

Knowledge Transfer between UK Universities and Business

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Abstract

In this paper, knowledge transfer between universities and business in the UK is examined at a number of different levels. The term 'knowledge transfer' has different meanings in different contexts and so the meaning of the term from a UK perspective is discussed. As UK knowledge transfer is usually part of the innovation agenda, the meaning of 'innovation' is also considered. A number of different activities, considered to be part of the third mission agenda, are often thought of as being capable of achieving knowledge transfer. The most common of these are described and the potential of each for actually achieving knowledge transfer is discussed. The UK government flagship knowledge transfer scheme, Knowledge Transfer Partnerships, is widely acknowledged to a very effective knowledge transfer paradigm. The Knowledge Transfer Partnerships methodology is described, and two case studies of projects that have been successfully carried out using this paradigm are presented. These case studies illustrate the point that while knowledge transfer was effectively achieved during the partnerships, innovation was also facilitated as a vital part in the process. The factors encouraging and supporting innovation during a knowledge transfer partnership are discussed. The conclusion is drawn that the knowledge transfer partnerships methodology forms a framework exhibiting a number of features that makes it more likely that innovation will arise, and that it is this combination of knowledge transfer and innovation that makes the scheme so effective and successful.

1. Introduction and Definitions

For a considerable time in their history UK universities were concerned only with teaching and research. More recently, however, a third mission has been established focussing on university enterprise activities, links with business and more recently still, collaboration with the community. This third mission activity has led to a third stream of funding (in addition to teaching and research funding) which universities, with government encouragement, increasingly wish to exploit. The 2009 Annual Innovation Report records that UK universities' external income was over £2.8

billion in 2007/08 (latest available figures) more than doubling in real terms since 2001 and increasing by 6.5% on the previous year [1].

Various government initiatives relating to the university-business interface can be identified dating back several decades, for example the Teaching Company Scheme which originated in the mid-70s. Just in the past five years there have been several significant reviews emphasising the importance and potential of this new area of activity, of which the following are examples. The Leitch review of the UK's long term skills [2] needs concluded that "...higher level skills are key drivers of innovation, entrepreneurship, management, leadership and research and development critical to a high skills, high performance economy increasingly in demand from high performance, global employers...". One of the recommendations of the Warr report on the impact of the Research Councils [3] was to "Expand incentives for researchers to participate in knowledge transfer". The Government accepted the recommendations of the Sainsbury review of science and innovation [4] and announced actions especially relevant to knowledge transfer, for example "Improved knowledge transfer between the research base and business through an improved Higher Education Innovation Fund, building up support for business-facing universities, and a doubling of Knowledge Transfer Partnerships to boost research-business links." The latest Annual Innovation Report [1] contains a recommendation to "... broaden knowledge exchange between the research base and business into the arts and humanities and service sectors such as the creative industries."

Knowledge may originate from a range of sources, including independent research centres outside the higher education sector. Hence, the UK Government Department of Business, Innovation and Skills (BIS, the ultimate successor to the Department of Trade and Industry) states on its web site that "Within a modern, knowledge driven economy, knowledge transfer is about transferring good ideas, research results and skills between universities, other research organisations, business and the wider community to enable innovative new products and services to be developed" [5].

While the concept of knowledge transfer originated in the desire to commercialise the outcomes of scientific research, the benefits of disseminating the outcomes of non-scientific research into the wider community more recently became appreciated. Hence, the RCUK web site describes knowledge transfer in the following terms "Knowledge transfer describes how knowledge and ideas move between the knowledge source to the potential users of that knowledge. The Research Councils encourage knowledge transfer by supporting schemes and activities to transfer good ideas, research results and skills between, for example, universities and other research organisations, business, the third sector, public sector and/or the wider community." [6]

The definition by the Economic and Social Research Council (ESRC) reinforces the idea that knowledge transfer has to have a commercial objective, as stated by its web site [7] *"Knowledge exchange is about exchanging good ideas, research results, experiences and skills between universities, other research organisations, business, Government, the third sector and the wider community to enable innovative new products, services and policies to be developed."*

UK university-business knowledge transfer has for some time been considered to be part of the innovation agenda, where the aim is to inject new ideas into companies to improve their competitiveness and profitability. An important implicit aim is that it should be orientated towards a useful outcome in business terms. Specifically, knowledge transfer should lead to innovation, which should in turn result in economic improvements reflecting on the bottom line profitability of a business.

Joseph Schumpeter defined innovation as 'ideas applied successfully in practice' and identified as areas where innovation can be applied the introduction of new goods, new methods of production, the opening of new markets, the conquest of new sources of supply and the carrying out of a new organization of any industry[8].

Hence, knowledge transfer can be applied to businesses to improve their bottom line profitability through, for example, the following types of innovation:-

- Devising new products or services, or improvements to existing products or services
- Improving manufacturing processes, including cost reduction and waste elimination
- Embedding new organisational concepts such as continuous improvement or mass customistaion
- Enhancing marketing strategies, enabling new markets to be challenged or finding better ways to challenge existing markets
- Interacting with customers better through e-commerce, web and internet systems

There is increasing interest in applying knowledge transfer to the social economy including organisations such as cooperatives, non-governmental organisations, charities, voluntary or non-profit bodies, or the community. In the case of a non-profit organisation, the aim of applying knowledge transfer to improve profitability may not be valid, although producing an increased surplus to be fed back into the organisation may be. In such a case, alternative objectives need to be specified such as:-

- An increased level of activity achieved with the same level of staff and resources
- The same level of activity carried out with fewer staff and resources
- The ability to carry out activities that would not have been possible before
- An increased level of financial surplus to be reinvested into the organisation

Although the broad principles of knowledge transfer are well understood and stated in the context of UK university-business and community interaction, the term knowledge transfer is also used and understood in other sectors, where it is interpreted differently. Knowledge transfer has a place in aspects of business management. In this context knowledge transfer is considered to be the practical problem of transferring knowledge from one part of an organisation to another area of the organisation, or indeed to another organisation altogether. This area topic is well covered in the literature (for example [9] and [10]); however, it is outside the scope of this paper.

The preceding discussion leads the following definition of knowledge transfer in the context of UK universities, business and the community: Knowledge transfer is the application of the knowledge of a university or non-university research centre into a business or community organisation, leading to innovation that improves its ability to operate in terms of improved profit or efficiency.

This rest of this paper focusses on knowledge transfer between UK universities and businesses.

2. Paradigms for Knowledge Transfer

There are a number of activities that are often grouped under the 'third-mission' heading. The most common of these are described in this section, and the extent to which each is likely to be an effective mechanism for university-business knowledge transfer is discussed.

2.1 Knowledge Transfer Partnerships

Supported by Government funding through the Technology Strategy Board (TSB), Knowledge Transfer Partnerships (KTP), and its predecessor the Teaching Company Scheme (TCS), has been in operation for about 35 years. It has been described as one of the most effective knowledge transfer mechanisms and is the UK Government's flagship knowledge transfer initiative [11].

A KTP project of the classic model involves a university or other research centre, a company or community organisation, and a KTP Associate. The Associate is a graduate that is employed to work in the client company or organisation on the project. This three-way partnership undertakes a project of strategic importance to the company or community organisation. The project must have as a target outcome a defined improvement in the profitability of a company or improvement in the way a community organisation is able to function. The project must also deliver benefits for the Associate and the university.

While the classic model KTP project undertakes strategic projects of about one to three years, a recently introduced shorter KTP (sKTP) is now available for projects with a tactical outcome, having a duration of up to 40 weeks, and an Associate who may have a lower level qualification.

During the 2008-9 year there were 964 Partnerships and 1021 Associate places in the KTP portfolio with an aspiration to increase numbers further [12]. Over the years and decades it has been in operation, the KTP model has gained an enviable reputation for delivering high-quality innovation to UK companies through its three-way knowledge-transfer interactions between firms, universities and skilled graduates.

Two successful KTP projects are described here [13, 14, 15]. KTP will be considered in more detail in Section 3 of this paper.

2.2 Conference and Journal Publications

Publishing of journal and conference papers is a required output of university research. It represents an established method of disseminating research results and circulating them among the rest of the research community. However, the effectiveness of publication as a method of knowledge transfer must be debatable. Knowledge is '*broadcast*', but it may not reach those who need it. Papers usually contain a limited level of detail, often for reasons linked to intellectual property rights, and may be too superficial to make effective exploitation of the knowledge possible. In addition, companies, particularly SMEs, may have difficulty accessing academic published papers for licensing reasons, they may be considered too theoretical and not sufficiently business-relevant.

While no statistics are to hand, it is likely that many more readers access conference papers than attend the conferences, and that most readers of journal papers do so without having an individual copy of the journal. Increasingly conference and journal papers are held online. Often, particularly in the case of science and technology papers, this is by Thomson ISI's Web of Science, Elsevier's Science Direct or Springer's Springerlink. Searches can be performed for papers of interest

using a web search engine that indexes academic publications, for example Google Scholar [16], Scirus, CiteSeeeX and IEEEXplore. Google Scholar will only display index entries for which users are provided with a freely available abstract of the paper [17], and it gives primacy to full text versions.

While many publishers make abstracts of articles freely available on the web, full text versions are often only available through a paid subscription. Universities often have subscriptions covering multiple publishers so that staff and students are able to access the full text versions of papers. Private research centres and companies large enough to have dedicated research departments many also have similar subscriptions. However, small companies are unlikely to find it cost effective to subscribe, and they may lack experience of finding information in this way.

Hence, while publication can be effective at achieving knowledge transfer between universities, there must be doubts about how effective it currently is in achieving knowledge transfer to companies, particularly SMEs. Future trends towards open content, and the growing tendency for authors to make preprint or postprint copies of papers openly accessible on the internet, may have a beneficial effect on this position.

2.3 Spin-outs and Spin-Ins

Spin-out companies, joint company ventures and licensing agreements are often included under the third mission umbrella and in some parts of the world (for example the USA, following the Bayh-Dole act) can be considered predominant modes of university-business interaction [18, 19].

A spin-out company is often formed with the objective of generating revenue, or another useful outcome, from a university's intellectual property rights (IPR) through converting it into a commercial product or service and then marketing it. In some cases a spin-out arises because a university identifies knowledge it wishes to exploit so as to generate a revenue stream for itself. However, the motivation often comes from the academic and income generation is not always the driver. The wish to give something back is growing in some areas as is demonstrated by UnLtd recently having been launched to fund HEI social enterprises [20].

Fazackerley et al in their paper 'Innovation and Industry' notes that the UK could claim to be a world leader in the area of university spin-outs, but only ranks number 11 in the 2009 INSEAD Global Innovation Index on university-business research collaboration. They conclude that there must be more to university-business interaction than spinning out companies [21]. As the desire to commercialise IPR comes from its originator, a spin-out represents a university-led approach rather than

one based on customer need. This is *'technology push'* rather than *'market pull'*.

As such, it does not represent a flexible approach capable of meeting customer requirements in a range of areas. A spin-out can achieve knowledge exploitation and generate revenue for a university, and knowledge transfer occurs between the university and the spin-out. However, it is not clear how a spin-out can achieve knowledge transfer and innovation outside this. Also, while a spin-out may generate a product of use to other companies, equally the product may form competition to existing offerings and the spin-out may become a rival to existing companies.

Formation of a spin-out company can require a significant level of investment that represents a risk to the university. A joint venture company in the form of a spin-in, or an arrangement where the technology is licensed to a company, are alternatives.

A spin-in, where a company works with the university to develop their product or service, can in some circumstances provide a more rapid return on investment than licensing. Flexible arrangements are possible where the university agrees to offer support in exchange for a shareholding or a share of profits or both. A spin-in can also potentially achieve a better fit customer needs, as it is focussed towards the customers' requirements.

2.4 Contract Research and Consultancy

A university may undertake to carry out on a paid basis research and development, product design, investigation of some problem, etc, for a client that does not possess the knowledge to do it themselves. Although knowledge will be transferred into the product through this mechanism it does not necessarily become embedded into the client company. Thus, contract research may form a 'quick fix' that deals with a specific problem, but it often does not give the client company the expertise to deal with similar problems in future themselves.

To overcome this need, some form of training or work-based learning can be linked to the contract research to embed the knowledge into the client company. Alternatively, the knowledge provider may form a continuing revenue stream from providing solutions for the client company.

2.5 Short Courses and Training

Properly structured training can be an effective form of knowledge transfer. However, a problem with short courses is that course participants may feel they understand the material during the course, but find they are unable to apply it when they are back in the company. Embedding of the knowledge is important for the company to gain maximum benefit. This can be achieved by proper post-course

support. Alternatively, structured in the right way, a programme of work-based learning can be an effective means of knowledge transfer.

2.7 Knowledge Transfer Networks

Funded by UK Government through the Technology Strategy Board, Knowledge Transfer Networks (KTNs) are an effective indirect mechanism for supporting knowledge transfer. KTNs raise awareness of specific areas of technology, they facilitate and support research and they are a good mechanism for communication, networking and loosely sharing knowledge. To this extent they achieve informal knowledge transfer. KTNs can also form a means of putting those in need of knowledge with potential suppliers of it.

2.8 New Knowledge Transfer Mechanisms

The development of the internet and related technologies has made available new techniques with the potential for use in knowledge transfer. Although not fully developed yet, there are interesting possibilities for innovative knowledge transfer schemes based on a combination of distance and work-based learning, with the embedding of the knowledge secured through the knowledge agent or associate being an employee of the knowledge client company. This could be a very-cost effective knowledge transfer mechanism where the knowledge client company is an SME, but remains to be explored further.

3. Knowledge Transfer Partnerships

Having considered a number of possible methods of achieving innovation through knowledge transfer in Section 2, the classic Knowledge Transfer Partnerships model, having a well-established track record in knowledge transfer, is discussed in more depth. In this Section, more detail is provided about the structure and operation of a KTP project. Section 4 provides two case study descriptions of KTP projects and in each case an attempt is made to discern the components of knowledge transfer and innovation that took place. Finally, in Section 5, KTP is considered as a framework for facilitating innovation through knowledge transfer.

Each classic model Knowledge Transfer Partnership involves three participants, a UK company, a Knowledge-Base Partner (usually a university), and a graduate, called a KTP Associate. The company must have a need for a demanding project of a strategic nature. This must be something that will lead to real business benefits in terms of increased turnover and profit, or safeguarded market-share. The project

must also be something that the company could not do for itself, without the help of the Knowledge-Base Partner.

Although the Knowledge Base Partner is most frequently a university, it can be a Research Technology Organisation (RTO) or a Public Sector Research Establishment (PSRE). However, few eligible non-university research centres (compared to the number of universities participating) have taken advantage of the opportunity to act as the knowledge base partner in a KTP project.

The Knowledge-Base Partner must have a high level of skills and expertise to contribute to the project. This is provided through an Academic Supervisor who has technical skills in the area of the project, and who also mentors the KTP Associate. To be suitable for KTP, the Associate must be able to benefit from the associate development programme that is offered, which means they must usually have gained their most recent qualification in the recent past. They must have a qualification appropriate to the project, for example, a first or upper second class honours degree for a classic KTP.

During the operation of the KTP, the Associate works in the company carrying out the project. The Associate works under the direction of the Academic Supervisor, and a member of the company staff, the Industrial Supervisor, who acts as the Associate's line manager. The Academic Supervisor visits the company on a regular basis, and commits to contributing half a day a week of their time to the project over the life of the partnership. The Associate works under the company's conditions of service, although they have a contract with the university partner, who is given responsibility for managing the grant. Although there is no compulsion on the company to offer a permanent position, and no compulsion on the Associate to stay, for many Associates KTP can offer a route to continuing employment with the company.

Each Knowledge Transfer Partnership carries attractive funding from the TSB or one of a number of other sponsors to the scheme. If the company is a Small to Medium Enterprise (SME), approximately within the European Union definition, i.e. has fewer than 250 employees and turnover and company values within certain limits, a classic model Knowledge Transfer Partnership provides funding of 66% of the project budget, and the company pays the remaining 33%. If the company does not qualify as an SME the project attracts about 50% funding, and the company contribution is 50%.

In order to obtain a Knowledge Transfer Partnership and the grant income it includes, a credible and financially beneficial business case must be presented in the proposal document. At the end of the project the benefits arising from the project are assessed by independent reviewers.

The business benefits actually obtained vary widely because of the wide range of types of projects, companies and business sectors but are held to make a significant contribution to the UK economy [12].

4. Case Studies

In this section, case studies based on two completed KTP projects are presented as examples of the way in which the scheme can achieve innovation through knowledge transfer.

4.1 Case Study A

The Company: Company A was an innovative SME located in the South East of England but trading internationally. The business of the Company was the design and manufacture of high-power solid-state lasers for industrial applications in the materials processing and micro-electronics manufacturing markets.

The Target Requirement: The Company wished to further improve the reliability of its products by implementing a pro-active condition monitoring strategy to achieve the very early signs of problems before the problem actually occurred. By this means unplanned down-time could be avoided, saving the cost or unanticipated failure. While the Company had world-class skills in the design and development of its laser products, it lacked specialist knowledge of condition monitoring, although the Managing Director had gained some exposure to the subject in his career.

The University: The University of Brighton Centre for Smart Systems had considerable experience of condition monitoring and the application of artificially intelligent software systems to the prediction of failure.

The Project: The Centre for Smart Systems provided two staff to act as academic supervisors in a two-year KTP project with the Company to develop the require condition monitoring strategy and system. An honours graduate in Electronic Engineering was recruited as the KTP Associate to undertake the project.

The Outcome: Analysis of the laser system design was carried out leading to a system model and a diagnostic matrix mapping possible faults to observable symptoms. Two approaches to symptom monitoring were evaluated. Firstly, a classical statistical technique (the Control Chart or Shewhart) was combined with a rule-based system, and implemented in custom software that could be embedded in the product. This enabled continuous condition monitoring of the system. Secondly, an artificial intelligence technique known as a 'neural network' was evaluated as a possible method of monitoring the output of the laser in such a way that potential failure could be anticipated. The techniques made available to

the Company through the project satisfied the Target Requirement. Embedding of the knowledge was achieved through the Associate carrying out a programme of training of company staff in the new techniques and updating company documentation.

The Knowledge Transfer: Knowledge of condition monitoring and intelligent systems was conveyed to the Associate from the Academic Supervisor. It was also gained by the Associate through his own research, guided by the Supervisor, and his attendance at an MSc module on the subject at the university. However, in addition to knowledge transfer, there was the origination of new knowledge.

The combination of conventional condition monitoring techniques and intelligent systems technology that arose out of the project was not available before the project.

The project achieved both the transfer of existing knowledge and also innovation, in the form of the origination of new knowledge about condition monitoring using a synthesis of existing techniques. It was the innovation that produced the solution, but the innovation could not have taken place without the knowledge transfer.

4.2 Case Study B

The Company: Company B was an SME located in Kent. It was a provider of integrated financial and accounting software, networking and IT training to companies in a number of industry sectors across the UK.

The Target Requirement: The Company wished to to implement internet-based customer support and problem-solving facilities to provide 24 hour/day support to customers. This would provide a better service for customers, and also reduce the amount of time service representatives were spending on telephone support calls.

While the Company had the ability to develop bespoke modules for the software it sold, it lacked knowledge of internet software development and other specialist techniques that would be necessary to satisfy the requirement.

The University: The University of Brighton Centre for Smart Systems possessed experience of software engineering, internet-based software and smart diagnostic systems.

The Project: The Centre for Smart Systems provided two staff to act as academic supervisors in a two-year KTP project with the Company to develop the support system. An honours graduate in software engineering was recruited as the KTP Associate to undertake the project.

The Outcome: The Partnership succeeded in achieving improved product information, self-help diagnostic facilities, customer information about accounts and improved call tracking, all of which provided enhanced scope and availability

of customer service delivery, potentially leading to increased sales. The target requirement was fully satisfied. In addition the company gained benefits not originally foreseen in the form of increased visibility in web search engine rankings, leading to additional revenue from resulting sales.

The Knowledge Transfer: When the project was proposed it was envisaged that what would be developed was a piece of software known as an expert system. This is a known technique that encapsulates the knowledge of experts, in this case the service representatives, and uses it to diagnose problems. A documented problem with expert systems is that after the development of the system, users of the system can find it difficult to add new problems and diagnoses as they become known, and the system falls into disuse. It became clear that the Company's service representatives were likely to find it difficult to maintain a conventional expert system, and that such a solution would not be a long term success. An innovative solution was developed based on frequently asked questions (FAQs), accessed through plain text queries and linked to a knowledge base. A simple method of updating the knowledge base was provided, convenient for use by Company staff and integrated into their day to day activities. Knowledge transfer in the area of smart diagnostic systems and software engineering took place between the Academic Supervisor and the Associate, who also gained additional knowledge of these subjects through personal study. However, the software solution that was devised did not arise just out of this knowledge transfer. A conventional expert system would not have been suitable, and therefore a new kind of system was devised that drew on expert systems but also other areas. The system that formed the solution was a synthesis of conventional and new techniques that arose out of both knowledge transfer and innovation.

5. KTP as a Framework for Innovation

The term 'knowledge transfer' can lead to the idea that knowledge will be transferred (or copied) from the university in the person of the Academic Supervisor to the company through the intervening 'pipeline' of the Associate. In fact, the Academic Supervisor provides specialist knowledge about the application domain. However, it is unlikely that they will have the solution to the company's problem ready for immediate implementation. It is more likely that the Associate will need to work under the guidance of both the Academic Supervisor and the company to devise a solution to the problem. The Academic Supervisor will provide knowledge about how to solve the problem, but will not directly provide the solution.

For example, say a company wishes to design a new product. The Academic Supervisor will be able to guide the Associate through a process which involves investigating customers' requirements, evaluating options, implementing the design, etc. However, the Academic is unlikely to have the new design in their head ready

for implementation. If another company wishes to produce a drug to cure a particular ailment, the Academic Supervisor is unlikely to have the cure already in their head.

They will not be able to directly transfer the knowledge that compound X cures ailment Y into the company. However, they may be able to transfer knowledge about approaches to the problem, and how to go about finding a drug effective in the cure of the ailment.

Thus, it can be argued that the knowledge that is transferred is knowledge about how to find a solution or approach a problem, rather than the solution itself. The Associate is mentored, cultured and educated in how to solve problems, perform an investigation, carry out a design etc., rather than being a solution being transferred for implementation in the company. The Academic Supervisor, therefore, needs to be more than just a technical guru.

During its lifetime a successful KTP project creates an environment where innovation is encouraged, facilitated and supported. Innovation occurs and is supported and cultured through a number of factors that arise out of the KTP structure.

The KTP project structure creates an atmosphere where the Associate is expected to "make something happen" i.e. they are expected to produce a solution to a problem.

The Associate is expected to take ownership of the project and ensure its success (given the support of the other parties). The Associate is 'ring-fenced' from the day-to-day activities of the company. Although the Associate inevitably makes a contribution to the wider activities of the business, it is intended that their focus is on the KTP project. Their prime responsibility is ensuring the success of the project. These factors act as an incentive and a spur to success.

Regular visits by the Supervisor (weekly, fortnightly or late in the programme, monthly) act as regular spurs and triggers points for progress by the Associate. The supervision meetings involve both the Academic and Industrial Supervisors, the Associate, and sometimes company management. As well as monitoring progress, each meeting can act as an ideas workshop, where ways of overcoming obstacles to progress are discussed, options for progress are evaluated and the best way forward selected. These meetings can make a significant contribution to achieving incremental innovation. Formal four-monthly meetings of the Local Management Committee (LMC) attended by the KTP Advisor (essentially the government representative who monitors the project), senior company management and supervisors act as another, higher level, prompt to progress.

Thus, there are a number of influences at work in a KTP project, the project requirements of the company, the availability of knowledge through the Academic Supervisor, the company and the Associate's study, the time structure imposed by the visits of the Academic Supervisor, LMC meetings and the fixed length

nature of the project, the expectations of progress, and the keenness and enthusiasm of the Associate. While innovation is not guaranteed, the supportive and fertile environment created by this combination of factors makes it more likely that an innovative outcome will occur that satisfies the project requirements and achieves benefits for the three partners.

Conclusion

The topic of this paper, knowledge transfer between universities and business, is not widely covered in the literature and its mechanisms and processes are not well described. This paper is an attempt to introduce the subject and to begin to analyse some of the processes at work in successful projects delivered under the KTP model.

Having considered several paradigms that could potentially lead to university-business knowledge transfer it is concluded that the most effective of these is likely to be KTP. While KTP leads to knowledge transfer, sometimes it is not obvious what knowledge is transferred during the course of the project. In some projects specialist technical or business knowledge is transferred. However, it would appear that it is often broad knowledge about the subject domain together with knowledge of how to approach and undertake the project that is transferred. In addition, knowledge is gained by the Associate from within the company and from their own study.

What does the Associate do with this knowledge, gained from disparate sources?

The Associate uses it to synthesise new knowledge, in the form of the solution to the problem, the design of the new product, the new improved method of manufacturing, etc. The important function of a successful KTP project team is to create an environment where this new knowledge can be created, grown and applied to achieving the aim of the project. The creation and growth of this new knowledge is innovation and the strength of KTP is that it cultures and supports this innovation.

Hence it is concluded that a successful KTP project involves both knowledge transfer and the use of the knowledge that has been transferred to facilitate innovation. The supportive framework that cultures innovation is an essential component in the success of the project.

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