

## The Evolution of an "Intellectual Property Pipeline" Engaging Business Angels in the commercialisation of University IP

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### Abstract

#### Objectives

This paper describes the evolution of an "Intellectual Property (IP) Pipeline", which aims to promote earlier stage interaction between potential informal business investors, their networks, universities and academics in Wales. This is in order to both accelerate the commercialisation process itself and also expand the number of commercialisable opportunities, new or improved products, processes and services.

#### Prior Work

Many studies have supported the role of venture capitalists / informal business investors contributing to the success of their ventures in ways other than simply providing finance (Berger & Udell, 1998, Harrison and Mason 2000, Mason and Harrison 2000a, Sorheim 2005; Large and Muegge, 2008). Numerous more general government policy efforts have also been made in many countries to commercialise the outputs of university research in some way (in the UK, see for example, Lambert, 2003; Sainsbury, 2007; Gibson, 2007; DIUS, 2008), perhaps the best known being the Bayh Dole act in the USA.

Regarding interactions between universities and informal investors, the Commercialisation in Wales report (Gibson 2007) noted that "Experienced entrepreneurs working with academics undoubtedly form the best solution in understanding the dynamic nature of markets and in judging how to adapt intellectual property to create successful commercial enterprises". There have, however, been very few published reports or academic papers specifically focused on the engagement of business angels in the commercialisation of university IP.

#### Approach

A formative research approach has been taken, given that the project is at the development stage. This approach specifically focussed on the development of the IP pipeline process, allowing identification, access and an understanding of the stakeholders wants and needs involved in the pipeline, and secondly, the creation of an IP Pipeline process that was tailored to the needs of the respective stakeholders.

#### Results

Through the contributions of the relevant stakeholders, an IP Pipeline has evolved through which IP will flow through the normal processes of IP commercialisation (knowledge creation, dissemination, commercialisation and exploitation), and the key milestones of IP Commercialisation (idea, proof of concept, ready for market vehicle, in the market). The IP Pipeline proposes that there are 5 key stages in the commercialisation of IP, where business angels and their networks on the one hand and universities and academics on the other can interact in various ways to accelerate the commercialisation of IP for the benefit of all parties.

#### Implications

This paper provides an additional mechanism through which, on the one hand, university IP may be commercialised and on the other hand, provide additional investment opportunities for informal business investors and their networks.

**Value**

The key contribution of this paper is that it provides a mechanism to government policies on the commercialisation of university IP and specifically a process through which university IP commercialisation can benefit through the engagement of informal business investors.

Key words: Key words: Innovation, Entrepreneurship, Universities, SMEs, Commercialisation, Commercialization, Intellectual Property, IP, Business angel networks, Business Angels

## Introduction

This paper describes the evolution of an “Intellectual Property Pipeline”, which is part of a Welsh Assembly Government funded project, aiming to promote earlier stage interaction between potential informal business investors (business angels), their networks, universities and academics. This is in order to firstly accelerate the commercialisation process itself through the utilisation of business angel finance and “non financial value added” skills and secondly, to expand the number of commercialisable opportunities, new or improved products, processes and services emerging from universities through the involvement of business angels in the IP development/commercialisation process.

Universities have had long experience of directly utilising internal knowledge to turn discovery and technology into application and through strategic resources, provide support for commercialisation and technology transfer to industry through the use of physical spaces including equipment, laboratory space, human resources, and to utilise investment capital derived from outside sources (Bird et al 1993; Allen and Levine, 1986). Higher Education Institutions (HEIs) have, however, increasingly been encouraged to take a larger role in local economic development (e.g. see Benneworth et al. 2009; Lenger, 2008; Beer and Cooper, 2007; Lazzarotti and Tavoletti, 2005) particularly through innovation (Cooke et al. 2000; Boucher et al. 2003, Benneworth, 2007) and increased government policy efforts have been focused in many countries to more directly commercialise the outputs of university research in some way ( Lambert 2003, DIUS 2008, Sainsbury 2007, EC 2009).

The commercialisation of IP, however, can also be seen to be fraught with uncertainty and difficulty, with a so-called “valley of death” between the stages of knowledge creation and exploitation, and knowledge-based entrepreneurship is often seen as high risk, as a result finding it difficult to raise the necessary finance and successfully commercialise IP. It is here that the role of informal investors or business angels can be important.

### **Business Angels, non financial value added and University Innovation**

The business angel, or informal venture capitalist, is a specific type of financial intermediary specialised in the financing of early stage entrepreneurial ventures (Bygrave et al 2003; European Commission 2003, Mason and Harrison, 2000). They can be viewed, however, as more important than venture capital firms (Harrison and Mason 2000), as they can provide small amounts of external equity capital where others “fear to tread”. Entrepreneurial firms often struggle to obtain financing from banks when they are in the very early stage of development and lack a track record, accounts and often collateralisable assets. Such a “financial gap” can affect a businesses acquisition of other resources and restrain its growth and development (Tyejee and Bruno 1984, Hughes 1996). Business angels are recognised as being able to “feel this financial gap” (Harrison and Mason 1992, Sorheim 2005).

In addition, the European commission (2003), amongst others, also documents that business angels, as well as providing financing, also provide managerial experience, which increases the likelihood of start-up enterprises being able to survive. Numerous studies over the last three decades have supported the role of venture capitalists / Business Angels contributing to the success of their ventures in numerous ways other than simply providing finance (Berger & Udell, 1998, Harrison and Mason 2000, Mason and Harrison 2000a, Sorheim 2005)). Two more recent studies (Large and Muegge 2008, and Politis 2007) reviewed previous empirical studies pertaining directly or indirectly to non financial value added. Large and Muegge attempted to identify areas of agreement and disagreement in the previous studies regarding NFVA. From this they created an eight category typology of NFVA inputs that encompassed the findings in the previous studies. Two of the categories are external environment orientated and the other six have an internal environment orientation. The internal orientated categories are recruiting activities (recruiting / advising on the recruitment of new employees), mandating activities (determining the management teams engagement), strategizing activities (contributing towards the overall strategy of the business), mentoring activities (providing informal guidance, mentoring etc), consulting activities (providing arms length planned and structured knowledge) and operating activities (direct managerial involvement).

The two external oriented categories are “Legitimation” and “Outreach”. Legitimation is the process by which certain attributes such as credibility, reputation, validation etc accrue to the venture from its association with the venture capitalist. Outreach encompasses activities that add value by establishing and developing connections to external stakeholders such as potential customers, marketing contacts etc. Large and Muegge also state that the evidence to date suggests that operating and outreach are the most important categories of

NFVA. Related to this outreach role, business angels are also often known to co-invest and be active in several strategic and managerial activities of portfolio firms (Landstrom, 1993, Stevenson and Coveney, 1996, Mayfield and Bygrave 1999, Mason and Harrison 2000, Sorheim and Landstrom 2001), which also makes them useful in linking firms and Intellectual Property(IP), as well as more likely to obtain growth because of such portfolio management expertise (Rosa and Scott, 1999). The study by Politis (2007) reviewed previous studies relating specifically to Business Angel added value and broadly categorised the “value adding roles” as, providing a sounding board / strategic role, providing a supervisory and monitoring role, providing a resource acquisition role and providing a mentoring role.

It is generally accepted that these NFVA attributes are a result of business angels business and management experiences. Linking this directly to the commercialisation of university I.P Mosey and Wright (2007) specifically linked previous experience to technology based academic entrepreneurs, arguing that where entrepreneurs had previous SME management experience they were also more likely to have broader social networks and ties than less experienced ones, such business experience being in seen as necessary in order to build relationships with both experienced managers and equity investors. The investment motives of business angels are also important, given that involving business angels in the commercialisation of university generated IP is a “niche” investment area. Numerous studies provide evidence that economic motives are the main reasons why business angels become actively involved in their portfolio firms, although other motives such as “having a greater control over their investment” and particularly “sharing knowledge and experience” are also important.

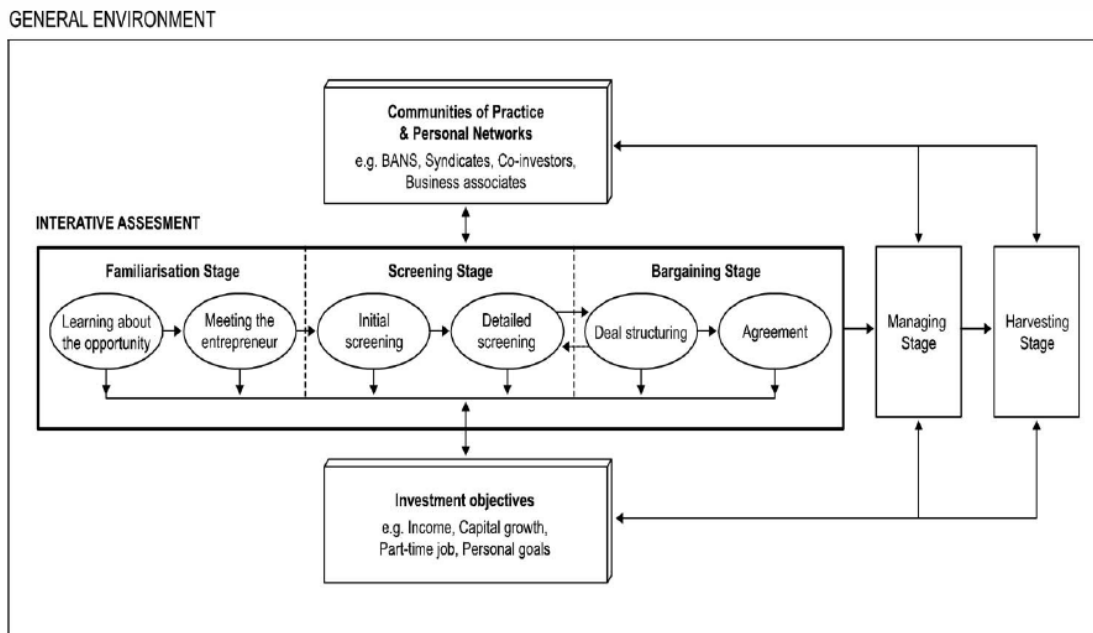
Given the potential overlapping skills sets of universities, business angels and their networks, combined with simultaneous government policy focus in these areas, there does, therefore seem to be potential to utilise business angels in university derived IP exploitation. Indeed, this is something already called for in Japan in Tsukagoshi, (2008), but also in the Welsh context given that the Commercialisation in Wales report (Gibson 2007) noted that “Experienced entrepreneurs working with academics undoubtedly form the best solution in understanding the dynamic nature of markets and in judging how to adapt intellectual property to create successful commercial enterprises”. Indeed, this is also already being explored in the United States for example, as an element contained within very recent programmes establish at the University of Pennsylvania (Penn Communications, 2010) as well as at the Purdue Research Park (2010) university incubator which has recently established an angel investment network to provide investment opportunity information and connections to firms or new technologies, but also provides the capital for commercialisation as well as access to 3-4 events per year, and online information. Their aim from this is to deliver I.P. to the marketplace on a much faster schedule, so that the market and economy will benefit through increased economic development.

Both of these are very new developments in a different national context, however, and generally there appears to be a gap in the academic literature with regard to the analysis of the issues surrounding this possibility, whilst the recent economic downturn has also seen Business Angels in the UK pulling back from funding university start-ups because of their inherent higher risk nature, but also because the businesses created were not perceived as being sufficiently commercially focused (Telegraph, 2009a). As a result, Telegraph (2009b) reported a reduction in Business angel-assisted university spinouts and increased used of foreign funding.

## University Innovation and the Business Angel Investment Process

This study evaluates if and how potential benefit could be delivered to University-generated IP by working with Business Angels and their networks to accelerate the commercial application of university research outputs. When analysing the potential role of business angels in commercialising university IP, the traditional operation of the business angel investment process is a key consideration.

Paul et al (2007) summarise the traditional business angel investment process, as highlighted by figure 1, below.



**Figure 1: A Model of the Angel Investment Process**

For this paper it was important to consider how the business angel-related factors indicated in figure 1 might help stimulate, manage and diffuse created University generated knowledge and allow effective exploitation of innovation and Intellectual Property (IP). Owing to this, issues surrounding the management of networks, the structures and fora in which the actors operate and their absorptive capacity are important.

What the university role (and the supporting government policies) should be specifically, however, is still the subject of much debate and uncertainty, and the resultant perceptions have often dissuaded business angels from involving themselves in university I.P. commercialisation. The traditional view of university purpose and values, includes knowledge for its own sake; making knowledge freely available to all (Behrens and Gray, 2001); organised scepticism (Kenny, 1987); and learning. This can manifest itself in a number of ways, Geographic clustering in certain highly R & D intensive industries, for example, often occurs within close proximity of leading universities in a region (Galambos and Sewell, 1996), though without necessarily strong direct innovation-focused contact. Instead these institutions provide access to knowledge and information which is often tacit, sticky and place-specific, the ability to transfer this information reducing with distance (Bell, 2005). University-based training in specific skills and access to human resources including staff can also facilitate understanding and absorption of innovation, benefiting and enriching the local labour market and providing an incentive to attract further researchers into the location, but again without necessitating direct contact with business.

The new entrepreneurial paradigm for universities, however, involves a focus upon value creation and academic freedom (Slaughter, 1988, Bird et al., 1993; Behrens and Gray, 2001; Harman, 2006). Shane (2002), however, found that academic spinout (i.e. commercialisation by the university itself) is a second best solution, behind licensing patented technology. Indeed, in terms of fora, the university can utilise a range of structures including incubators, licensing and joint ventures, as well as start-ups and spin-outs (e.g. see Berggren and Dahlstrand, 2009). Birley (2002) highlights, however, a number of potential university

management and governance-related barriers which work against the new entrepreneurial focused university paradigm (e.g. see Bok, 2003, Clarke 1998, Etzkowitz, 2003, Morrison, 2004). The university's management in relation to these structures, therefore has the potential to enhance or inhibit firm innovation performance and growth (Carlsson and Mudambi, 2003), and Chappell et al (2004) also argue that university Technology Transfer Offices often lack the capability to be effective in commercialisation strategies.

Kitagawa (2004), therefore, argues that there is a need to examine the complementary relationships between university institutions, policy initiatives, and other support organisations, whilst authors such as Potts (2002) illustrate a regional dimension to these issues. Reid and Schofield (2006) also highlight the potential use of technology "brokers" as conduits or fora through which knowledge and innovation transfer from academia can occur and it is here that the (non-financial) role of the business angel may come to the fore.

There is therefore a need for evaluation of a range of university and business angel-specific factors, in order to progress University IP opportunities (both current and future) at a range of stages of development. For example, technical development work of the initial IP itself may be needed to bring the knowledge to proof of concept stage. This may then need to be combined with enhanced connectivity with industry players in relevant markets, in order to overcome problems currently inherent in the process of bringing the IP to market. There is also an issue of a lack of market knowledge and business modelling expertise and a lack of appropriate commercial investment when the IP does come to market. Business Angels and informal investors are most obviously seen as potentially key in terms of accessing business networks, accessing markets, expertise in contract negotiations, in addition to access to finance. Business Angels also, however, have the opportunity to add value at earlier stages through investing (time and /or money) in IP opportunities.

There thus exist a range of potential inputs in the process, through developing the opportunity with the academic and university, taking that opportunity to market, developing the IP exploitation strategy, sharing in the financial returns, and as a result making a longer term contribution to University research priority setting to build new opportunities. The review of the literature would suggest that the key considerations in developing and implementing a university IP Pipeline fall into the following broad areas:-

1. The type of returns (consulting fees, licensing fees, management fees, equity, etc.) required by business angels, business angel networks and university academics to incentivise these relationships
2. The activities (financial, coaching, idea development, idea marketing, firm screening, deal brokering, firm management-related, network management-related) that business angels, business angel networks and university academics believe they should take part in and who they believe should lead these activities (from stakeholders including themselves but also universities, government and industry).
3. What the university-IP Business Angel commercialisation framework and its mechanisms should look like

## **Methodology**

A formative research approach has been taken, given that the project is at the development stage. The major goal of such research is to inform the decision making process during the development of a product or program in order to improve the product/program being developed (Walker 1992). Reigeluth and Frick (1999) refer to formative research "a kind of developmental or action research that is intended to improve design theory for designing instructional practices or processes".

Perhaps, most appropriately to this project Van Den Akker (1999) describe Formative Research as Research activities performed during the entire development process of a specific intervention, from exploratory studies through (formative and summative) evaluation studies, aimed at optimization of the quality of the intervention as well as testing design principles.

This approach specifically focussed on the development of the IP pipeline process, allowing identification, access and an understanding of the stakeholders potential contributions, wants and needs involved in the pipeline, and secondly, the creation of an IP Pipeline process that was tailored to the needs of the respective stakeholders.

Initially a draft IP pipeline was created, based on a review of the existing university commercialisation and business angel literature and a pipeline outlined in a previous study (McCarthy et al 2009).

After creation of a basic draft pipeline, however, interviews with the key “gatekeeper” stakeholder groups of business angel network managers and university Technology Transfer staff, supported by interviews with relevant external governmental actors were also conducted. During this process, discussions took place with 11 technology transfer staff representing 6 different universities, three business angel network managers and four Welsh Assembly government staff whose roles involve the commercialisation of university IP. The authors also attended a business angel investment forum where a mixture of formal investee presentations and rocket pitches were made, followed by an informal session where investees and presenters could have further informal discussions.

The interviews focused on the best articulation of the pipeline, to clarify any misunderstandings and establish a generally accepted terminology, as well as highlighting the key roles of each of the stakeholders at the various stages in the commercialisation process. Issues raised for this included the overall name of the pipeline (which became broadened from I.P. to Intellectual Capital), renaming the types of business angels engaged at different stages of the pipeline, and renaming certain stages of the pipeline, as well as the need for Universities to complete a short initial I.P. proforma to capture the key information required by business angels, in a form able to be disseminated easily via monthly newsletters etc. , and from which business angel involvement would then be stimulated.

The business angel investment forum gave insights into the various possibilities for pitching events where business angels, academics and TTO’s could get together.

## Results

Figure 2 below illustrates the University “Intellectual Capital – Business Angel pipeline that has evolved from the interviews with the key stakeholder groups.

### University Intellectual Capital-Business Angel Commercialisation Pipeline

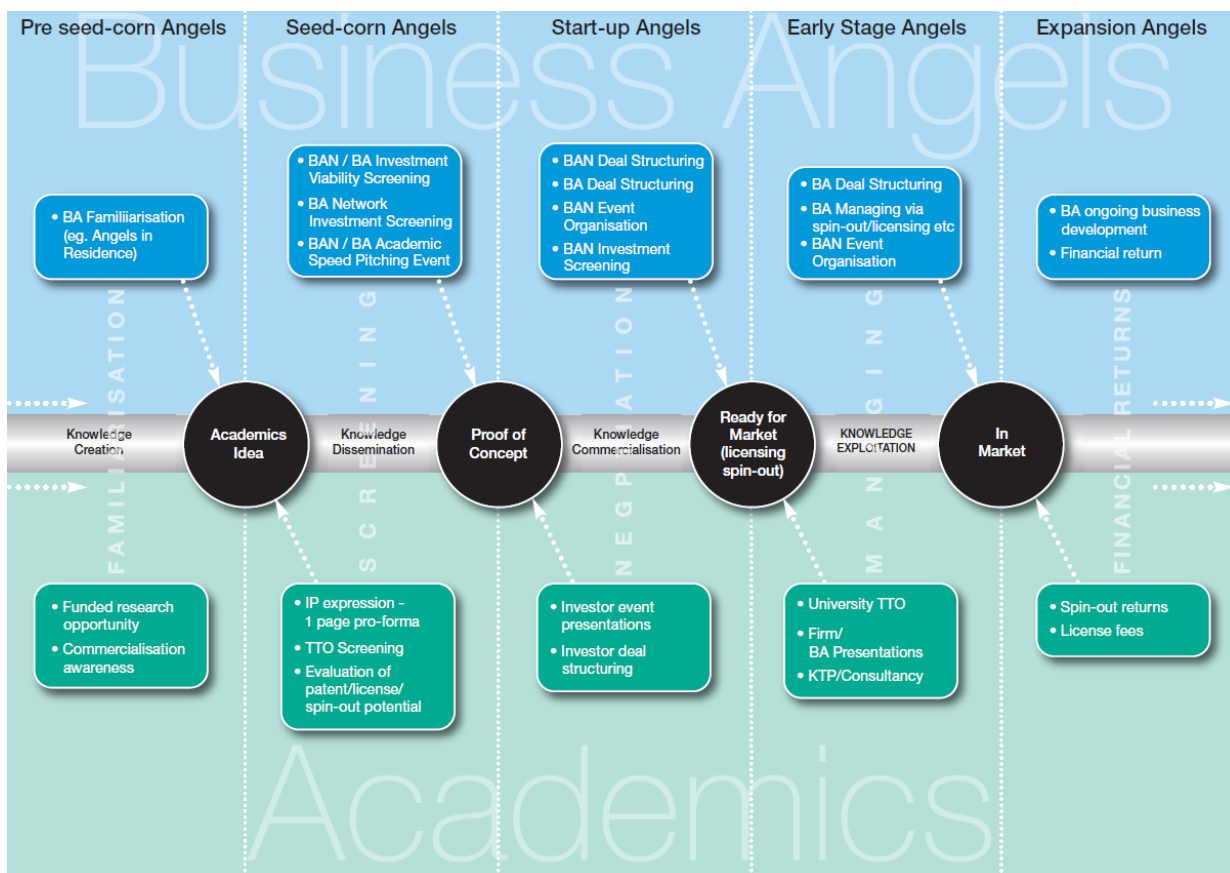


Figure 2: A Model of the University Intellectual Capital-Business Angel Commercialisation Pipeline

The diagram shows the Intellectual Capital pipeline, with Intellectual Capital moving horizontally from left to right, through the normal processes of Intellectual Capital commercialisation (knowledge creation, dissemination, commercialisation and exploitation), and the key milestones of Intellectual Capital Commercialisation (idea, proof of concept, ready for market vehicle, in the market).

This part of the Intellectual Capital pipeline is reflecting the variety of commercialisation activities currently taking place, many of which are “fuelled” by a range of university and government support policies (such as the A4B’s Scouting project, Early Stage Development Fund, Patent and Proof of Concept and Feasibility Studies, and other University Technology Transfer activities). What is new is that within the existing IP pipeline’s processes and milestones, there are 5 key stages (indicated vertically on the diagram and linked to the processes engaged in by both universities and academics on the one hand and business angels and their networks on the other) where business angels and their networks could become involved. Specifically, these stages are; Familiarisation, Screening, Negotiation, Managing, and Financial Returns.

The upper part of the diagram then indicates the roles of the business angel and business angel network at each of these stages, although it must be emphasised that business angels and their networks can begin their involvement at any of the five stages on the pipeline. The potential roles of business angels and their networks at the five stages are:

At the Familiarisation (Pre-seed-corn) stage the role of the business angels and business angel network is to *familiarise* themselves with university intellectual capital and assist in the *commercialisation awareness* of academics in order to create more commercialisable initial academic ideas.

At the Screening (Seed-corn) stage the role of the business angel network is to *screen* and evaluate the viability of the idea from information submitted by universities and academics through an intellectual capital pro-forma (basic potential for patenting, licensing and spinout opportunities). The angel network will, where possible, match the academic / Intellectual Capital with interested business angels prior to a “speed-dating” / introductory event<sup>1</sup>. Where such “prior matching” is not possible, angels and academics will be invited to the “speed-dating” / introductory event, which the angel network and university will organise.

At the Negotiating (Start-up) stage the role of the business angel network is to work with the university to organise, publicise and manage more formal screening, matching and pitching *events* (for post-proof of concept to ready for market ideas, the original information again coming from the Intellectual Capital Pro-forma) to potential investors. From these the business angels can then *structure* the actual *deals* with the university and / or firms (depending on whether the idea is exploited via licensing, spinout, joint ventures, sale of technology, brokering fee, etc.). This will also allow business angels to further develop their own network of contacts, particularly in regard to university intellectual capital.

At the Managing (Early-Stage) stage the role of the business angel network may again be to work with the university to organise, publicise and manage formal screening, matching and pitching activities (for in-market ideas, again using the Intellectual Capital pro-forma) to potential investors. The business angel’s role (if this is their first involvement with the pipeline) will be to *structure deals with* the university and / or firms in the early stage of utilising the knowledge. Business Angels will also be involved in assisting with the *management* of firms that are exploiting the knowledge in the market place. This will again allow business angels to further develop their own network of contacts, particularly in regard to university intellectual capital.

At the Financial Returns (Expansion) stage, the commercial rewards from the Intellectual Capital will occur (for the University, business angel and firms using the Intellectual Capital). In addition, however, there may also be additional opportunities for business angels and their networks to further engage in any ongoing expansion the businesses themselves, through firms’ requirements for additional capital. (e.g. existing business angel additional investment, syndicates of business angels / venture capitalists) or innovations. This information will again originate from the Intellectual Capital pro-forma

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<sup>1</sup> Babson college undertaking a similar process, which they call a “Rocket pitch”

<http://www3.babson.edu/ESHIP/outreach-events/rocketpitch.cfm>



In terms of the rewards that business angels could expect from their involvement, these would be a matter of negotiation, but would fall into one or more of the following categories, with different mixtures of these depending on the point in the pipeline that the business angel became involved.

#### Potential Business Angel Reward Categories

Equity share in the company adopting the Intellectual Capital (most obviously through start-up / spinouts)  
Percentage of the Intellectual Capital -related income, in the form of license revenues, from the firm adopting the Intellectual Capital  
Fee for acting as a broker for the University to potential firms  
Fee for developing the marketing of the Intellectual Capital / product  
Fee for acting as advisor to the academic in developing the Intellectual Capital  
Given option by the University to take a future equity stake in any early stage IP business angel helped to develop that eventually makes it to market  
Allowed to have a role within the university to develop future spinouts in which business angel could take an equity share  
Acknowledgement of business angel role from the University e.g. Given Visiting Professor status

The lower part of the diagram then indicates the roles of the university's Technology Transfer Office and academics at each of these stages, namely:-

At the Familiarisation stage the role of the academic is to synergise their university *research* with *commercialisation awareness* from the university in order to create more commercialisable initial academic ideas.

At the Screening stage the role of the academic, *if they think Business Angels may be able to assist*, is to *summarise the idea* / research into an easily understandable form (using the Intellectual Capital Proforma). From this the university TTO / experts can *screen* and *evaluate* the *potential* viability for *patenting, licensing* and *spinout* opportunities, availability of funding (e.g. A4B Early Stage Development Funding), and the potential for business angel involvement. For those deemed suitable, the Intellectual Capital proformas will then be sent to the business angel network managers, to be sent on to business angels (in their monthly update briefings, etc.). The academic / TTO will also present the idea at subsequent "speed-dating" type events and / or in prior matching meetings with business angels.

At the Negotiating stage the role of the academic is to actually present post-proof of concept to ready for market ideas (with assistance from the university) at a formal *event* (to potential investors / business angels) in an easily understandable form, from which the university can then *structure* the actual *deals*. For existing post-proof of concept Intellectual Capital already with University TTOs, where they think business angel involvement could be useful, they can also use the Intellectual Capital proforma at this stage. The Intellectual Capital proformas will again then be sent to the business angel network managers, to be sent on to business angels (in their monthly update briefings, etc.).

At the Managing stage the role of the academic would again be to present (in-the-market) ideas (again at a formal *event*) to business angels. From this the university / business angel can then *structure* actual *deals*. Academics can also be involved (in a *consultancy/KTP* role) in assisting firms using the innovation. For existing in-market stage Intellectual Capital already with University TTOs, where they think business angel involvement could be useful, they can again use the Intellectual Capital proforma at this stage. The Intellectual Capital proformas will again then be sent to the business angel network managers, to be sent on to business angels (in their monthly update briefings, etc.).

At the Financial Returns stage, the *rewards* to the academic and the university occur in the form of *license / royalty fees* and /or *returns on equity from profits generated*. Because there may also be additional opportunities for business angels and their networks to further engage in ongoing business expansion, where they think business angel involvement could be useful, University TTOs can also use the Intellectual Capital proforma at this final stage. The Intellectual Capital proformas will again then be sent to the business angel network managers, to be sent on to business angels (in their monthly update briefings, etc.).

## **Implications and Conclusions**

This study has developed a process through which enhanced and earlier stage interaction between potential business investors and academia can take place leading to the creation of new or improved products, processes or services. In terms of policy and strategy, this paper fills a gap in the commercialisation process by enabling academics who are interested in developing commercial IP opportunities to engage with business angels who can give a “reality check” and sound commercial advice.

There is clearly potential for benefit to be delivered to University-generated IP by working with Business Angels and their networks to accelerate the commercial application of university research outputs within a UK and Welsh context

In addition, the creation of an explicit framework of the processes involved appears to be vital, to clearly identify the stage of development of the ideas, the required activities of business angels, their networks and universities at the various stages, and also the rewards on offer. In order to evaluate the success of this approach, however, and any changes or additions to it, there is a clear need for further research into the actual operation of this framework, in order to determine the viability and sustainability of the processes involved for both universities and angels, the extent of the beneficial outcomes to be derived and the potential for this approach in different contexts and environments.

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