THE MARKETING SCIENCE INTERFACE: PROMOTING THE ENTREPRENEURSHIP AGENDA WITHIN THE SCIENCE, ENGINEERING AND TECHNOLOGY (SET) CONSTITUENCY OF HIGHER EDUCATION.

Dr Pauric McGowan, Director of the Northern Ireland Centre for Entrepreneurship (NICENT), University of Ulster, Jordanstown Campus, Newtownabbey, County Antrim, BT37 0QB, N Ireland.
Tel: 44 (0) 28 9036 8864 Email: p.mcgowan@ulster.ac.uk
Website: http://www.nicent.ulster.ac.uk

Sharon Porter, Teaching Fellow in Entrepreneurship, Northern Ireland Centre for Entrepreneurship (NICENT), University of Ulster.

Micheal Brennan, School of Marketing, Entrepreneurship and Strategy, University of Ulster.

1. Introduction

University based entrepreneurship in the UK is of increasing interest to both policy makers and university managers; evidenced by government sponsored initiatives such as the Science Enterprise Challenge, (SEC) in the UK – promoting entrepreneurship within higher education and the more recent development of the National Council for Graduate Entrepreneurship, (NCGE). However, while the idea of the "entrepreneurial University" has begun to find support within a small number of constituencies the literature suggests that there are still a considerable number of barriers to the promotion of entrepreneurship within universities, in the UK, as well as across the EU and indeed the US, (Morrison 2004, Bok 2003, Etzkowitz 2003, Clarke 1998, 2003). While there is a growing agreement about the need for UK universities to become more entrepreneurial, a crucial question it seems is how might this be done effectively? (Gibb 2000).

In this paper, using a case study approach, the authors seek to provide an answer to this question. They explore the challenges that exist in seeking to migrate the agenda for entrepreneurship out of the faculties of Business and Management where it is traditionally lodged within most universities and into the faculties of Science, Engineering and Technology, (SET), where, for all sorts of reasons, it is viewed as foreign and a threat. They present insights to the some of the challenges faced in engaging academic entrepreneurs and nascent entrepreneurs within the university partnership which involved the University of Ulster and Queens University, Belfast, represented by the Northern Ireland Centre for Entrepreneurship, (NICENT).

The outcomes of the paper are presented as a contribution to those seeking to better understand entrepreneurship in different university settings. The authors fully recognise the limitations of such a case approach as a basis for generalisations. Nevertheless, given the paucity of extant research in the area and the unique role that individual universities play in regional economies, such an approach was felt to have merit and to be of interest to those involved in seeking to find innovative ways to push the agenda for entrepreneurship within the higher education sector, (Tidd et al 2001, Shane 2004).

1.1 Overview
In recent years the UK government has determined that the higher education sector must play a much greater role in generating a stronger environment for entrepreneurial activity. The output of any of the UK's universities in terms of qualified graduates and primary research can clearly be a major influence in determining the economic potential of the region in which it is located and beyond. The ambition of many universities to respond to these challenges presented by government and, sadly, to a lesser extent industry, to increase for example the incidences of effective commercialisation of ongoing research must be seen to be a function of how well they position themselves as entrepreneurial institutions. A key determinant of success in this strategy is the development of a culture of entrepreneurship amongst both the student body as well as amongst academic staff.

A starting point for creating such a culture is the development and the implementation of an appropriate curriculum for entrepreneurship particularly with in the faculties of Science, Engineering and Technology, (SET). It is in these faculties that the potential for new ideas for new products and processes must be seen to be high but where such a curriculum has rarely if ever existed. Selling the idea that entrepreneurship is important to Scientists, Engineers and Technologists within universities however is no easy enterprise and seeking to persuade them

that it should form a part of the curriculum for their students at every level within the SET faculties means resorting to every trick in the sales manual if buy-in is to be achieved and ownership taken up. Before considering a classical sales model as a basis for promoting the entrepreneurship agenda within the SET faculties within the NICENT partnership, let us consider first what an "entrepreneurial university" is and some of the difficulties that exist for universities aspiring to become one.

1.2 Characterising the Entrepreneurial University

The entrepreneurial university is one that facilitates the creation of value for society and economic wealth through new and innovative undertakings. The term reflects a philosophical 'maturation' of the concept of entrepreneurship to include socio-economic value in addition to an association with job creation and new firm creation (Kao, 2002). This socio-economic mission is an expansion of the teaching and research missions that traditionally determined the priorities and direction of universities (Etzkowitz, 2003a). At the heart of the entrepreneurial university is innovation – what Drucker called "the effort to create purposeful, focused change in an enterprise's economic or social potential" (Drucker, 1985, p. 67). The purpose of the entrepreneurial university, some argue, is to transform academic knowledge into economic and social utility (Bok 2003, Clarke, 1998)

On the basis of a review of five leading European universities perceived as entrepreneurial, Clarke further identified pathways important for organisational transformation to be considered an entrepreneurial university:

- A strong steering core for monitoring and reacting to environmental change
- Boundary spanning structures and mechanisms
- A diversified funding base
- A strong academic heartland accepting of an entrepreneurial culture
- An integrated institutional entrepreneurial culture

In addition Etzkowitz (2003b) identified at least five key elements of an entrepreneurial university:

- The organisation of group research
- The creation of a research base with commercial potential
- The development of organisational mechanisms to move research out of the university as protected intellectual property
- The capacity to organise firms within the university
- The integration of academic and business elements into new formats such as university-industry research centres

Clark's transformational pathways and Etzkowitz's organisational elements are a reaction to, and to a degree influence, the changing policy perspectives of how universities are perceived and understood in knowledge-based economies. Evidence of new attitudes as to the changing role of universities reflected in recent policy reviews are reflected in the following examples:
"*Universities will have to get better at identifying their areas of competitive strength in research. Government will have to learn to do more to support "business – university" collaboration. Business will have to learn how to exploit the innovative ideas that are being developed in the university sector"*. (Lambert Review of Business-University Collaboration, 2003, p. 2)

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"In a knowledge based economy both our economic competitiveness and improvements in our quality of life depend on the effectiveness of knowledge sharing between business and higher education". (The Future of Higher Education 2003, p.36)

Such policy perspectives have invariably been translated in the UK into funding streams to support various initiatives at different levels. Examples of these are:

- University structures and systems - the Higher Education Reach out to Business and the Community initiative
- Discipline areas - the Science Enterprise Challenge in which NICENT is a partner
- Funding academic spin out firms - the University Challenge Fund
- Supporting knowledge transfer - the Teaching Company Schemes/Knowledge Transfer Schemes.

At the core of any ambition to create the entrepreneurial university, however is a clear need to generate an appropriate culture that encourages staff and students to be continuously innovative and opportunity focused and that allows them to be comfortable with the changes that will be the inevitable outcome of such innovative and opportunity focused activities. Generating such a culture requires the support of those at the highest level in the institution as well as buy-in from everyone else. Those who challenge the status quo, who break the mould, if they are not driven out of the university by reactionary forces and defenders of that status quo, will become the new heroes and should be feted as such. Their stories should become the stuff of legend for others to emulate. Such is the raw material of an entrepreneurial culture. Experience, however, tells us that challenging the status quo is easier said than done and can actually be down right dangerous to career prospects.

This is said conscious, of course, of the questioning by many about the appropriateness of promoting this agenda within academia at all. Bok 2003, for example, writes in the preface to his book about universities in the market place:

"..I wonder that commercialisation may be changing the nature of academic institutions in ways that we will come to regret. By trying so hard to acquire more money for their work, universities may compromise values that are essential to the continues confidence and loyalty of faculty, students, alumni, and even the general public"

2. Marketing the Entrepreneurship Agenda within the SET Constituency

Key challenges and potential barriers to effectively promote and build an infectious culture for entrepreneurship within traditionally grounded higher education institutions can be considered under four headings. Firstly, *credibility,* which focuses on issues of quality, relevance and the value, attached to the entrepreneurship agenda by the target faculties. The second is *transferability*, and addresses the issue of what entrepreneurship means in the minds of those within the target market and the different constituencies within that market. *Confirmability* is the third issue and deals with the need to establish the efficacy of the efforts being made to push the agenda for entrepreneurship across the different constituencies within the SET faculties and finally there is *dependability* which addresses the important challenge of sustaining the agenda, supporting it in its infancy and protecting it against the many counter revolutionaries and vested interests that will undoubtedly seek to reverse any progress made in pushing the agenda within the SET faculties.

2.1 Selling the message, "Entrepreneurship is good for you, Mr/Ms Engineer, Scientist, Technologist"- the NICENT experience

In the late 1990's a specific strategy was adopted by the UK government, keen to do something to generate a greater entrepreneurial culture within the SET faculties in universities across the UK. The Science Enterprise Challenge (SEC) network that emerged saw the establishment of 13 centres of excellence in entrepreneurship education within clusters of different UK universities. NICENT was one such centre. It was established in 2000 and funded by the Office of Science and Technology and Invest NI. It is a partnership between the University of Ulster and Queens University Belfast. Both universities have between them some 50,000 students pursuing programmes at undergraduate, postgraduate taught and postgraduate research, in Science; Engineering; Technology; Social Science; Humanities; the Arts, and Business and Management.

NICENT was charged with seeking to embed entrepreneurship within the curriculum at all levels within the SET faculties. Furthermore, the Centre sought to engage the teaching and research staff within this constituency with the entrepreneurship agenda. Indeed, it was crucial to recognise the pivotal role that teaching colleagues played in determining the likely success or failure of this endeavour over the longer term. Issues of understanding how entrepreneurship could be interpreted and of establishing relevant value and appreciation for the future development of students (and subject areas) within these faculties was crucial. Furthermore, a means to meet the learning needs of students exposed to entrepreneurship for the first time in these faculties had to be developed that had credibility in the eyes of academics, governing bodies and associated interest groups were relevant. In the best practice of sales, initial selling resistance had to be overcome, buying signals identified and every effort made to close the sale.

As consequence of NICENT's efforts to date to market the entrepreneurship agenda within the SET faculties, primarily through the adoption of a curriculum development strategy, for the academic year 2004/05 over 6,948 students within the SET faculties were exposed to entrepreneurship learning for the first time across the Partnership.

To sell the message that entrepreneurship is good for staff and students within the SET faculties, however, means addressing those challenging issues highlighted above, dealing with objections and closing the sale by essentially getting buy-in. Developing an appropriate sales message starts with a consideration of what is for sale, to whom, at what "price", how and at what cost?

In marketing terms "a product" is any good, service or idea that someone wishes to sell to another. In this case the product for sale, in its simplest terms it is that "entrepreneurship is good for both teaching and research staff and students within the faculties of Science, Engineering and Technology, (SET) within the higher education sector. Experience has shown that it is a message that has to be "sold" largely in the face of considerable scepticism and often, outright opposition. Of course, nothing in life is ever simple and selling such an intangible concept as entrepreneurship is probably as complex a challenge as anyone is likely to face in a university context.

The first major challenge arose because staff members, at different levels, as well as in the target faculties, were confused about what was meant by the term "entrepreneurship". Many within the latter constituency were particularly sceptical of its relevance to them and their

students. The most common misunderstanding was that entrepreneurship is only about starting a business. Therefore, many schools, particularly within Life and Health Sciences, did not consider entrepreneurship relevant to their programmes of study. To view entrepreneurship as being only about new venture starts was too myopic for NICENT and was at odds with extant research. It would also lead to entrepreneurship having nothing to say to the majority of staff members and students within the wider SET constituency.

Initial discussions with the SET faculties were very beneficial as they allowed us to identify the needs and concerns of our target market and how best to position our agenda within the individual faculties and schools. NICENT quickly realised that we had to put customer benefits to the fore and, in turn, these benefits would help to create desire for the entrepreneurship agenda.

Thus, in order to effectively deal with the issues of credibility and transferability, NICENT emphasised a broad interpretation of entrepreneurship that includes not only new business creation but also the dimensions of social entrepreneurship, academic entrepreneurship and intrapreneurship. To reflect this wider interpretation, entrepreneurship was defined as "initiating change for social good". Terms such as "new venturing" and "the new venturer" were used to help broaden understanding coupled with the promotion of a skills for life focus.

Every opportunity was taken by NICENT to spread this understanding of entrepreneurship. An effective public relation strategy was considered a key aid in gaining the support of faculties. If staff could see the relevance and value of entrepreneurship within the curriculum then they would be more likely to support its adoption and not consider it as being the latest "buzz" term, particularly, if the NICENT message could be communicated in an effective manner.

There was a potentially wide and varied market for the entrepreneurship message. This market included senior management within the University itself, through to senior staff within the target faculties, through to staff members who had always hankered after the opportunity to do something innovative and to behave entrepreneurially in a proactive manner, through to those who were more reactive and so on to those who were totally resistant to the whole idea. Beyond them then were the different student groups, those on undergraduate courses, or postgraduate taught programmes through to those on postgraduate research programmes.

To get buy-in to the idea that staff and students within the SET faculties need to know about and learn to apply entrepreneurship meant resorting to tried and tested sales techniques and strategies. The challenge to those of us in NICENT seeking to make the sale was to promote the benefits accruing from adopting the agenda, overcoming objections and close the sale. The AIDA Model helps to encapsulate NICENT's "sales" strategy, developed to effectively address a challenging and complex sales environment.

2.2 Following a Classic Sales Model

The AIDA Model, developed by St. Elmo Lewis (circa 1898), attempts to explain how personal selling works. AIDA is an acronym that describes a common list of events that is very often undergone when a person is selling a product:

1. **A** - Attention - to attract the attention of the customer and create awareness of the product.

2. **I** - Interest - to get the customer interested by demonstrating its features, advantages,

and benefits of the product.

3. **D** - Desire - to convince the customer of the product's benefits and its ability to satisfy specific needs.
4. **A** - Action - to push customers toward actually purchasing the product.

In the process of selling the entrepreneurship agenda, the steps highlighted above were systemically "climbed" by the NICENT team. The Model intuitively makes sense. Following its steps has enabled the NICENT message to be successfully developed and sold to the target market. In additional, post-purchase satisfaction was also important to help achieve sustainability and positive word of mouth within the target market. This was achieved through goods salesmanship and reassurance via the provision of a quality after-care service.

3. The NICENT Partnership Approach

With differing educational perspectives and individual cultures, each Partner faced it's own unique challenges in embedding the entrepreneurship agenda within their institutions. It became apparent that in order for NICENT to successfully fulfil it's mandate a "one size fits all" strategy would not work across the Partnership and a less generic approach was required.

In the initial stages the largest group within the faculties, the undergraduate constituency was targeted. The first challenge was that within both universities the numbers to be introduced to the agenda were substantial. Strategies to market the agenda differed between the institutions as each Partner was allowed flexibility within the overall NICENT strategy to develop specific responses to meet the individual challenges each faced.

NICENT has successfully developed joint initiatives to support the agenda such as establishing entrepreneurship awareness learning outcomes; an assessed Certificate in Entrepreneurship Studies; the 25K Competition managed by Investment Belfast; joint training and development activities; the establishment of the Northern Ireland Entrepreneurship Network and individual entrepreneurship clubs.

The key challenges that each Partner has faced, and the key enablers each has used to embed within their institutions will now be explored.

3.1 NICENT at the University of Ulster

At the University of Ulster (UU) a very specific policy was adopted which recognised a number of important issues within the target faculties. Firstly, there were too few within the target faculties concerned who understood the subject let alone could teach the material with any credibility. The few that did exist were already too busy as practicing Academic Entrepreneurs. Secondly, the Centre was committed to promoting the agenda to a very large number of students in a range of disparate courses across the faculties concerned. As a consequence, NICENT UU took two key steps.

The first step was to develop a new module in "Entrepreneurship Awareness" to be presented wholly on-line using e-Learning. The pedagogic basis for this approach emphasises the importance of student centred, independent learning as being key to encouraging entrepreneurial learning. The challenge then was for the NICENT team to negotiate with course planning teams within the University to accommodate the module within courses. The hard sell began.

The second step was to work closely with course planning teams to ensure that the learning outcomes for entrepreneurship were embedded in the course where the bespoke e-Learning module could simply not be accommodated. In this way, NICENT working with course planning teams, sought to negotiate where and how the learning outcomes could be introduced and assessed in different modules making up the programme over the duration of the student life cycle. This required a review of each of the modules within the course, seeking edits and revisions were required to accommodate the learning outcomes for entrepreneurship. This was called the "spread option". In order to be able to see where learning outcomes were lodged and assessed within a course, NICENT UU developed a tracking mechanism. The learning outcomes were introduced to courses progressively over the five years of the project through engagement in the rolling programme of course reviews and revalidations exercises that required course planning teams to submit their programmes to a critical external examination on a five year cycle. One prominent example of NICENT UU's success has been the introduction of entrepreneurship learning outcomes to all pre and post registration courses in the School of Nursing within in the Faculty of Life and Health Sciences.

A third step to building on the entrepreneurship awareness agenda was to provide students with an opportunity to apply their knowledge in practice. To this end NICENT co-sponsored a local enterprise competition, the 25K Competition, targeting the higher education sector. The competition, now in its sixth year, has lead to the establishment of 12 spinout companies.

A further step was to organise personal development training for staff drawn from the SET faculties to teach entrepreneurship and to manage the e-Learning modules. These ranged from in-house programmes to engagement in an Entrepreneurship Development Programmes run by the SEC network in the UK along the lines of the MIT EDP, to supporting faculty to attend the EDP at MIT and the Price Babson Programme at Babson College. The rationale behind encouraging academic colleagues from within the SET faculties to become involved was to encourage buy-in, build knowledge in a way that was credible and would build confidence. All the time the hope was that ownership for the agenda would begin to become embedded in the SET faculties. There were those too, from within the SET faculties, who expressed a real interest in receiving enterprise development training for starts-up activity or for the development of an existing enterprise. Here too, NICENT sought to play a role by organising business planning programmes and ideation workshops.

Key to the success of NICENT UU was the support of management at the most senior level of the partner institutions. This emphasised the importance of the agenda at the highest level and sent a clear message to course planning teams of the importance of adhering to the University's demands for greater entrepreneurship within course documentation. The rolling programme of course review and revalidation also provided NICENT with a unique opportunity to intervene and negotiate for the introduction of the learning outcomes to courses. In addition, a new policy on staff promotions was introduced that reflected the commitment by senior staff in the UU to encouraging academic members of staff to engage with the entrepreneurship agenda. As a consequence, faculty members who engaged in promoting the entrepreneurship agenda within his or her faculty, either through teaching, research or new venturing activity became eligible for promotion. Performance in the arena of Academic Enterprise became a third avenue for faculty staff seeking promotion in addition to quality in teaching and research activity.

3.2 NICENT at Queen's University Belfast

Queen's places considerable emphasis on building its reputation as a centre of academic excellence and research. The ongoing challenge for the university therefore has been how to implement entrepreneurship into the agenda without comprising academic rigor and teaching quality as assessed by subject review. It was apparent that unless entrepreneurship became part of the compulsory module content much impact would be lost. In order to address this challenge Queen's made a number of significant decisions. Firstly, a NICENT planning committee was formed comprising 'Enterprise Champions' from the engineering and science faculties and other individuals who had considerable expertise in this field. The Pro-Vice Chancellor chaired this committee for Teaching and Learning, thus establishing the importance of the agenda that the university attached to it. Secondly, and as a consequence entrepreneurship was added to the official teaching and learning strategy of the university. Thirdly, a cohort of Teaching Fellows in Entrepreneurship, based within the School of Management and Economics, was created to focus on undergraduate entrepreneurship curriculum development and teaching delivery.

In order to promote entrepreneurship, NICENT staff at Queen's decided to adopt the 'learning by doing' approach, incorporating the use of small groups, role-plays, case-studies and business simulations. This approach was deemed the most appropriate in order for students to engage with the entrepreneurship agenda, whilst at the same time complementing the traditions at Queen's. One of the main challenges was that certain degree courses offered at Queen's such as engineering, medicine and law have professional accreditation and the professional bodies have a major influence on curriculum content. Moreover, the implementation of entrepreneurship into an already packed curriculum posed specific challenges for academic staff already challenged by research obligations, and providing quality assurance on teaching and learning. Consequently, embedding enterprise into the curriculum was not seen as a key priority particularly in areas where there were no obvious links to enterprise and innovation. However, as Queen's had made a contractual obligation to embed entrepreneurship in the science and engineering curriculum it was felt important to gain individual schools' commitment through the provision of customized solutions for each degree pathway. Consequently, NICENT staff designed both a stand-alone entrepreneurship awareness module and a blended module whereby entrepreneurship awareness was delivered within a complementary existing module. The modules were also designed to introduce students to the possibility of self-employment as a possible future career alternative. Consequently this frontline strategy using 'people on the ground' stands in sharp contrast to its partner, University of Ulster, which utilises eLearning in its delivery of entrepreneurship education.

NICENT at Queen's has had to build an awareness of entrepreneurship and encourage a more receptive culture in the science and engineering faculties. This was not easy as enterprise was initially viewed as counter to the academic culture. In fact, gaining the balance between education and training was a particular challenge as it was paramount that the Queen's reputation for teaching quality and research was not in any way diluted.

4. Concluding Comments

In the Northern Ireland context, a higher fear of failure exists amongst potential entrepreneurs of both sexes (43% in Northern Ireland compared with 32.9% in the UK) (O'Reilly and Hart, 2004). However, the NICENT Partnership has had a major role in shaping attitudes, values

and beliefs of individuals towards risk-taking behaviour. This change has been significant, not just within the student population, but also amongst the academic staff.

For the academic year 2004/05, NICENT once again exceeded performance targets for students exposed to entrepreneurship awareness education (6948 students). By the end of the academic year 2005/6, it is estimated that over 15,000 students will have undertaken entrepreneurship education and training as part of their undergraduate to post-doctoral studies since the Partnership was established in 2000.

Initial feedback from independent reviewers (BDO Stoy Hayward) suggests that NICENT is having a positive impact and had the Centre not been created no progress in this agenda would have been made. However, in some respects the agenda could be considered rather sterile. Building awareness has its limitations (Hytti and Kuopusjarvi 2004). If there is to be real attitudinal change, application is a much better strategy.

Much remains to be done to meaningfully meet the challenges highlighted by GEM research and Invest NI. The Region has been devastated by a decline in traditional industries such as shipbuilding, textile and aircraft manufacture. It is overly dependant on the public sector. It is estimated that over the next five years some 75,000 jobs will have to be lost within the public sector, at least, in order to bring it more in line with the norm for other regions of the UK. Building a new culture for enterprise, one that is truly entrepreneurial, is a challenge that will take time.

Machiavelli is credited with the statement that "…there is nothing more difficult to carry out nor more doubtful of success nor more dangerous to handle than to initiate a new order of things."

Culture change takes time, patience, risk-taking and lots of sweat equity and not a little vision. It requires an entrepreneurial response. The challenge for NICENT is to extend its efforts beyond the SET constituency to all faculties within our institutions, to build international networks in entrepreneurship education and exploitation, as well as share experience and best practice.

The overall NICENT strategy involves a pull-push marketing policy to stimulate the entrepreneurial potential within the Partnership's institutions. Our role has been to develop this talent to the extent were the enterprise support agencies operating there (such as incubation and enterprise support facilities) and within the wider environment (such as Invest NI) could engage with emerging entrepreneurial potential and assist with the commercialisation of viable opportunities. Obviously, some entrepreneurial potential stemming from this effort may take time to develop and, thus, this strategy is long-term in focus.

Despite a growing urgency for change there are no quick fixes. Change is possible, and is already beginning to happening. However, to achieve lasting change there must be a sustainable long-term strategy, which integrates the efforts of both the Further and Higher Educational Institutions and the enterprise support agencies.

Universities have a valuable role to place in the process of culture change. The educational institutions can be seen as "the entrepreneurial propagators" who plant the seed and support the seedling, while the enterprise support agencies help nurture and grow the entrepreneurial

potential "budding" from our institutions. In this way, we can create a fertile environment, which will inspire and support a vibrant entrepreneurial culture.

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