provide a route to market and engage investors; R&D partnerships to provide more academic IP and a route to commercialisation; consultancy to provide an initial route to exploitation; a "capabilities map" or "capabilities audit" to match industry needs coordinated with the Research Office and academics. As well, as implementation of active measures to raise awareness and knowledge about potential university business projects and the benefits with heads of faculties, lecturers, researchers, and students; and submissions of bids to invitations to tender that require an industrial partner.

In addition to current proxies for successful university business projects and processes that focus on licensing, patents, and spin-outs other paths for successful university-industry partnerships include support measures for collaborative research and consultancy partnerships, continuous professional development and training services, entrepreneurial undergraduates and postgraduates, maintaining a strong relationship between industrialists and academics, and networking (Tang, 2008).

Further to the conclusions and the consideration of good practices a number of recommendations have been made from the findings of this paper. The AURIL model of university-business partnerships (shown in Figure 1) identified the main partnerships for university business activities. In relation to this, the model of university-business partnerships investigated (also shown in Figure 2) shows contract, collaborative, sponsored, and other research links are categorised under research projects together with postgraduate studentships. Student projects and placements take place under programmes like those of knowledge transfer and university consultancy and associated commercial services occur mainly as consultancy projects. Those areas where universities could possibly seek to develop are clubs and networks, and sponsored and honorary posts and secondments, especially with regard to alumni networks.

There is a need for expertise and commitment by university senior managers for university business partnerships to be successful in order to support and build partnerships that need to understand academia and industry technology/knowledge transfer dynamics (as noted by Tang (2008) in relation to findings from a study of university TTOs' exploitation of intellectual property in the UK). Research and Knowledge Transfer Services should make greater use of the services of university business schools (an example being one of the new universities (Uni E)). The identification of university business partnerships could have greater assistance provided by research offices (as evidenced by another new university (Uni F)). Three phases of (i) opportunity recognition, (ii) opportunity development, and (iii) opportunity exploitation need to be practiced similarly to the universities in the study (Tang, 2008). Key proxies for university commercialisation activities of licenses, patents, and spin-outs need to be recognised as a major part of business-related activities at a university. Between universities and industry, good relationships need to be built in order to underpin successful university-industry partnerships. University business relationships can be strengthened through networks and they offer the possibility for new relationship development with an increase of benefits. Through clubs/associations/societies, greater networking needs to be undertaken by university researchers with industry to enable research projects to be commissioned. To enable networking the development of an alumni office is of particular benefit involving contacting alumnae to obtain research sponsorship and commercialisation of a university's IP (one of the new universities (Uni F), for example, harnessed alumni with the aim of exploitation). Finally, in collaborative projects protecting IP is a vital consideration (Tang and Molas-Gallart, 2008) for a university that has an innovation process moving towards an "open" model (Chesbrough, 2003a&b).

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