THE UNIVERSITY SPIN-OUT PROCESS: CAREER TRANSFORMATION THROUGH THE PRACTICE OF ENTREPRENEURIAL IDENTITY

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Abstract

The purpose of this paper is to examine in depth the nature and extent of identity work carried out by a PhD engineer involved in various phases of high tech university spin-out (USO) activity. The paper commences with a discussion, where firstly, it is established that the creation of a USO presents challenges to career development for engineering researchers which can hinder the spin-out process if not managed effectively. Secondly, it is argued that the purposeful construction of entrepreneurial identity may support successful career transformation and may therefore be a significant element in successful spin-out activity for engineering researchers. This paper goes on to examine these issues through a qualitative study of the identity and career issues in this case study. The maintenance of engineering identity is found to be most significant issue, though over time this becomes enriched through positive association with entrepreneurial growth. Recognising this career trajectory is useful to theorists of entrepreneurial identity and those involved in the practical support of USOs.

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1. Introduction

The purpose of this paper is to explore the creation and maintenance of entrepreneurial identity during involvement in high tech university spin-out (USO) company processes and activities in the UK. The paper is based on a case study of a mature PhD student working initially in a research team, and later in a spin-out company, in a UK university; towards the end of the study he seeks to found his own company, moving on from the initial spin-out, though remaining in a closely related field, and continuing his role in technological development. The study tracks his understanding and development of different aspects of his professional identity as he works towards shifting career goals in different formal and informal learning settings. The paper commences with a discussion of the career tensions that might arise during the spin-out process. The next section argues that purposeful construction of entrepreneurial identity may be a significant element in supporting successful career transformation from researcher to high-tech entrepreneur. The third section presents the case in detail. Following a discussion, conclusions are presented. The practical implications of the study are that better understanding of these processes can be used by educators and support staff in classroom settings and in high-tech incubators. Theoretically, the paper adds specifically to the growing literature on entrepreneurial identity, extending it to the realm of science and engineering; more generally it adds to the literature on the decision of engineers or scientists to start firms.

The literature on why <u>anyone</u> starts a business is vast, covering issues at the macro level, such as policy, governance and the environment, as well as at the micro level, where the research approaches have spanned the disciplines of economics, psychology and sociology. This is too broad to review here in any meaningful way. It is noticeable however, as Audretsch and Erdem (2004) note, that there is little on why *specifically* engineers or scientists, as distinct from other entrepreneurs, choose to become entrepreneurial (or not), though Casson (1995) notes that technological advance presents a more intense demand for associated entrepreneurship, which may be regarded as a general attractor. Some work has been carried out in France by Fayolle (1994), who suggests that the best qualified engineers are less likely to become entrepreneurs. Chell and Allman (2003) have examined the motivations and intentions of technology oriented entrepreneurs in structured learning settings, indicating the importance of the individual, their cognitive, behavioural and emotional dimensions in interplays with the broader contextual milieu. They suggest that entrepreneurial metamorphosis is complex and difficult to predict for any individual case. Luthje and Franke (2003) also note the relation between personality, attitude and barriers and support factors on the entrepreneurship-related context for engineering students at MIT. Meyer (2003) too, examines the relation of the individual to the wider context; he concludes that public support mechanisms and incentive structures may not necessarily promote academic entrepreneurship, but develop an entrepreneurial behaviour pattern where scientists in public sector organisations are not necessarily interested in setting up a high growth company but are instead looking for an alternative avenue to pursue research interests. Anderson and Chorev (2006) explore how engineers learn to become entrepreneurs in the specific cultural context of Israel, noting that the uniqueness of the context has an impact on lifelong learning for their sample.

In summary, the relation between entrepreneurial propensity in a context of entrepreneurial support and education, and the broader societal and cultural milieu is complex and not well understood. To date, a significant missing dimension is that the dynamic between professional, academic and entrepreneurial identity *for engineers and scientists* has not been explored in depth; the entrepreneur is at the discussion table, the engineer is absent. Yet, as argued below, the significance of personal career choice and identity issues at key stages in the process of establishing a USO may be very significant and merits further attention.

To set the next two sections in context, a brief overview of the case history is now presented. The engineer in question, John, was born in Germany in 1970. In 1991, after school, and military service, he studied mechanical engineering to first degree level, followed by a PhD in a UK university between 1997 and 2001, on automotive electrical systems. In late 2000, as his PhD was coming close to completion he began work for a new spin-out company at the university as an R&D Engineer and Software Developer. His duties were the design of mechanical and electrical hardware as well as software for precision measurement systems. From September 2004 – 5, John also undertook a Masters course in entrepreneurship with a strong focus on business venturing. He is now in the process of setting up his own company in a closely related field and in late 2005, has attracted first round funding from a range of investors.

2. Creating a USO: Challenges to career development

There is considerable interest in the UK in the creation of wealth from the commercialisation of university research. USOs are new firms created specifically to exploit commercially knowledge, technology or research results developed within a university. The spinning-out of new technologies through the formation of new companies is one mechanism by which commercialisation might occur, though the UK is as yet underdeveloped in this area (Bray and Lee, 2000; Nicolaou and Birley, 2003a,b; Vohora et al, 2004). Although creating a spin out presents significant challenges to academics, as it involves a transition from a non-commercial to a commercial environment, nonetheless, a spin-out is attractive as it can potentially provide higher revenues to universities and to the founding academics (Bray and Lee, 2000). However as Meyer (2003) notes, a spin-out may also function simply as a grant-generator for furthering research, rather than target high growth (intentionally, or unintentionally).

The structure, form objectives and outcomes of USOs vary significantly according to a number of factors including the status of the individuals carrying out the business venturing process and the nature of the knowledge or technology being transferred (Pirnay et al, 2003). Nicolaou and Birley (2003a) argue the process of spin-out emergence is contingent in part on the role and degree of involvement of key academic staff. They propose a trichotomous categorisation of USOs into orthodox, hybrid and technology spin-out. An orthodox USO involves both the academic inventors and the technology spinning out from the institution; the hybrid situation refers to the technology spinning out and the academics retaining their university position, but holding a part-time position within the company, such as a directorship; a technology spin-out involves the technology spinning out, but the academic maintaining no substantive connection with the newly established firm (beyond, perhaps, an equity position, or the provision of consultancy advice). Nicolaou and Birley (2003b, p.1704) note that the trichotomy implies that, at the individual level of analysis, every academic inventor is faced with a critical career choice. On the one hand, the inventor may leave the university to completely focus his or her energy in the firm (academic exodus). On

the other hand, the inventor may decide to remain in the university and may or may not accept a part-time position in the firm (academic stasis). Of course, the career choices for those in temporary positions in research units, PhD students such as John for example, the career choices may well be a little less clear cut. In this case, the choice is between developing the USO, developing a new company in a related field, obtaining temporary research funding to continue 'pure' research, obtaining work elsewhere in the university, or leaving the university: not between a 'secure' academic position and the USO possibility. Whatever the starting position of the individual in question, PhD student or a fully-tenured academic, if the choice is to follow the USO route, this presents a set of personal and organisational challenges and tensions to the potential entrepreneur. Overcoming these challenges is vital if new high tech firms formed are to prosper.

Vohora et al (2004) identify 5 phases of growth for high-tech USOs: the initial research phase, the opportunity phase, the pre-organisation phase, the re-configuration phase and the sustainable high growth phase. In order to reach full potential, the venture must successfully make the transition between the phases, overcoming what are termed 'critical junctures' as they move from one phase to the next. The critical junctures concern the absence of key resources or capabilities required by the firm, some of which are tangible business necessities, such as finance, others are less tangible, associated with the personal motivation and career intent of the potential academic entrepreneur. It is these less tangible capabilities associated with the entrepreneur that are the concern of this paper, as they include the decision as to what career path to follow. These appear to be most significant in the juncture between the opportunity recognition phase and the pre-organisation phase, and the juncture between the pre-organisation phase and the re-configuration phase.

Turning to the first phase transition, 'entrepreneurial commitment' is the juncture that is most significant in the move from opportunity recognition – the idea that a new technology may have commercial potential – to the pre-organisation phase. It is in the pre-organisation phase that many fundamental uncertainties about industry, location, size, market, and team issues are resolved. Strong intention and commitment are necessary to move forward from a vision to an operational business engaged in commercial transactions (Erikson, 2002). It is here that the decision for academic exodus or stasis takes place. Vohora et al identify possible challenges to entrepreneurial commitment at this critical juncture:

1. institutional culture prioritising research
2. the challenges of an alien commercial environment
3. founding a USO is risky, engineers/scientists may be risk averse
4. difficulties in delegating to business specialists.

At this point, the academic may decide on stasis, or exodus; exodus may still take place, but the academic may remain in a research role, relying on other team members to carry out business functions. Vohora et al (2004) use the term 'surrogate entrepreneur' for this possibility.

Turning to the second phase transition, once commitment has been achieved, then there is the issue of credibility, the juncture between the pre-organisation phase and the reconfiguration phase. This is the 'building' phase for the organisation, the choice for growth, or existence; a choice for growth is dependent on presenting a credible business-like front to customers and financiers. To some extent, going for growth is a functional business issue that can readily be addressed through support in the development of feasible business models, plans and

effective presentations, but legitimacy and trust issues also impact at the personal level (Lounsbury and Glynn, 2001) in dealing with sceptical customers and investors. As Meyer (2003) points out though, some firms remain in incubators for years, subsisting on public grants and infusions of 'love money' from the founders themselves.

Vohora et al (2004) present evidence that it is the pre-organisation phase that represents the steepest learning curve for the academic; particularly if they have little or no commercial experience or knowledge of how the industry operates. The entrepreneurial learning has to take place in the context of contemplating a significant career shift that carries with it considerable career risk in terms of university cultures that prioritise research output rather than commercial activity, as well as business risk. They also argue that it is the re-configuration phase that presents the steepest learning curve for the entrepreneurial team, where the academic has to manage a new team role, whether as an entrepreneurial leader or not. Of course, this latter depends on the goals of the reconfiguration phase.

Mainstream tenured academic staff who choose a high degree of involvement in a USO are inevitably moving away from a linear model of classical academic career development to a less traditional, multi-faceted path where entrepreneurship is more central, at least for a time. Not only is this challenging, but work is not just about financial reward; it is a source of personal identity and self-fulfilment (Baruch, 2004). Politis too (2005), argues that entrepreneurs have diverse career motivations and that self-image is an important element in the conceptualising of decisions and motivations surrounding career choice. Baruch (2004) notes that career success is different for various constituencies:

- *internal*, how a person sees the development of own career in terms of inner values, goals, aspirations
- *external,* how career success is perceived by the external environment, in terms of status, hierarchy, income and power
- *organisational,* in terms of organisational power and influence

While Baruch (2004) notes that the academic career has a certain fluidity of its own, nonetheless, the academic entrepreneur has to carefully balance their USO aspiration -- stasis or exodus -- against organisational and external perceptions as well as internal goals. It could also be argued that self-image too has an external dimension in terms of the identified need to appear credible and business-like to potential investors and customers: should this be delegated to other team members, the inventor academic remaining in the 'back room'?

From John's point of view, his career development is steeped in the culture of academe and engineering. Considering moving to an entrepreneurial career position would require a reworking of internal values and beliefs to meet his own aspirations and institutionalised sets of expectations of the university and the commercial world. Yet John is a PhD student, not a tenured academic, which will inevitably set his career decisions in a different context. In this paper, I contend that crafting an entrepreneurial identity may be part of effecting a successful career transformation – but what does that mean for a PhD engineer? The next section underpins this argument.

3. Formulating an entrepreneurial identity

In this section, I address Down and Reveley's (2004, p. 236) "the social formation of the entrepreneurial self", from the point of view of career transformation. Some authors have

argued for an empowered vision of entrepreneurial identity (Lounsbury and Glynn, 2001; Down and Reveley, 2004; Reveley, Down and Taylor, 2004; Downing, 2005; Warren and Anderson, 2005). In this school of thought, entrepreneurs are acknowledged as skilled cultural operators manipulating perceptions of the entrepreneurial self to achieve desired outcomes for their new ventures. For example, Lounsbury and Glynn note (2001: 554) that a key challenge for entrepreneurs is 'to establish a unique identity that is neither ambiguous nor unfamiliar, but legitimate', arguing for the importance of formulating an entrepreneurial identity for self and firm in acquiring legitimacy in the early stages of venturing.

This empowered understanding of entrepreneurial identity is still contested, not least because identity itself is a concept subject to ongoing debate in the academic literature (Jenkins, 1996)[i]. However, debates in philosophy (Foucault, 1982; Taylor, 1989; Dennett, 1993), sociology (Giddens, 1991; Jenkins, 1996), and social psychology (Lewis, 2003; Harré and Gillett, 1993), have resulted in a consensus that identity is not located in the personality of the individual, but instead is constituted through interaction between the individual, society and culture. Significant in this view is the notion of identity as a process of becoming (Giddens, 1991), where there is the possibility of agency, and individual identity can be negotiated through and within the sense-making systems of the surrounding cultural milieu (Jenkins, 1996). From this perspective, it can be argued that identity is related to social and cultural forms, but is not predetermined by them (Goffman, 1959; Holland et al., 1998; Lash, 1999; Creed et al., 2002). Thus, self-identity can be crafted and re-crafted as an ongoing project of the self (Giddens, 1991). This clearly has resonance with Baruch's (2004) metaphorical conceptualisation of 'career' as a 'life journey': the emergence of the short-term portfolio career over the past two decades has placed the emphasis far more on the individual in terms of maintaining expertise and employability. In the past, the emphasis was more on the linear progression through an organisation, which in a sense 'owned' the career trajectory. Of course Baruch (2004) also notes that individual career progressions do not take place in isolation; they are shaped by organisational structures, cultures and processes. Thus, an individual crafts and recrafts their career as a significant dimension of self-identity, in line with Giddens' theories of structure and agency (1991).

Goffman (1959) too argues the relation between the individual identity and the collective of the social milieu, placing an emphasis on roles in shaping identity. He describes how individuals 'work' their roles in relation to social expectations; here, identities and meanings are fluid, that is, negotiated and sustained in shifting role-based interactions with others. For Goffman there is a performative dimension to role maintenance where micro-level proceedings may formulate actions and situations, not just inhabit them. Goffman also argues however, that roles become institutionalized sets of social expectations, with stereotypes emerging as a more fixed form of meaning and stability. One might consider 'academic', 'engineer' and 'entrepreneur' as career 'roles' that have associated professional expectations; those aspiring to such career roles have to craft their identity to social and professional expectations.

John clearly makes a personal journey from focussing on engineering technologies in an academic setting, to becoming an entrepreneur in the high tech development milieu. I now turn to the case study to explore this in an empirical setting, to examine to what extent he carries out identity work to smooth his career transformation.

3. Becoming an entrepreneur?
3a. Methodology

The research phase of this project was designed in an inductive and exploratory manner to obtain a rich understanding of how John recognised, considered and assessed issues of identity during his career generally, but more specifically, during his engagement with USO activity (Eisenhardt, 1989). John was chosen from the student group undertaking the Masters course because of his strong engineering background and because he was engaged with USO activity, that is, in the space where the USO evolves from research activities to a commercial organisation (Van de Ven, 1992). Additionally, the course enabled extensive space for developmental discussions between academic staff and students. This closeness enabled a speedy rapport between myself and John, especially as I too have a scientific background and have worked with engineers and USOs in a similar field at another university. The disadvantage of this closeness, is of course, bias in the data collection and the analysis which impacts on the generalisability of the study. Hence as well as material gained from one-to-one discussions between John and I, the study was augmented by consideration of reflective material prepared for other members of the academic staff during the course, and material from the company website.

Data was collected over a one-year period from September 2004-5, during the time when John was undertaking his Masters course in entrepreneurship. During that time, he moved from his initial position with an existing USO to establishing a new company in a related field. A 90-minute semi-structured interview was carried out in March 2005, during which extensive notes were taken; other sources used were, with his permission, John's assignments for the course (in which self-reflection was a significant component), notes taken from meetings between John, his project mentor, another member of the academic staff, and myself, comments from emails and informal chats. The analysis employed the method of reflecting on the data as it emerged during the study period, to look for patterns and themes concerning issues of identity, which were then related to an explanatory framework to support conclusions. Necessarily, there is the potential for subjective bias in the interpretative phase here, in John's interpretations and my own. Nonetheless, there is a trade-off in the depth and richness of the material obtained.

3b. Analysis and discussion

The analysis is divided into two parts. Firstly, John's phases of engagement with USO activity are defined in terms of Vohora et al's (2004) model; secondly his perceptions of career issues are analysed in accordance with that categorisation. His engagement spans 4 of the phases identified by Vohora et al (2004) and concerns two companies, A-tech (the initial USO firm he joined towards the end of his PhD) and B-tech (the firm he was in the process of starting up during this study; he would continue his role as a researcher into product development, but in a closely related field). This transition is set out on Table 1 below:

#	Phase	Date	Company	John's activities
A-1	Opportunity	Pre 2001	A-tech[ii]	Academic researcher/PhD student
A-2	Pre-organisation	2001-3	A-tech	Academic researcher -> company R&D software
A-3	Re-configuration	2004-5	A-tech	Company R&D/entrepreneurship student
B-1	Opportunity	Late 2005	B-tech	Founder

Table 1   Phases of John's engagement with USO activity

In A-1, he is undertaking a PhD in traditional academic mode, but in a research group where a senior professor (his supervisor) is forming a spin-out which presents potential possibilities for his own career future. He also undertakes a 'Economics for Engineers' distance learning course, with a view to gaining business skills for the future (not necessarily the spin-out company), but leaves because it is too theoretical. In A-2, he completes his PhD and joins the company as it forms in 2001, very much in 'engineer/researcher' mode. In A-3, he is fully engaged with A-Tech, but still as an employee, not a shareholder. The company is successful, but not growing very quickly. He again seeks to improve his understanding of the commercial aspects of the business outside engineering by joining a Masters course in entrepreneurship with a strong practical focus on new ventures. In B-1, he is now in the process of founding his own company to seek high growth and market share, from a position where he now has equity in the firm, but remains the main product developer.

During these phases, John is working towards different career goals in formal and informal settings. I now analyse his perceptions of self and career during these phases drawing largely an interview which covered the history of each phase. It is particularly important to note, that throughout all the phases, John sees himself first and foremost as an engineer, and that in any team or business development, he would build to bolster any perceived weaknesses, but most firmly:

"I would never compromise my reputation as an engineer"

This theme recurred constantly. When asked what he considered to be the prestige factors for an engineer the following were suggested:

- Good engineers can not only make something work, but understand why
- Uniqueness of ideas
- Elegance of ideas
- For an academic engineer, publications

Noticeably here, John privileges engineering over academe. 'Publish or perish' haunts academe, but even for an engineer working in a university, high skill levels related to engineering are the most significant prestige factor for John.

A-1: joining A-Tech

I asked John why he had joined a spin-out, as distinct from a large company environment at the end of his PhD:

"It's not just a way of earning money; I had a job offer from [a large car company] while I was doing my PhD, but it wasn't what I wanted. The company [USO] *was the best technology available in the jobs I was offered; in any case, a spin-out company is prestigious – if it works!!"*

Here John clearly privileges the engineering reputation over money. For a mainstream academic, publication and tenure are at the heart of the career decision for exodus or stasis. For a newly qualified PhD engineer, the concerns are to be associated with leading edge technology and a USO such as A-Tech is a highly legitimate domain to work in, in terms of supporting a future career; again, a different set of priorities to the career academic. Of

course the decision was also pragmatic in that the opportunity was there, and John did not want to work for a large company in any case.

A-2: Working for A-Tech

John enjoys working for A-Tech as an engineer, and at the outset holds a view that if a product is good enough it will sell. During A-2 however, there is an increasing realisation, and one that he hold more strongly on reflection, that this was a little naïve. During this period, the company acquired UK government funding in the form of SMART awards to bring the technology to market. Although John was still very technology focussed, as he became more involved with the SMART work, he began to realise that the company's marketing strategy was weak and reactive. Operational business activities were undertaken by the company's founder, but John saw these activities as just having *"nuisance value"* rather than any strategic dimension. At this time, although he was meeting sales people, he maintained what he referred to as *"a healthy amount of prejudice"* against sales people, who were not valued, he explained, in engineering cultures if they had little or poor understandings of the product. He makes a clear distinction between 'business' and the potential for growth through strategic marketing. It could be argued that this is the trigger point for John to consider crafting not just a sense of self defined through technological expertise, but also through the attractions of turning technology into market growth: a market pull, not just a technological push. In other words, the beginnings of crafting an entrepreneurial identity.

A-3 Developing through A-Tech and education

John still enjoys working for A-Tech but is frustrated at the slow pace of growth and the lack of a strategic marketing strategy (perhaps A-tech is unable to progress through the next 'critical juncture' to achieve the next phase of growth). In addition he is still receiving a wage and does not have the prospect of equity, although he is working long hours and demonstrating enormous commitment. He realises the importance of business knowledge but during this Masters education phase (as well as the concomitant business development activity) he also now realises this knowledge is not just about business functions but is on a higher level – it is about engaging with different vocabularies and audiences and about the appropriate presentation of self in new settings. At this point, I asked him if it was about networking. He explained that his early experiences of networking were poor *"not a valuable use of time, meeting people selling me low-level services such as business cards"*. By September 2005 however, John had moved on from hovering at the edges of generic business networking events to building his image by giving a presentation at the Institute of Directors, a prestigious grouping of senior managers in the UK. In his own analysis he had gone from meaningless networking, where he was being sold things he did not want, to establishing a meaningful network of the right high-tech focussed contacts for his intended new business. Here, John highlighted the importance of being seen, not as a student, but as a 'product developer' by potential customers, able to *"ask the customer, what is his pain, and how can my machine fix it"*. To be seen as a student, or a recent student, or even an academic, was seen as a route to not being taken seriously. While he presences himself as a top-ranking engineer, this now seems to be enriched by a growing sense of entrepreneurial self.

B-1 Out on his own

Now that John is in the process of setting up his own company, to pursue his expertise in a closely related field under his own control, I asked him what he thought of 'entrepreneurs': had he 'become an entrepreneur? Interestingly, he was fairly neutral towards the term, as he claimed it wasn't really used in Germany (although this is changing. However, he was developing a more positive view of the term as it was now associated with 'growth' as distinct from the mundanities of business life, and the downside of his perception of sales. He was now beginning to see it as an attractive term, associated with growth and success. However:

"it's not me yet – I'm still an engineer".

I then asked him who his role models were: *"early stage developers in high tech spin outs, putting good technology ideas into practice".*

Here John seems to be in the process of developing an enriched sense of engineering self-hood, with the elegance of solutions being extended from the laboratory into the market place. This manifests in two ways:

1) He is focussed not just on recognising the value of business knowledge but also on presenting the 'right' identity in business settings.

2) Most importantly of all is his maintenance of self as 'cutting edge engineer' and that spin-out activity is a legitimate dimension of engineering activity.

3) Engineering identity is not compromised by association with growth and market share.

4. Conclusion

In this brief overview of John's transition through different phases of spin-out-related activity that tally strongly with the norms identified by Vohora et al (2004) it is clear that John is carrying out considerable work on his identity. In line with Lounsbury and Glynn (2001), the self-hood is strongly associated with the purposeful development of legitimacy for himself and for the company, to achieve market share and growth, and that legitimacy is engineering-driven. As he makes his journey from PhD engineer in the research lab, to founder of his own company he actively crafts his career, his company and his identity in line with role expectations in his professional milieu (Goffman, 1959). To conclude, the message of this paper for theorists of entrepreneurial identity, is that this case shows a powerful sense of agency concerning the elegance of engineering and its potential for commercial solutions, not an identification with heroic entrepreneurial stereotypes in the media: this is very much an empowered version of entrepreneurial identity. Practically, the career transition for either a mainstream academic (such as the founder of A-tech, though this in not the focus of this paper) or a newly qualified PhD student is complex and challenging: but better understanding of the centrality of the engineering identity and its enrichment through entrepreneurial practice may well aid those engaged in the support of USO activity. Clearly this is just one case and more studies need to be carried out to explore these ideas in more depth.

Acknowledgement

[i] Authors such as Ritchie (1991), du Gay (1996) and Cohen and Musson (2000) suggest a less empowered view of entrepreneurial agency, here, individuals are reflexively inscribed as entrepreneurs, an identity 'on offer' within the discursive medium of the enterprise culture. Clearly however, entrepreneurial identity is still constituted as a relation between the individual and society in some way.

[ii] A-tech actually embraces two companies on paper

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SUMMARY

Research proposal
This paper examines and nature of identity work carried out by an engineering researcher during the establishment of a UK university spin-out (USO) and later, forming his own company. The study tracks his understanding and development of different aspects of his professional identity as he works towards shifting career goals in different learning settings.

Problem definition
The establishment of USOs is one mechanism by which better commercialisation of research might occur. To work in the USO domain may well represent a challenging career shift for an academic scientist or engineer and little is known about this dimension of the process.

Research questions
The paper considers whether the purposeful construction of entrepreneurial identity by scientists and engineers may support successful career transformation and may therefore be a significant element in successful spin-out activity.

Theoretical framework
The paper is rooted in sociological and cultural understandings of entrepreneurship that focus on the relationship between the individual entrepreneur and the social context. The dimension of interest is <u>entrepreneurial identity</u>, and the extent to which entrepreneurs shape and manipulate their identity as part of business development and growth. This is rooted primarily in Giddens and Goffman.

Empirical context
The research concerns data collected over a one-year period arising from interactions with a PhD student engaged in different aspects of USO activity, while participating in a Masters course in entrepreneurship.

Research design
An exploratory qualitative case study that has strengths in the richness of the interaction with the main participant; the weakness of the case is possible bias due to the closeness of the relationship with the main participant, and generalisability.

Research phase
I have produced and published a number of theoretical and empirical papers in journals or at conferences on entrepreneurial identity; some are still in review. Some are individually authored, others are co-authored with two other colleagues. The emphasis at present is on laying theoretical foundations while using empirical material to illustrate the concepts. My express interest at present is taking this work through to the engineering and science fields.

Contribution
There is a vast literature on why people choose to start businesses. There is little however on why *specifically* engineers or scientists, as distinct from other entrepreneurs, choose to become entrepreneurial, although a number of authors have argued that the decision emerges from a complex interplay between personal and structural factors. This paper brings the dimension of entrepreneurial career identity to the debate and extends the entrepreneurial identity literature to scientists/engineers. The importance of maintaining engineering identity is established, though positive associations with entrepreneurial growth become more apparent over time.