UNIVERSITY OF
GLOUCESTERSHIRE

This is a peer-reviewed, post-print (final draft post-refereeing) version of the following published document, © The authors and is licensed under All Rights Reserved license:

Wynn, Martin G ORCID logoORCID: https://orcid.org/0000-0001-7619-6079 and Jones, Peter ORCID logoORCID: https://orcid.org/0000-0002-9566-9393 (2017) Knowledge Transfer Partnerships and the Entrepreneurial University. Industry and Higher Education, 31 (4). pp. 267-278. doi:10.1177/0950422217705442

Official URL: https://doi.org/10.1177/0950422217705442
DOI: http://dx.doi.org/10.1177/0950422217705442
EPrint URI: https://eprints.glos.ac.uk/id/eprint/4327

Disclaimer

The University of Gloucestershire has obtained warranties from all depositors as to their title in the material deposited and as to their right to deposit such material.

The University of Gloucestershire makes no representation or warranties of commercial utility, title, or fitness for a particular purpose or any other warranty, express or implied in respect of any material deposited.

The University of Gloucestershire makes no representation that the use of the materials will not infringe any patent, copyright, trademark or other property or proprietary rights.

The University of Gloucestershire accepts no liability for any infringement of intellectual property rights in any material deposited but will remove such material from public view pending investigation in the event of an allegation of any such infringement.

PLEASE SCROLL DOWN FOR TEXT.

Title Page

Knowledge Transfer Partnerships and the Entrepreneurial University

Martin Wynn (Reader in Business Information Systems, School of Computing and Technology, University of Gloucestershire)

Peter Jones (Professor in Strategic Marketing, The Business School, University of Gloucestershire),

Corresponding Author: Martin Wynn, School of Computing and Technology, University of Gloucestershire, the Park, Cheltenham, Gloucestershire GL50 2RH. Phone: 01242 714066. Mobile: 07929 081854. email: Mwynn@glos.ac.uk

Peter Jones, The Business School, University of Gloucestershire, the Park, Cheltenham, Gloucestershire GL50 2RH. Email: pjones@glos.ac.uk.

Acknowledgements

Acknowledgement and thanks are given to the UK Government Department of Trade and Industry and Department of Innovation, Universities and Skills for support for these KTP programmes. These Partnerships received financial support from the Knowledge Transfer Partnerships programme (KTP). KTP aims to help businesses to improve their competitiveness and productivity through the better use of knowledge, technology and skills that reside within the UK Knowledge Base. KTP has been funded by the Technology Strategy Board/InnovateUK along with the other government funding organisations.

Knowledge Transfer Partnerships and the Entrepreneurial University

By Martin Wynn and Peter Jones

Abstract

The purpose of this paper is to outline one way in which less research intensive universities can contribute to entrepreneurship by examining the achievements of a number of Knowledge Transfer Partnerships (KTPs) within the University of Gloucestershire. The paper adopts a qualitative case study approach and four case studies of KTPs at Beacons Business Interiors, Dowty Propellers, EnergistUK and Muddy Boots Software, all of which have operating bases within 40 miles of the University, are researched and analysed. The findings reveal that the four KTPs delivered a number of benefits for the companies, the university and the staff directly involved in these projects, and more generally that the KTPs successfully met their initial aims. The authors identify a number of challenges involved in looking to maximise the benefits of KTP activity within the University, and suggest how KTPs can actively foster the development of the entrepreneurial university.

This paper is an accessible review of KTP initiatives within the University of Gloucestershire and as such it will interest academics and business practitioners, who are looking to develop university-industry partnerships. It also offers some reflections on how a programme of KTPs can advance entrepreneurial development and support Growth Hub initiatives.

Keywords: Knowledge Transfer, Knowledge Transfer Partnerships, Entrepreneurial Activity, Entrepreneurial University, KTPs

INTRODUCTION

Collaborative relationships between universities and businesses have received growing attention from governments and academics. Within the UK, for example, a number of government commissioned reports and reviews (e.g. Lambert, 2003; Wilson, 2012; Dowling, 2015) have explored ways of extending and enhancing these relationships and have made a wide range of recommendations designed to further that end. At the same time, the organisational and broader economic and social benefits of academic engagement with the business world have been explored within academic literature (e.g. Ankrah et al., 2013; Perkmann et al., 2013). A wide variety of collaborative relationships can be identified, ranging from large scale research projects involving research intensive universities and multinational industrial corporations, to bespoke foundation degrees; but in many ways the theme of knowledge transfer and entrepreneurship lie at the heart of all such collaboration. For the University of Cambridge (2016: webpage), for example, 'knowledge transfer is a term used to encompass a very broad range of activities to support mutually beneficial collaborations between universities, businesses and the public sector.' Kalar and Antoncic (2015:1) suggested that 'the mutual relationship between the university and industry through the exchange of knowledge' has effectively meant that 'a number of universities have transformed themselves from a traditional university to an entrepreneurial university with strong ties to industry, thereby encouraging the entrepreneurial activities of their academics.'

Knowledge transfer is not new *per se* (Decter, 2009), but interest in its role in promoting economic growth and job creation has been growing for over two decades. Hardhill and Baines (2009:82) suggested, that 'since 1993 the promotion of knowledge transfer to maximise public investment has been a recurrent theme in UK policy documents.' The Lambert Review of Business-University Collaboration (Lambert, 2003:31), for example, acknowledged the scale of public investment in teaching and research within the UK's universities and formally endorsed the belief that 'transferring the knowledge and skills between universities and business and the wider community increases the economic and social returns.' The Sainsbury Review (Department for Innovation, Universities and Skills, 2007:60) of the UK Government's Science and Innovation Policies suggested that 'while our knowledge partnerships seem to be working well for our research universities, there is scope to increase knowledge transfer from business-facing universities to small and medium sized enterprises.'

The UK's Knowledge Transfer Partnership (KTP) scheme offers one way in which less research-intensive universities can play a valuable role in encouraging greater academic engagement with businesses. The KTP scheme helps businesses to innovate and grow by linking them with a university and a graduate to work on a specific project, and the University of Gloucestershire has a track record of delivering technology change projects with local SMEs via this scheme (Wynn et al., 2009). With this in mind, this paper examines the achievements of a number of the KTP initiatives within the University of Gloucestershire and offers some reflections on the challenges involved in maximising the benefits derived from these KTPs. This introduction is followed by a review of relevant literature and the positioning of two key research questions. This is followed by a short section on the research methodology employed. The next two sections report on the case study findings, and then analysis and discussion of results. The final section makes some concluding remarks that attempt to draw together the key themes covered in the paper.

KEY CONCEPTS AND RESEARCH QUESTIONS

The term entrepreneurship is widely used, and widely acclaimed, in business, government and media circles, but there is little by way of a consensus as to its meaning, and a number of contested definitions can be identified. Ma and Tan (2006:704) argued 'entrepreneurship as a theoretical construct and practical phenomena remains poorly defined and its interpretation fragmented.' More recently, in an attempt to make 'sense of the elusive paradigm of entrepreneurship,' Audretsch, Kuratko and Link (2015: 703) have suggested that 'the term entrepreneurship means different things to different people' and that 'even the scholarly literature is rife with disparities and even contradictions about what is, and what is not, entrepreneurship.' Defining the entrepreneurial university has also been described as 'difficult and controversial' not least because there is 'no one-size-fits–all definition', but rather 'an invaluable plurality of approaches, inventive, creative, yet practical, which distinguishes the entrepreneurial style' (European Commission/OECD, 2012:2).

Within the North American context, Thorp and Goldstein (2010) see the entrepreneurial university as being research led and tackling the global challenges of climate change, extreme poverty, childhood disease, and the impending worldwide shortage of clean water. In tracing the development of 'the Entrepreneurial University: From Concept to Action', Coyle, Gibbs and Haskins (2013:10) argued that 'central to the debate on the idea of the entrepreneurship university is the question of how the entrepreneurship concept and the often associated meaning and use of the word enterprise, are interpreted' and they looked to take a catholic view of entrepreneurship. They saw the 'enterprise

concept' as being concerned with the development of the 'enterprising person and the entrepreneurial mind-set.' In similar vein, Kao (2006:69) has suggested that 'entrepreneurship is the process of doing something new and something different for the purpose of creating wealth for the individual and adding value to society;' and Bruyat and Julien (2000:173) have similarly argued that 'entrepreneurship is concerned first and foremost with a process of change, emergence and creation: creation of new value and at the same time change and creation for the individual.' Lambert (2003) highlighted that entrepreneurship can be pursued in a range of ways, depending on the size and nature of the university, and the existing balance between research and teaching. He argued that 'the type of business collaboration that would make sense for one kind of university might be either impossible or irrelevant for another: a less research-intensive university can play an extraordinarily valuable role in working with local business in a way that might make no sense to one of the big research universities' (Lambert, 2003:13).

Lambert's assertion is particularly relevant to the growth of the KTP scheme, which has seen a major uptake by some of the smaller and less research intensive universities in the UK. KTPs are a tripartite partnership between a business, an academic institution and a graduate. KTPs began life as the Teaching Company Scheme (TCS), established by the Science and Education Research Council and the Department of Trade and Industry in 1975 to 'bridge the gap between industry and academia' (Peattie, 1993:60). This scheme was replaced by the KTP scheme in 2003. While each individual KTP has its own specific aims, the general aim of the KTP scheme is to meet a core strategic need with the focus being on delivering increased profits for businesses through improved quality and operations, increased sales and access to new markets. The academic institution employs a usually recently qualified graduate, known as the associate, who works at, and brings new skills and knowledge to, the business. KTPs can last between 6 and 36 months, depending on the scale of the project, and during the life of the project an academic from the academic institution is assigned for 25 days per annum to support and supervise the project. KTPs are partly funded by government grant aid and partly by the business which contributes to the cost of the academic and the salary of the associate. The scale of the company contribution varies according to its size, with typical annual contribution for an SME being £23,000 and that for a larger company being £30,000.

A number of reviews and evaluations of the KTP scheme have been published. A strategic review, undertaken by Regeneris Consulting (2010:ii), for example, concluded that the KTP scheme 'generated high levels of satisfaction amongst businesses, academics and associates', and that 'the impacts on

business performance are significant.' Financially the review suggested that between 2001/2 and 2007/8 the KTP scheme secured between £4.2 and £4.6 billion of new sales, between £1.6 and £1.8 billion of gross added value and between 5,530 and 6,090 jobs. A further study was commissioned by InnovateUK to evaluate the economic impacts and other benefits arising from the participation of the associate and the academic institution. This suggested that the concept and the rationale of the KTP scheme are

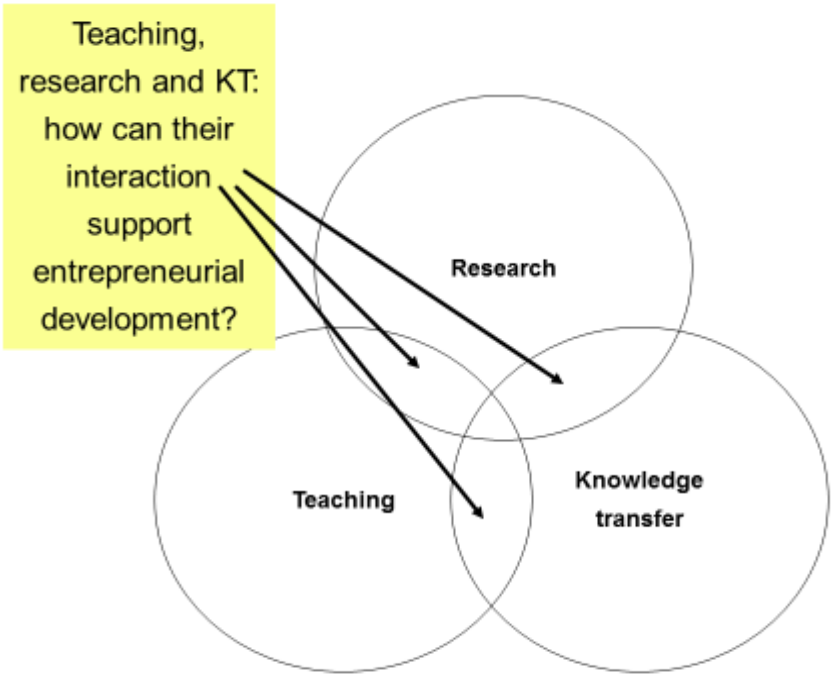

Figure 1 Entrepreneurial development can be progressed through the interaction of research, teaching and knowledge transfer

'extremely well regarded and highly valued' by both the academic institution and the associate, and 'exposure to industry and the corporate world' was considered the most valued aspect of the scheme by both academic institutions and associates (Warwick Economics and Development, 2015:iii). More specifically, the study found that over 80% of the academic institutions reported that their participation in KTPs had enhanced their understanding of industry, that KTPs were seen as a particularly effective way of enabling academic institutions to engage with SMEs, and that KTPs provided good quality case study material to enable academic institutions to demonstrate the impact of their research as part of submissions to the 2014 Research and Excellence Framework.

It is within this context that we see entrepreneurship in a university context as being leveraged by the

positive, managed, interaction of knowledge transfer (KT), research, and teaching activities (Figure 1). In a university context, the synergies between KT, teaching and research have been explored by practitioners and academics who concluded that 'knowledge exchange interactions have the ability to generate significant positive benefits for research and teaching' (PACEC, 2010:23). Entrepreneurial development can be seen as a product of the synergies that emerge from these three spheres of activity when 'in addition to the direct benefits realised by the external organisation, and for the academic from the interaction, indirect benefits are generated for academic research and/or teaching' (PACEC, 2010:1).

This article explores the linkages between KTPs and the development of the entrepreneurial university and addresses two research questions (RQs):

RQ1: What has been the nature of knowledge transfer in KTP projects and how has this impacted the University and the company partners.

RQ2: How do KTP projects help foster the entrepreneurial university?

The research pursues a case study methodology focussing on four KTP projects conducted at the University of Gloucestershire involving locally based SMEs.

RESEARCH METHODOLOGY

This research adopts an inductive approach using qualitative case studies. The case study is a widely used research method within business research. Yin (1984:13), for example, defines a case study as 'an empirical inquiry that investigates a contemporary phenomenon within its real life context, especially when the boundaries between phenomenon and context are not clearly evident.' Bryman and Bell (2011) argue that the case study is particularly appropriate to be used in combination with a qualitative research method, allowing detailed and intensive research activity, usually in combination with an inductive approach, as regards the relationship between theory and practice. Saunders, Lewis and Thornhill (2009) argue that case studies are of particular value for explanatory or exploratory investigation, such as that pursued in this research; and Silverman (2005) has noted three key benefits of such qualitative research. First, it can take into account the local context; second, it can include 'rich' data, providing a deep understanding of change processes; and third, such cases studies normally cover a significant time period, allowing assertions about causality and benefits.

Company (& Location/ KTP dates)	Industry Sector	Start Turn Over (£m)	End Turn Over (£m)	Staff No.	Project Summary
Beacons Business Interiors (Brecon) 2004-2006	Office design, assembly, & project manage-ment	6.9	11.0	60	Upgrade Goldmine CRM and Sage Financials systems. Add bespoke reports and interfaces developed in Visual Basic applications. Rationalise data structures. Future ERP options evaluated.
Dowty Propellers (Gloucester) 2004-2006	Aerospace manufact-uring	27.0	40.0	181	Migration of aftermarket business to Syteline ERP package, standardisation of business processes, and integration with SAP Financials module.
EnergistUK (Cirencester) 2010-11	Environ-mental consultancy services	1.1	2.3	40	Implementation of Microsoft CRM software modules and process improvements in sales and marketing functions.
Muddy Boots Software (Ross-on-Wye) 2010-12	Supply chain software for food industry	1.3	1.9	35	Roll-out of Microsoft CRM system, new technical support centres, 24/7 helpdesk and new training products for company's software.

Table 1 The 4 KTP case studies

These case studies are of KTP projects that featured author involvement as project supervisors, working half a day a week at the case study companies to supervise the KTP projects. This allowed first-hand involvement in the project management process over an eighteen month to two year period. This is thus, in part, action-research, which 'must involve analysis of a problem situation not controlled by the researcher, the making of plans for intervention in the situation, and the attempted execution of these plans' (Mansell, 1991:30). The four case studies exhibit varying small business profiles, providing a relevant cross-section of cases for investigation of the research questions. They all involved systems, process and/or organisational change, and are drawn from different industry sectors (Table 1).

Saunders, Lewis and Thornhill (2009) also note that a case study approach is particularly apt for doing

research which involves an empirical investigation using multiple sources of evidence. One of the main strengths of this approach is its depth, and the amount of detail it can generate. Several different methods were used to collect data, all of which are associated with a qualitative approach: interviews, observation, and documentation analysis, notably of the project final reports. Observation was particularly significant, undertaken in weekly project management meetings held at the companies' premises. There were, in addition, many *ad hoc* meetings with senior management and systems' users, as well as with the associates performing the project manager roles.

FINDINGS

Since 2002, the University of Gloucestershire has completed 44 KTPs, and four case studies seen through the lens of the three partners (the company, the associate and the University) provide an illustration of the workings and benefits of the scheme, and of its contribution to entrepreneurship and enterprise. The case studies are of Beacons Business Interiors Limited, Dowty Propellers, EnergistUK Limited and Muddy Boots Software Limited, all of which have operating bases within 40 miles of the University, and which can thus be seen to be local companies (Table 1).

Beacons Business Interiors Ltd (BBI)

BBI was established in 1989 as an interiors construction company providing its clients with facilities support services incorporating office furniture installation and design, mechanical and electrical design and construction services. In 2004, when the company embarked on the KTP project, it had 45 employees and operated from bases in Brecon, Leeds and Cheltenham. The aim of the KTP was to enable BBI to rationalise its business processes to take advantage of existing information systems, and then to leverage additional benefits through the implementation of new communications and software integration technologies. The project involved the introduction of new corporate business processes and the setting of key performance indicators to assess the success of the change programme, introducing new systems to improve management information and support efficiency gains, and the embedding of a new information culture and management of a corporate training programme.

The main improvements in information management introduced during the KTP project are listed in Table 2. Some of the key benefits came from the development of an integrated project-costing sheet, which eliminated the re-keying of data to provide an on-line snapshot of project profitability. This gave the estimation department a quick effective feedback tool to guide their pricing, and eliminated painstaking

manual work in working out contract detail. A further enhancement was the introduction of automated programs ('POP' and 'SOP') to produce on-line reports for all purchase orders and sales orders related to a

	Before the KTP Project	After the KTP Project
1	The company received about 30 invoices a day. To register these invoices and channel them to the right person, was taking about 2 hours a day.	Using the new Project Identifier Program (PIP), this process took only ½ hour a day - a major reduction.
2	The project-costing process took 1 hour every day to process all the invoices and one full day every month to make the necessary calculations and produce the project-costing sheet. These sheets were neither accurate nor on time, as the recording and calculation were done manually.	A new Project-Costing Sheet (PCS) meant that project-costing could be done automatically. Manual calculations were no longer necessary, allowing timely profit analysis by customer project.
3	For managing deliveries and suppliers, the project support team had to use one database to find out the purchase order number, and then use that code to obtain the purchase order details from a second database. This was time consuming and error prone.	Using new programs written in Visual Basic and Excel - Purchase Order Processing (POP) and Sales Order Processing (SOP) - purchase orders, the supplier details and delivery status were organised on one sheet per project. As this was an Excel sheet, it also gave the project support team the facility to search quickly for any item of information that they might need, which was related to their project.
4	It took the accounting department about a day every month to sort out the site staff wages.	Using the new Time Sheet Database (TSD), this was reduced by 75% and could be done in two hours.
5	Site staff performance management was not effective as there was no electronic database to make the necessary analysis.	The TSD was equipped with the necessary analysis, making the management of site staff performance more effective.

Table 2 Key efficiency gains from new information systems at BBI

specific project. Many aspects of day-to-day operations were affected by these developments. The ability of BBI to respond to customers' information and collaboration requirements has numerous benefits in maintaining existing relationships and securing new business. The introduction of comprehensive, integrated systems solutions, which share a common database, helped to minimise data duplication and data errors. This reduced the overheads on management to resolve data conflicts and improved information quality and engendered effective decision-making. Another benefit to BBI was to allow flexible working from home. Many of the company's staff were away from the office for much of the working day. Hitherto, effective access to key information from remote PCs and laptops had been impractical because of lack of systems integration. This had frustrated attempts to encourage remote working by engineers, sales and other staff. The new systems platform made this possible. Steve Lesbirel, the company's Strategy Director, commented that 'the

KTP project vastly improved management information in key business areas and established information strategy options for future years' (Momenta, 2007:1).

The University of Gloucestershire, the academic institution, reported a number of benefits from the KTP. The KTP was seen to have extended academic experience and expertise into a new business area, namely office design, assembly and delivery, and it led to enhanced awareness and understanding of the importance of project costing. The outcomes of the KTP provided live case study material for a third year undergraduate module on E-Business and led to some new consultancy and training opportunities. The University also reported that the KTP had provided a direct input into research on the development and implementation of information systems strategy in SMEs. The KTP associate reported gaining valuable commercial experience in facilitating a company-wide change programme, extended his working knowledge of a number of market leading software packages, and successfully completed qualifications in both management and commercial computing during the course of the KTP.

Dowty Propellers

Dowty Propellers is part of Smiths Aerospace, which in turn is a division of General Electric. At the time of the KTP project, the company had 181 staff, and could thus be considered an SME, albeit being also part of a larger international group. Dowty Propellers itself is recognised as the industry leader in the manufacture of composite blades using resin transfer moulding technology, and is split into the two main value streams of the business - the manufacture of original equipment (OE) and the aftermarket business, which constitutes the company's Repair and Overhaul (DPRO) operations. 70% of the business was related to OE and the remaining 30% to DPRO. An Enterprise Resource Planning (ERP) system (Syteline) had already been installed in Dowty OE, but the main functions of DPRO were supported by a different ERP system (Fourthshift). The original aims of the KTP were to implement a new integrated ERP system based on new data base technology and to remodel core business processes. However, following a number of changes within the company and more widely within Smiths Aerospace, the project was refocused on the implementation a the Syteline ERP and new business processes in DPRO and to manage its interface with Smith's corporate financial systems, specifically the SAP Financials module, part of another ERP system, supported corporately across the Group.

Business analysis was carried out at an early stage of the KTP project to identify the current status of the IT architecture at DPRO; this was a key step to determine and plan how best to link the two businesses together within the given short timescales. The business analysis revealed a set of systems that had grown

organically to support the needs of the business as it experienced a period of rapid growth. As Fourthshift was unable to meet all business information requirements, enterprising computer end-users had developed a suite of standalone databases and spreadsheets to help them run the business. Whilst this supported the business at the time, management recognised the need to rationalise and simplify the company's information systems as the business entered a new phase of growth. The improved functionality of the Syteline ERP would reduce the reliance on end-user systems.

The proliferation of these databases had increased the support demands on the IT department, and the department had also lost much of its Fourthshift expertise. The migration to Syteline therefore made support easier to deliver, and was within a core skill set of Smiths Aerospace IT function. It also facilitated change control and standardisation of the IT architecture. A common ERP platform also facilitated the implementation of standard business procedures and controls at both sites. By adopting Syteline, the DPRO business area was brought within scope of the Group strategic information systems provision.

The project reviewed, improved and standardised core processes across the two businesses so that both companies could be supported by one configuration of Syteline. Gap analysis was carried out to identify the business requirements and map these to the functionality offered by the new ERP system. A new IT architecture was devised and peripheral databases were reduced to the bare minimum, leaving just four additional Access databases connected to the main ERP system. The communications between the two sites in Gloucester were also addressed, as the DPRO site was linked to the ERP server hosted at the OE site. Systems piloting, user acceptance testing and training were progressed in accordance with the project plan.

The system was delivered as per plan and the new system went live at DPRO in March 2006. No major problems were reported after go-live, only teething problems that were directly related to system configuration and user access rights. This was recognised as a potential issue on the plan as there was not enough time to cater for all the necessary system administration work before the go-live date. Business management agreed to compromise in some areas in order to have the DPRO business integrated into the OE business by the agreed date, and so a post-implementation phase was agreed to address minor issues.

Dowty Propellers reported that the KTP helped it to align information technology with its business strategy, and to help the company to respond to business change more flexibly and to standardise on the SAP Financials package without having to sacrifice profitability, transparency or internal control. More specifically, the company reported that the KTP enabled the company to successfully introduce an integrated business

strategy that replaced discrete, project based activities, managed as separate functions, and this in turn promoted a cost effective approach that enabled it to achieve agility, drive revenue and competitive advantage, enhance productivity and ultimately to optimise the business performance. The KTP project was seen to be central in providing a common information system - the Syteline ERP product - to support the business in improving customer service and reducing costs.

The academics working on the KTP at the University of Gloucestershire were involved in a major systems project with a large multi-national client and this was important in enhancing their appreciation of the integration of theory and practice, which in turn provided valuable live inputs to three third year undergraduate modules. A small number of third year undergraduates assessed the business process analysis developed for Dowty Propellers against mainstream models of information systems and e-business adoption. The KTP also provided material for comparative research on systems strategy which was published in an international journal. More generally, the KTP allowed academic staff within the University of Gloucestershire to develop their understanding of the supply chain in the aerospace sector and this is valuable in a region where the industry is well represented and more specifically led to a further KTP at SKF AeroEngine Bearings, another aerospace company within the county. During the course of the KTP, the associate completed a comprehensive training programme and at the end of the project secured a post with a commercial vehicle manufacturer and dealership in Swindon.

Muddy Boots Software Ltd (MBS)

MBS is a rapidly expanding software house and at the time of the KTP, the company's business plan targeted a trebling of turnover within 5 years from £1.3m in 2009/10 to £4.0m in 2014/15. The company creates innovative software for the food supply chain and the company's vision was to be a world recognised authority and trusted provider of traceability and quality assurance solutions for sustainable food and farming. The company's customers include Unilever, Marks and Spencer, Morrisons and Coles. The company's UK operations are based at Ross on Wye in Herefordshire, but the company also has bases in Germany, Kenya, South Africa, Egypt, Australia and New Zealand. The aims of the KTP were to research, develop and install new technical services, systems and processes to support growth and to enable the company to provide the level of service required by its evolving customer base. MBS was transitioning from a mainly UK customer base to an international user base, supported by additional offices abroad, and systems which could be accessible from multiple locations and time zones. More specifically the KTP was focused on developing a technical framework that enabled improved software distribution and support for international systems

operations, on the specification, development and implementation of new training systems to support sales operations, and on embedding a new customer-centred support culture through intensive staff training and support.

The company reported that the KTP had led to an increase in the capacity of its technical services function and had seen an upskilling of its technical services division to provide a reliable, robust and effective function to the business. A number of different software products were used for service management activities with different activities being undertaken by different teams of staff. The majority of these were Microsoft products (TFS, Outlook and CRM) and the KTP project succeeded in improving integration of both software products and associated processes. There was a lot of technically sound software in place, and the KTP provided additional analysis and a degree of re-implementation to optimise its deployment to support its international operations. In addition, the company reported that the KTP had seen the development of up to date user guides, tutorials and functional documentation for its own software products, and the introduction of more effective means of capturing, storing and retrieving customer contact details and support cases, which have in turn led to a more efficient technical support capability. The KTP also enabled the company's management team to obtain a better overview of the technical services team's performance through advanced reporting from its systems, and thus were able to identify pressure points and to gauge customer demand more accurately.

The company also reported that the new knowledge and capabilities acquired through the KTP had been successfully embedded into the business, for example, via the creation of process and workflow documentation, staff training, regular staff knowledge sharing workshops and management reports. The combined effects of the completed roll-out of the Microsoft CRM system, the development of a technical services portal, the upskilling of technical support staff, the introduction of documented processes and procedures, video tutorials, the remote training capability, and the establishment of 24/7 support desk, had all contributed to the securing of a number of high-profile accounts, supporting a growth in turnover to £1.9m by the close of the project in 2011/12.

Within the University of Gloucestershire, the KTP acted as the catalyst for the development of thinking around information systems strategy and service management systems. The KTP provided a case study for a third year undergraduate module and material for a student project. The research outputs from the KTP were limited and were confined to a published conference paper, which examined three different KTPs that

focussed on improving service systems and processes. Following the completion of the KTP, the associate obtained a permanent position with Muddy Boots as Service Support Manager.

EnergistUK Ltd

EnergistUK, based near Cirencester in Gloucestershire, is a small family business operating within the construction consultancy market. The company, which was founded in 2004, had 40 employees and a turnover of £1.1m in 2009/10, when the KTP started. The company wanted to make better use of their 8,000 customer profiles through the utilisation of a new Customer Relationship Management (CRM) system. This aligned with their overall business strategy, which aimed to make their customers aware of all assessment needs regarding compliance with environmental regulations, and to support them in resolving these needs. Before the KTP project got underway, the company had a technologically more basic approach to customer relationship development, using Microsoft Outlook to store customer records within a range of shared folders. Reporting was limited in scope, and poor internal version control meant that data was too often inconsistent or lost.

In 2010, the Microsoft CRM system was selected as the new software product that would act as the main repository for customer detail storage, analysis and reporting. Other Microsoft Office applications were already deployed in the company, so an expansion of this software suite to include the CRM module made good financial and technological sense. The software was acquired and supported by a licensed distributor, chosen on the criteria of cost, capability and customer rapport. Specific modules from this off-the-shelf package were selected, allowing some configuration to meet specific user requirements. The modules selected were the sales module for data capture purposes (supporting customer management from sales lead to invoicing), and the marketing module, so that customers could be targeted and sold the correct services on the basis of increased customer knowledge. As Microsoft were the software provider, the system was likely to remain technically robust, scalable and future proofed, as different upgrades would be released in coming years.

Project implementation was undertaken adopting a phased approach, spanning a nine month period in 2010-2011. Two methodologies for managing the project were adopted. Initially, SSADM - a mainstream methodology for systems projects - was used, until software product selection was made. From then on, Microsoft's rapid application development (RAD) approach was adhered to, for reasons of cost and practicality. The project was directed by the company IT manager, and managed on a day-to-day basis by the associate. Third-party consultants were also used during the implementation. The project progressed

reasonably smoothly, although the requirement to parallel run new and old systems resulted in problems around data updates and staff resourcing. The relatively speedy implementation limited any overall negative impact. The implemented solution allowed integration with both Outlook and the company's Sage accounting package, although the Sage integration required the use of a middleware product (Sage Redware), which allows a 2-way data exchange between the two packages.

For the company partner, a major benefit has been more effective marketing and customer profiling resulting from the centralisation and consolidation of sales and marketing data. The user-friendliness and configurability of the package allows the system administrators and key users to enhance their core customer data with new details and concepts. Data entry screens and views of data have been customised for individual users' requirements and job roles. Benefits include improved management reporting and better systems integration (in invoicing and servicing) as new versions of the package are released. The system is now well bedded in and upgrades to the new version of the package are planned for 2016-17. The project 'has helped to consolidate and manage information about our client base, and the system now allows us to effectively market to, and communicate with, them' (Technology Strategy Board, 2012:3). The system has supported the continued growth of the company with turnover increasing significantly since implementation in 2010/11 to reach £2.3m in 2012/13 and £3.0m by 2014/15.

For the University, this project provided a significant case example of CRM systems implementation that has contributed to a broader research project examining CRM projects in small businesses. This has focussed on key implementation issues in three CRM KTP projects, and has allowed the development of new models to guide CRM systems implementation (Wynn et al., 2016). It also provided valuable case material for undergraduate teaching. The associate built on his first-hand experience of project managing a CRM project to secure a permanent job in IT in the private sector.

ANALYSIS AND DISCUSSION

This section directly addresses the two RQs noted above by drawing on the case study findings and related analysis of existing literature, and then explores some of the wider strategic benefits the University of Gloucestershire has derived from the KTP projects.

RQ1: What has been the nature of knowledge transfer in KTP projects and how has this impacted the University and the company partners?

The case studies illustrate the rich two way exchange of knowledge that took place in these projects between university and company partner staff. The associates and KTP supervisors employed by the University

brought a range of skills and knowledge to support the implementation of these IS and process change projects. Equally, the learning experience for university staff was unquestionably of significance and value, allowing new materials to be used in teaching, and providing new case material for student projects and for research publications. This was not just confined to the authors of this article, as additional supervisors, who had not been previously exposed to KTP project supervision, were also used on the EnergistUK and MBS projects.

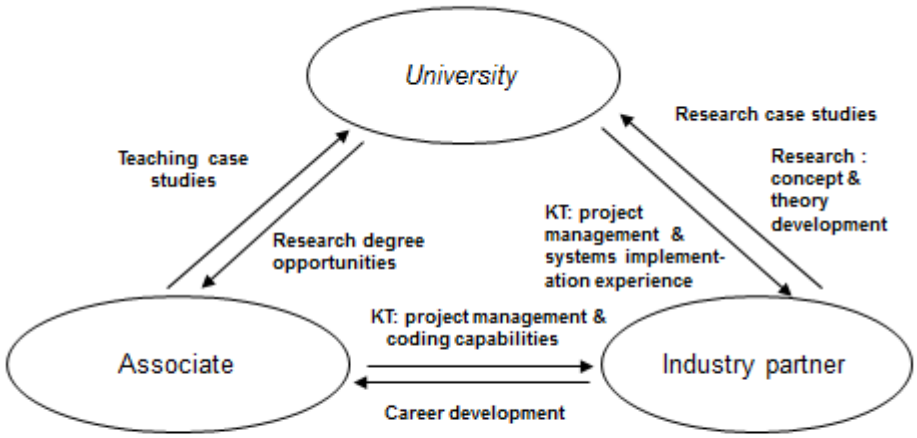

Figure 2 KT, teaching and research within a KTP (based on the BBI KTP project)

The Lambert Review (2003) described KT as being concerned with transferring knowledge and skills between universities and business and in a similar vein, the Regeneris Consulting (2010) strategic review of KTPs suggested that the core aim of the scheme is to transfer knowledge from academia to business. The KTP projects studied here show that the transfer of expertise and skills was, in fact, in both directions (Figure 2). The Work Foundation (2010) emphasised the value of universities as a source of knowledge and innovation which can benefit start-ups and existing businesses, and knowledge transfer from universities can play a crucial role in the organisational development of local industries. In the KTPs studied here, a major contribution by the associates and academics from the University concerned the use of project management methodologies to plan and implement the systems projects. This was complemented by a broader knowledge of systems implementation processes brought in by the university supervisors, and the coding

capabilities of the associate. Interestingly, this expertise did not originate from university research projects, but rather from the real-world experience in industry of some of the supervisors and associates. Overall, and more generally, the final reports to the funding partner suggested that the KTPs successfully met their initial aims, including the embedding of new knowledge and skills in the culture and operations of the company partners. The KTPs provided new systems, processes and procedures that supported significant growth in turnover in all four companies across the lifespan of the projects (Table 1).

The involvement of staff as KTP supervisors was of benefit to their teaching capabilities and programmes in a number of ways. Understanding of conceptual issues and models was enriched by exposure to real-world practitioner contexts, and this was evidenced in a range of new teaching materials. Interaction with company staff as colleagues in the KTP project team also provided a range of learning and personal development opportunities, which can enhance the style and quality of teaching in business related disciplines such as Computer Science. The spin-offs from KTPs in terms of research activity could, and arguably should, be more systematically pursued and developed. However such activity faces a number of challenges – for example, the encouragement and facilitation of a stronger and more supportive research culture, and the introduction and funding of timetabling arrangements to create time and space for academics to pursue research. Knowledge sharing, based, for example, around the issue of regular newsletters, bulletin boards and staff development sessions, could be important in making information about KTPs more widely available to academic staff. That said, such knowledge sharing depends on members of the academic staff having and maintaining the enthusiasm to participate in the process, and here the issues of culture and incentives mentioned above are important factors. More generally, information from KTPs could profitably be housed in the research repositories now common in almost all UK universities, as part of the evolving Research and Teaching Excellence Frameworks.

RQ2: How do KTP projects help foster the entrepreneurial university?

At national level, it is the interaction between research and knowledge transfer activities that is perhaps the key to the development of the entrepreneurial university in the spirit intended in the Lambert Review. Entrepreneurship and innovation are central to UK government policy for re-invigorating and supporting British industry, and the University sector continues to play a key role in this process. This role is likely to be reinforced once the Higher Education and Research Bill, currently reaching its concluding stages in Parliament in 2017, comes into effect. This entails major reform of the UK's research and innovation funding system to bring together all Research Councils, Innovate UK and HEFCE's research funding role under the

single banner organisation of UK Research and Innovation (UKRI). Within this evolving funding landscape, and particularly for less research-intensive universities, KTP projects can play a key role in engendering an entrepreneurial culture and instigating related activities.

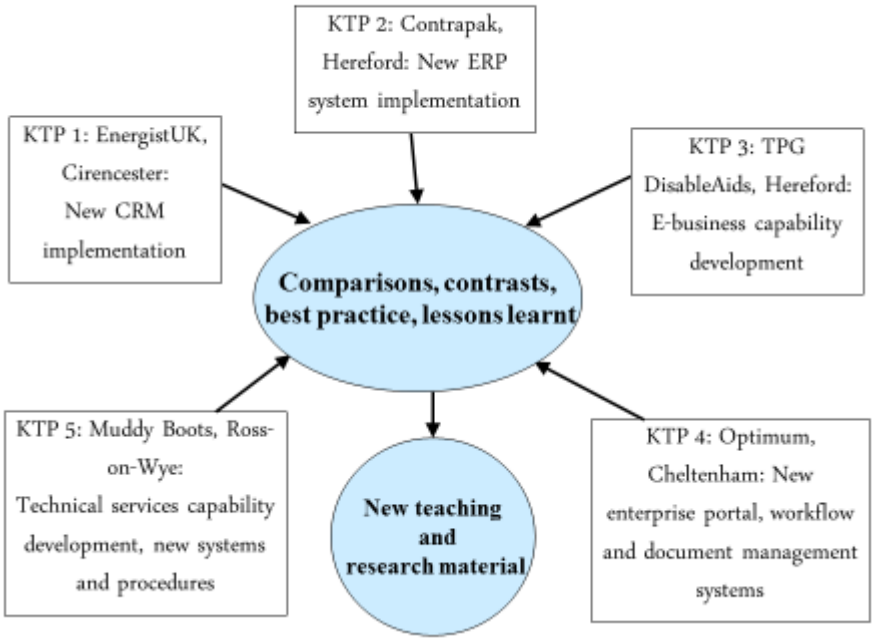

Figure 3 KTP projects at the University of Gloucestershire 2010-11

Individual KTPs should not be seen in isolation, and the knowledge, teaching and research they generate can over time form a critical mass of expertise and enterprise which can in turn generate its own momentum. Apart from opportunities for learning and applied research within each KTP project, there are similar and arguably richer opportunities for cross-KTP research and development. We have already outlined some of the benefits for the University from the Muddy Boots KTP, which at one level may appear modest. However, a snapshot of KTP activity at the university in 2010-11 shows 5 parallel-running projects all involving IS implementation and support (Figure 3). This provided material for cross-project comparisons and contrasts that were used in undergraduate teaching. It also provided the experience and case material for the drawing up of a comprehensive set of guidelines for KTP project selling, designing and supervision, subsequently published in an educational journal (Wynn and Turner, 2013).

In addition, the KTP programme can be used as the stimulus for other entrepreneurial initiatives. For example, a short course programme can be developed that builds on skills deployed in KTPs. At the

University of Gloucestershire, several of the university KTP supervisors were trained in PRINCE2® to support the KTP systems projects, and this led to a programme of PRINCE2 courses at the University for industry practitioners and academics, a programme that is still running today. Other courses on management of successful projects, skills and personality profiling and development, and financial management were put together as the short course programme was established. Related consultancy packages, concerning, for example, information systems strategy were also developed, and presentations were given at the annual Growing Gloucestershire conference held at the University (Wynn, 2007). This in turn generated new interest in KTPs, short courses and related activities. These early initiatives that built on the KTP programme provided the basis for many of the Growth Hub activities, discussed below, that followed and continue today.

The development of such a critical mass requires commitment at the university level and from what ideally will be a growing number of academics. University commitment is important in that the growth of KTP activity requires different, and for some academic staff, unfamiliar and possibly partly unwelcome, forms of working. KTP activity thus may need to be incorporated into both contractual arrangements and work scheduling models along with teaching, research and administrative duties. At the same time, it is vitally important that academic staff are fully prepared to buy into KTP activity, not least because half-hearted commitment can seriously damage the university's reputation within the commercial marketplace. Here, it is important that academic staff with KTP experience actively promote the teaching and research benefits of KTP activity, and are prepared to mentor less experienced colleagues.

The KTP projects successfully completed by the University of Gloucestershire and its partners have certainly generated a wide range of operational benefits, but in addition the synergies between knowledge transfer, research and teaching have provided both an essential platform, and served as a catalyst, for the wider development of entrepreneurial activity within the University. In many ways, it is their wider strategic benefits that may prove to be the most important contribution to the continuing development of the University's entrepreneurial spirit. Following the successful completion of a large number of KTPs, the focus of the University's entrepreneurial activity was given physical and strategic substance in 2014 with the establishment of the Growth Hub which is now housed in - and in many ways forms the centre piece of - the Gloucester campus. The Growth Hub is a partnership between the University and GFirstLEP, the local enterprise partnership. Here the aim is to help local businesses realise their potential and grow, and the Growth Hub is seen as 'the focal point for ambitious businesses who are seeking the relevant information,

guidance, support, expertise, finance, knowledge and experience they need to grow' (University of Gloucestershire/GFirstLEP, 2014: webpage).

The KTP programme and the majority of the University's business partnerships are now administered via the Growth Hub, which also offers incubation services for the creation of new businesses and graduate start-ups. More generally, the Growth Hub looks to offer support to local businesses across a wide range of functions including business strategy, sales and marketing, operations, human resource development, finance and export operations. In order to strengthen the links between the university and the business community, the post of Director of Business Engagement and Partnership was created in 2016 and the focus is on exploiting the university's resources to meet the needs of a broader range of businesses, and on promoting the university's services in skills, innovation, knowledge exchange, strategic partnerships and specialist sector expertise.

In line with these aspirations, the Growth Hub already offers an environment to test new ideas, gather feedback from target markets, and inform product development. More generally, the University of Gloucestershire is also developing a number of strategic regional partnerships. In November 2016, for example, the University established a formal partnership with Raytheon, a large, US-based defence manufacturer, which has a significant subsidiary UK business in intelligence and cyber security, and which recently established a presence in Gloucester. This partnership reflects the development of Gloucestershire as a national centre for cyber intelligence and security. Raytheon has supported the development of degree apprenticeships in cyber, contributed to the design and delivery of courses, and undertaken to sponsor and co-fund some PhD students and to support some undergraduate student projects. Another recent development has been the joining of the Business School with the School of Computing and Technology in 2016, as part of the new Faculty of Business, Computing and Applied Sciences, with the Business School moving to new premises alongside the Growth Hub in 2017. This aims to further cement and expand the university's entrepreneurial activity with the local business community, with Business School staff working in liaison with the Growth Hub.

CONCLUSION

The four case studies of KTPs completed at the University of Gloucestershire provide an illustration of the achievements of these projects as managed by a less research intensive university. The case studies reveal that the KTPs produced tangible benefits for the businesses, the university and for the associates, and as

such they can be seen to have contributed positively to enterprise and entrepreneurship within the local region. At the same time the authors also outline some of the challenges in looking to spread and maximise the benefits of KTP activity within the University and suggest some ways in which these challenges might be overcome.

The KTP scheme constitutes an ideal vehicle for involving academic staff in the development of the entrepreneurial university, through the interaction of KT, teaching and research activities. As Regeneris Consulting (2010: ii) noted, the KTP 'is an important tool to help academics engage with business and a key vehicle to develop their understanding of industry.' The significance and potential of this role in developing the entrepreneurial university suggests that some of the conditions for gaining KTP approval and funding could be relaxed somewhat, to allow less research intensive universities to build up their KTP portfolios. The emphasis on innovation for new KTP projects since 2012 is understandable, but projects like those discussed above are surely also still worthy of support. They deliver genuine bottom line benefit to the company partner, and engender the active participation and growing contribution of the academic community to the entrepreneurial development of the UK's universities. A significant programme of KTPs can involve academics in a broader range of customer facing roles, and thereby build upon relationships and linkages between different initiatives to generate a sustainable income from these 'third wave' activities.

® PRINCE2 is a registered trademark of the Office of Government Commerce

References

Audretsch DB, Kuratko DF and Link AN (2015) Making sense of the elusive paradigm of entrepreneurship. *Small Business Economics* 45(4): 703-712.

Ankrah SN, Burgess TF, Grimshaw P and Shaw NE (2013) Asking both the university and industry actors about their engagement in knowledge transfer: What single-group studies of motives omit. *Technovation* 33(2/3): 50-65.

Bruyat C and Julien P-A (2000) Defining the Field of Research in Entrepreneurship. *Journal of Business Venturing* 16(2): 165-180.

Bryman A and Bell E (2011) *Business Research Methods.* Oxford: Oxford University Press.

Coyle P, Gibb A and Haskins G (2013) The Entrepreneurial University: From Concept to Action. Available at: https://www.oecd.org/site/cfecpr/EC-OECD/%20Entrepreneurial%20Universities%20Framework.pdf (accessed 13 May 2016).

Decter MH (2009) Comparative review of UK-USA industry-university relationships. *Education and Training* 51(8/9): 624-634.

Department for Innovation, Universities and Skills (2007) The Race to the TOP: A Review of government's Science and Innovation Policies. Available at: http://www.rsc.org/images/sainsbury_review051007_tcm18-103118.pdf (accessed 23 May 2016).

Dowling A (2015) The Dowling Review of Business-university Research collaborations. Available at: http://www.raeng.org.uk/policy/dowling-review/the-dowling-review-of-business-university-research (accessed 3 June 2016).

European Commission/Organisation for Economic and Cultural Development (2012) A Guiding Framework for Entrepreneurial Universities. Available at: https://www.oecd.org/site/cfecpr/EC-OECD%20Entrepreneurial%20Universities%20Framework.pdf (accessed 18 May 2016).

Hardhill I and Baines S (2009) Personal reflections on Knowledge Transfer and changing UK research priorities. *21st Century Society* 4(1): 81-94.

Kalar B and Antoncic B (2015) The entrepreneurial university, academic activities and technology and knowledge transfer in four European countries. *Technovation* 36/37: 1-11.

Kao RWY (2006) Defining Entrepreneurship: Past and Present and?. *Creativity and Innovation Management* 2(1): 69-70.

Lambert R (2003) Lambert Review of Business-University Collaboration – Final Report. Available at: www.lambertreview.org.uk (accessed 13 April 2016).

Ma H and Tan J (2006) Key components and implications of entrepreneurship: A 4-P framework. *Journal of Business Venturing* 21(5): 704-725.

Mansell G (1991) Action research in information systems development. *Journal of Information Systems.* 1(1): 29-40.

Momenta (2007) Beacons Business Interiors (BBI) – Optimising Business Processes, KTP Case Study, Momenta.

Peattie K (1993) The Teaching company scheme: Effecting Organizational Change through Academic/Practitioner Collaboration. *Journal of Management Development* 12(4): 59-72.

Perkmann M, Tartari V, McKelvey M, Autio E, Brostrom A, D'Este P, Fini R, Geuna A, Grimaldi R, Hughes A, Krabel S, Kitson M, Llerena P, Lissoni F, Salter A and Sobrero M (2013) Academic engagement and commercialisation: A review of the literature on university-industry relations. *Research Policy* 42: 423-442.

Regeneris Consulting (2010) Knowledge Transfer Partnerships Strategic Review. Available at: http://webarchive.nationalarchives.gov.uk/20140827133341/http:/www.innovateuk.org/_assets/pdf/corporate-publications/ktp%20strategic%20review%20feb%202010.pdf (accessed 3 June 2016).

Saunders M, Lewis P and Thornhill A (2009) *Research Methods for Business Students.* England: Pearson Education Limited.

Technology Strategy Board (2012) Knowledge Transfer Partnerships – KTP 007225 Partners' Final Report, EnergistUK Ltd. Unpublished.

The Growth Hub (2016) The Growth Hub. Available at: http://www.thegrowthhub.biz/ (accessed 31 August 2016).

Thorp H and Goldstein B (2010) *Engines of Innovation: The Entrepreneurial University in the Twenty-first Century*. Chapel Hill: University of North Carolina Press.

University of Cambridge (2016) What is knowledge Transfer? Available at: http://www.cam.ac.uk/research/news/what-is-knowledge-transfer (accessed 2 June 2016).

University of Gloucestershire (2012) Strategic Plan 2012-2017. Available at: http://www.glos.ac.uk/docs/download/Sustainability/Strategic-Plan-2012-2017.pdf (accessed 16 May 2016).

University of Gloucestershire/GFirstLEP (2014) The Growth Hub. Available at: http://www.thegrowthhub.biz/ (accessed 23 November 2016).

Warwick Economics and Development (2015) KTP Programme: The impacts of KTP Associates and Knowledge Base on the UK Economy. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/467142/KTP_Report_July_2015_Exec_summary__1-SEP-15_.pdf (accessed 2 June 2016).

Wilson T (2012) A Review of Business-University Collaboration. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/32383/12-610-wilson-review-business-university-collaboration.pdf (accessed 3 June 2016).

Work Foundation (2010) *No city left behind? The geography of the recovery – and the implications for the coalition*, Work Foundation, July.

Wynn M (2007) Developing your Information Systems for Growth. In: Growing Gloucestershire Conference, June 2007. Available at: https://eprints.glos.ac.uk/view/creators/2747.html (accessed 12 December 2016).

Wynn M and Turner P (2013) Effecting successful knowledge transfer: lessons from the UK Knowledge Transfer Partnership scheme. *International Journal of Management in Education* 7(3): 293-312.

Wynn M, Turner P, Abbas H, and Shen R (2009) Employing Knowledge Transfer to support IS implementation in SMEs. *Journal of Industry and Higher Education* 23(2): 111-125.

Wynn M, Turner P, Banik A and Duckworth AG (2016) The impact of customer relationship management systems in small businesses. *Strategic Change* 25(6): 655–670. Published online in Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/jsc.2100.

Yin RK (1994) *Case Study Research: Design and Methods.* Thousand Oaks, CA: Sage