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Promoting technology-based enterprise in higher education

The role of business plan competitions

Pauric McGowan and Sarah Cooper

Abstract: *The research discussed in this paper explores the impact of a higher education initiative targeted at developing entrepreneurial capability and encouraging student technology venturing activity in Northern Ireland. The initiative in question is the £25,000 enterprise competition run by the Northern Ireland Centre for Entrepreneurship (NICENT). The authors report the outcomes of exploratory survey-based research to establish the competition's impact on participants and its contribution to the development of positive attitudes towards technology transfer and enterprise by aspiring, would-be new venturers.*

Keywords: *student entrepreneurship; student ventures; entrepreneurial capability; technology-based enterprise; Northern Ireland*

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Encouraging technology-based new venturing is central to local and national government policy agendas in many countries (Cooper, 1998). This trend has been stimulated by the emergence of wealth and job creation opportunities in sectors as diverse as software, biotechnology and nanotechnology. Empirical evidence pointing to the key role of entrepreneurs in technology-based venture formation and growth suggests that most of them work in a related sector before establishing their own venture, and are typically in their mid-to-late thirties (Cooper, 1973; Roberts, 1991; Harrison *et al.*, 2004; Cooper, 2006; Majid, 2006). For numbers of technology-based ventures to grow, it is necessary to increase the flow of talented individuals who choose to

commercialize technological opportunities in areas such as science, engineering and technology (SET).

Universities are seen as having a role to play in increasing this flow of entrepreneurial human capital. Interventions to build enterprise awareness and increase skills range from compulsory and optional modules in enterprise to extra-curricular intensive boot camps (Cooper and Lucas, 2006) and business plan competitions. The last decade has seen a proliferation of business plan/enterprise competitions, but this growth has not been accompanied by research to assess their effects. This paper helps to fill that gap by exploring the impact of a university-based enterprise/business planning competition in Northern Ireland in building the

innovative and entrepreneurial capability of participating higher education students. The competition that is the focus of this study is the £25,000 Enterprise Award Scheme (EAS) run by the Northern Ireland Centre for Entrepreneurship (NICENT), a partnership between Northern Ireland's two universities, the University of Ulster (UU) and Queen's University, Belfast (QUB).

Before presenting results of the empirical research, we explore some of the challenges facing Northern Ireland in its immediate post-conflict period; we consider the emergent enterprise environment and the particular contribution of the education sector to its development. We then examine how business plan/enterprise competitions can act as vehicles for entrepreneurial learning, providing opportunities to acquire new and to enhance existing venturing skills, as well as stimulating attitudinal change towards enterprise. The structure and process of NICENT's competition are considered and the discussion draws briefly on a descriptive analysis of participants in the 2005/06 competition before presenting the findings of more detailed exploratory research, to assess the impact on participants, conducted among teams from the first five years of the competition. The paper seeks to enhance understanding of the value of university enterprise competitions and considers the implications for policy.

The environment for enterprise

Northern Ireland is identified in the United Kingdom GEM 2005 report as a relatively poor performer in entrepreneurial terms, coming tenth out of twelve regions (Harding, 2005). Just 5% of its population are likely to start a business, with women only a third as likely as men to do so. As a result of the decline of its traditional industries, lack of high-value inward investment, skewed growth in public-sector spending and the relatively recent return to peace after thirty years of social unrest, the region still reflects an 'entrepreneurially-weak economic environment' (Sweeny, 1987). Government agencies across the UK continue to encourage and assist high-technology start-ups as a key economic policy plank and small and medium-sized enterprises (SMEs) are viewed as offering benefits that are central to developing and sustaining dynamism in the economy (Cooper, 1998). Notwithstanding the important contribution of service-oriented businesses, Northern Ireland's SME sector is relatively small and lacking in strength in important areas such as SET. Its sizeable stock of highly-educated people, particularly in technical subjects, has not been matched by job opportunities to

capitalize on their skills. As a consequence there are relatively few stories of successful venturing by local role models/champions to foster an environment supportive of enterprise.

Resources, such as intellectual, physical, financial and human capital, are important in establishing any new venture, but the vital 'input' is the entrepreneur, whose role and actions are central to opportunity exploitation and the commercialization of existing/emergent know-how. The founder's or founding team's motivations, vision and long-term aspirations have a profound impact on the way ventures are developed, and those factors in turn will be shaped by their expertise, capabilities and prior experience (Shane, 2000). Research suggests that most would-be technology venturers work for public-sector or private-sector organizations in related fields immediately before starting their own venture (Oakey, 1995; Cooper, 1996; Lindholm Dahlstrand, 1999); thus government support is often targeted at programmes encouraging business start-up among such individuals. For numbers of technology-based businesses to grow significantly, there must be an increase in the flow of SET talent commercializing technological opportunities, and particularly in the number of younger people engaging in venturing. New and existing firms also require talented employees who are able to contribute from an early stage of employment (Pittaway and Thedham, 2005).

If there is to be significant progress, other organizations must support government by actively helping to raise the profile of entrepreneurship and proactively assisting individuals, particularly from technical domains, to develop the knowledge, skills and attitudes that will enable them to be innovative employees and entrepreneurial venturers.

HE and the enterprise agenda

Some national governments have launched initiatives to encourage higher education institutions (HEIs) to embrace the enterprise agenda. A prime example of this is the UK's SEC programme which resulted in the creation of thirteen centres of excellence, many of them partnerships between HEIs, focused on enhancing the entrepreneurial potential of students, staff and alumni within SET. Established in 2000, NICENT represented part of Northern Ireland's response to the SEC initiative. As previously noted, the key partners in NICENT are UU and QUB, the region's two universities. Tasked with migrating entrepreneurship from its traditional home in business and management into SET faculties, NICENT's early focus was on building awareness of entrepreneurship among students

through curriculum development activities. NICENT has also been committed to encouraging engagement in venturing practice through its £25,000 EAS enterprise/business plan competition, managed in collaboration with local, government-sponsored agencies. This paper considers the experiences of some of the leading teams from the first five years of the competition. First, the discussion focuses on enterprise/business plan competitions and their contribution to the development of entrepreneurial capability.

Enterprise/business plan competitions

The first business plan competition is attributed to the University of Texas. It was held in the early 1980s, and since then competitions have been established in numerous countries (Kautz, undated). Many competitions are modelled on high-profile events, such as the Massachusetts Institute of Technology's \$50,000 competition.

In some cases entry is limited to those from the organizing institution while in others it is open to people from any source organization or background. Some competitions accept plans based around opportunities from any sector while others focus on a specific field. A typical format sees individuals and/or teams submitting business plans, from which the best are selected for some form of final stage. Some competitions provide those who get through the first round with access to specialist workshops and mentor support. National competitions tend to comprise local and regional rounds, in which winners are chosen to compete in national finals. Judges are often drawn from the enterprise community and may be successful entrepreneurs, financiers or enterprise support professionals. Many competitions are sponsored by venture/enterprise-related organizations, with prizes varying from money to advice and business support. Winners and losers alike gain vital feedback on venture feasibility from real investors and support providers, which is valuable in helping them to reshape their proposition. Investors see opportunities generated by highly innovative individuals or teams which may become investment prospects. A growing body of evidence suggests that first-hand experience of venturing provides a powerful vehicle for developing the skills, confidence and positive mindset that are important in entrepreneurial individuals (Lucas *et al*, 2006; Cooper and Durand, 2006).

Venture creation, skills and entrepreneurial learning

The venture practice offered by business plan/enterprise competitions provides participants with a glimpse of

how to exploit opportunities or how to help others build ventures. Developing a business plan takes participants to the heart of entrepreneurship by encouraging consideration of Timmons's three cornerstones (1999) of new venture creation: opportunity, resources and team.

Evidence indicates that past experience is important in the new venture creation process (Timmons, 1999; Chandler, 1996), helping entrepreneurs to identify opportunities and assisting with resource planning to support exploitation (Roberts, 1991; Cooper, 1998). Most students lack exposure to the market, where customer or supplier feedback and comments can trigger opportunity identification. Competition entrants are required to undertake market research, which encourages a strong market focus, including an engagement to elicit the views of potential customers. This may be critical in helping to shape opportunities and test feasibility. Matching resources (human, physical, intellectual and financial) to venture needs through start-up, development and growth requires founders to envisage their business beyond start-up. Participants gain knowledge about the stages involved in venture development and the range of sources of knowledge, information and resources which they might usefully access. Activities associated with business plan competitions give participants the opportunity to gain practical experience of applied research; such enactive mastery is, arguably, the best way to build competence and self-efficacy (Bandura, 1997; Cooper *et al*, 2004).

The majority of technology-based ventures are products of a number of complementary knowledge and skill sets that enable the founders to build teams to operate in competitive markets (Roberts, 1991; Harrison *et al*, 2004). Venture teams are, ideally, multidisciplinary, with participants identifying their respective strengths and weaknesses, recognizing the challenges they face as a team and addressing them in the 'safe' environment of the business plan competition. In the absence of commercial experience, entering a business plan competition provides team members with an opportunity to gain contrasting perspectives on the feasibility of a proposed opportunity. The external review by experts from the entrepreneurial community, including business advisers, business angels and venture capitalists, offers constructive criticism and helps to convey a realistic sense of individual and team skills and capabilities, and of the merits of the proposed venture.

While teams who wish to take their business plans forward from university-based competitions could be viewed as suffering from the liability of newness, it could equally be argued that youthful and untrained

minds constitute a green field for the development of knowledge and core skills. Those with no intention of commercializing their technology gain a valuable understanding of the complexity of the new venture creation process – the knowledge and perspectives thus acquired are valuable in any role where project planning skills are required. Those who go on to work in SMEs as employees understand more clearly what it means to have developed a business to a stage at which it employs others.

Many of today's business plan competitions provide access to specialist training and development workshops and mentors, although often only for those who get through to later rounds. Participants have the opportunity to learn vicariously from the experience of others in addition to learning by observing competing teams.

Having considered briefly business plan competitions in general and their role in developing skills and know-how, our attention now turns to NICENT's £25,000 EAS and the findings of exploratory research into its impact.

Research sample, methodology and findings

NICENT's £25,000 EAS is just one of its activities: other activities include individual modules and commercialization assistance to raise awareness of and build capacity for entrepreneurship among students, staff and alumni. The EAS is designed to encourage student engagement in enterprise through the practical exploitation of technology-based opportunities. Based on the above-mentioned \$50,000 Enterprise Award Competition organized by MIT, NICENT's EAS aims to encourage entrepreneurship and stimulate technology transfer within Northern Ireland's universities. The EAS, managed across higher education by NICENT, is open to undergraduates and postgraduates at all the UU campuses and at QUB. It attracts teams of students from management and SET disciplines and presents them with the challenge of writing a plan for the commercialization of a specific piece of technology. The popularity of the competition has increased year by year, from the 28 plans submitted in the first year to 98 in 2005/06. Analysis of the 2005/06 competition shows that 345 people entered and that teams had on average three to four members. Just over half (55) the teams were from business and management – a marked increase on previous years – and the rest were from SET. Mixed-discipline teams are rare. Around 58% of the participants were female, which is partly attributable to the large percentage of females studying business and management and health and life sciences, which are both major sources of entrants.

The competition operates in two stages, extending over six months. All teams submit a short plan for their technology-based opportunity which is evaluated by a team of experts: the top ten teams are then selected to compete in the final. Teams reaching the final have access to specialist workshops and are matched with a mentor who provides support to shape the proposition. Twenty per cent of the 50 finalists to date have founded high-technology companies. The success of the competition has attracted significant private-sector support as well as that of Invest Northern Ireland (INI).

In the following sections the findings of research among teams from the first five years of the competition (2000–2005) are presented. Data were collected via a questionnaire survey administered to spokespeople for 48 of the 50 business ideas/teams (contact information was unavailable for two teams). The survey focused on the experience of participation and the extent to which engagement in the competition had increased understanding of and changed attitudes towards venturing and future work.

Seventeen team representatives (35%) responded to the survey. The minimum length of time between a respondent's engagement in the EAS and completing the questionnaire was one year and the maximum was five years; 80% had participated within the previous three years. The responding representatives were from teams with three or four members: nine were male and eight were female. Twelve were between 20 and 30 years of age, two were between 31 and 40 and three were over 40. Of the 17 business teams represented, eight were from UU and nine were from QUB. Nine respondents had completed or were completing a PhD, six had completed a taught undergraduate Master's degree and two had undertaken a Bachelor's degree; all but two were or had been full-time students. Fourteen respondents (82%) were from the faculty of engineering, with one each from computing, medicine and business. While participants in the overall competition are drawn from diverse faculties, team membership centred predominantly around a single discipline. The one exception brought together members with business (MBA), engineering and science backgrounds. Business opportunities included a diabetes management system, a tamper-evident tarpaulin, a smart bandage to aid in the monitoring of wound healing and temperature-responsive footwear. All but three respondents were from Northern Ireland; of the other three, two were from the Republic of Ireland and one was from England (but this respondent had resided in Northern Ireland for over ten years). Sixteen of the respondents (94%) were currently in employment, and the outstanding one stated that he was self-employed.

Table 1. Extent of understanding gained about key skills/abilities (S) and knowledge-based (K) areas.

	None (%)	Some (%)	Good (%)	Considerable (%)
Business planning (K)	0	6	82	12
Doing market research (S)	0	29	47	24
Raising investment capital (K)	0	35	41	24
Marketing and promotional strategies (K)	0	35	47	18
Effective communications (S)	0	18	58	24
Leadership and people management (S)	12	12	58	18
Selling (S)	0	47	35	18
Negotiation (S)	6	47	35	12
Competitive differentiation (K)	18	35	23	24
Developing unique selling points (K)	0	12	64	24
Managing risk (K)	12	53	29	6
Building and managing networks (S)	0	47	47	6
Networks and assistance in Northern Ireland (K)	6	35	47	12
Legal aspects of starting a business (K)	6	53	29	12
Securing intellectual property rights (K)	0	24	59	17

To gain further insights, representatives of three other teams, drawn from different years of the competition, were interviewed (the discussion topics were the same as those explored in the questionnaire survey). Each interview lasted for half an hour and a shorthand record was taken and transcribed for analysis. Two interviewees were graduates from QUB and one was from UU. All were aged between 20 and 30 and were in employment.

The overall sample of 20 includes representatives of teams that had established a business and others that had not.

Perceptions of entrepreneurs and entrepreneurship

Perceptions of entrepreneurship as an activity and potential career may influence the likelihood that individuals will pursue such a path. Through the EAS participants met entrepreneurs and heard of their venturing experience; this enabled them to learn vicariously about what entrepreneurial people do and what motivates them. Nearly half of the respondents (47%) indicated that their knowledge and awareness of entrepreneurs had improved to some extent or to a good degree; 35% indicated considerable improvement as a result of participation. It was encouraging to find that 58% of the respondents now held entrepreneurs in generally higher esteem than before they had participated in the competition, while the other 42% now held them in considerably higher regard.

Opportunities, skills and competences

A key aim of the EAS is to encourage student engagement in entrepreneurial behaviour. The profile of the participants surveyed is heavily skewed towards those from SET disciplines, the majority of whom have little or no background in business planning and venture

development. Thus an important area for investigation was the extent to which participation in the competition had helped to increase understanding in those areas. The respondents commented on the degree to which they had gained knowledge and developed key skills as a result of participating in the EAS (Table 1).

Opportunity recognition is a critical first step in the entrepreneurial process, and earlier comments regarding influences on opportunity recognition have pointed to the importance of prior experience. Young teams in the competition had little prior experience on which to draw, but, following their participation, 88% of the respondents considered that they were either moderately or considerably more aware of the opportunities around them. The experience of working with an opportunity, sufficiently robust to build a plan capable of reaching the final stages of the competition, had provided valuable evidence for reflection on the identification, evaluation, filtering, shaping and reshaping of that opportunity. To pursue an opportunity, an individual or team needs appropriate knowledge, understanding and a broad portfolio of skills (either possessed by the individual or team or accessible through networking or outsourcing).

With respect to awareness of the importance of business planning, participants appeared to gain significantly: 82% of respondents indicated that they now had a good understanding of processes and 12% said that they had considerable understanding. The funding required to start and grow a venture varies significantly depending on the nature of the technology in question, and this will influence at what stage and to what extent external funding is needed. Nearly two-thirds of the respondents had gained a good or considerable understanding of the key aspects of raising investment capital from equity and venture capital firms.

With regard to market research skills, just under three-quarters (71%) of the respondents had either a good or considerable understanding of the relevant issues. Similarly, 82% felt they had gained some or a good understanding of strategic marketing. Without sales a venture is not viable, so it was encouraging to learn that over 50% of the respondents felt that they were now much more aware of the importance of selling. It is important that those establishing a business focus on the distinctive aspects of their venture. More respondents had developed a stronger understanding of what it means to have a unique selling proposition for a new venture idea than had gained an understanding of the importance of competitive advantage. Most respondents felt that they had gained at least some new understanding of the range of marketing areas presented to them.

The respondents also commented on the skills associated with effective management. Attitudes to risk can significantly influence start-up decisions, and helping would-be entrepreneurs to understand the nature of risk and ways to manage it may increase their perception of the feasibility and desirability of pursuing an entrepreneurial pathway: all but two of the respondents felt that they had gained a new understanding in this domain. In terms of leadership and people management, over 75% felt better informed owing to their participation in the EAS. With respect to their ability to build and manage networks, more than 50% of respondents indicated that they now had either a good or considerable understanding, a pattern reflected in their enhanced understanding of local business networks in Northern Ireland.

As for the legal aspects of starting up a business, the respondents had developed significant levels of understanding. The academic discipline of most of the respondents had provided them with little background in this important area, but participation in the EAS had helped 94% of them to develop some new understanding in this domain. More specifically, in intellectual property, which is very important for technology businesses, more than three-quarters (76%) considered that they now had a good or considerable understanding of the issues.

When questioned about their communication skills, 82% of the respondents indicated modest to significant changes. Negotiation skills are important in many aspects of business, and 48% of those surveyed felt they had a good/very sound understanding of the skills needed to be an effective negotiator.

The interview evidence provided additional perspectives on the value of participation in the competition. Engagement in the EAS was identified as an important way of building on SET knowledge. The

interviewees said that the opportunities to develop business knowledge during their degrees had been limited to 'uninteresting' and 'abstract' courses. The EAS had proved an interesting, realistic and more applied experience. Typical comments include:

'My degree was in an engineering discipline so my experience of business theory and practice was limited to a few rather dry courses on the subject. Taking part in the £25k awards gave me an overview of not just theory but the concerns and considerations of business and I have found this to be very helpful.'

'The "entrepreneurship" module that I completed at Queen's in my final year and the resulting entry into the £25k award was invaluable in helping me to understand the processes and concepts involved in business in general, in starting a new business, giving me the confidence to consider starting my own business in the future.'

Development of opportunities post-competition

The EAS acted as a springboard for some teams to progress with their technology opportunities: 65% of the teams surveyed received funding following their participation. Only one had previously received funding, in the form of a PhD research grant and 2,000 euros from the Health Informatics Society of Ireland. The most popular source of finance was Proof of Concept funding made available by INI. Two-thirds (64%) of the respondents considered that reaching the EAS final had enhanced their profile and credibility among entrepreneurial practitioners and that the publicity surrounding the gala final had opened doors to key entrepreneurial networks. They felt that the reputation of the competition had given them high visibility among potential funders:

'As a consequence, a wide range of people got to hear about our idea, many of whom were particularly interested to fund us.'

All of these respondents had refined their business proposition, and many noted that their engagement in the competition had enabled them to develop a more 'realistic' business plan. The need to 'focus' on marketing, market research, finance and managerial issues was recognized as crucial in transferring technology to commercial reality:

'The competition helped us to focus and gave direction to the business plan: it enabled us to develop a more realistic perspective about owning a business.'

Ongoing commercialization activities

While a number of respondents continued to work on their opportunities after the EAS, four had pursued their opportunity directly or indirectly. These four business opportunities were still very much live projects one to three years after EAS participation. Third-party involvement emerged as crucial in continuing activities. In one case, a third party was developing prototypes. In another, clinical trials were ongoing via an intellectual property agreement with a third party. In a third, a company had been created which employed eight people by the time the respondent sold her shares to pursue other interests. And the final enterprise was now two years into its existence and employed three people. In this last case, the respondent remained engaged with the project but on a part-time basis, as others assumed responsibility for its development. Thus two ventures had been created and technology had been transferred in two other cases.

Of those who had done nothing tangible, 75% felt more interest in starting a venture based on their proposition as a consequence of their greater appreciation of support networks, contacts developed during the EAS, insights gained into the business planning processes and their growing level of confidence from the EAS experience. Those no longer interested in commercialization cited very negative market research feedback as the prime reason.

Influences of EAS participation on current and future work

Finally, respondents reflected on whether or not they considered that engagement in the EAS had enabled them to bring added value to their current role as an employee and the extent to which they now considered that starting their own business was a more realistic career option.

Over two-thirds of respondents (70%) agreed or strongly agreed (20%) that the EAS had helped to demonstrate that establishing a new venture was a viable future career choice. However, interviewees highlighted the importance of first acquiring practical business experience:

‘Combined with the experience that I have from my current job, the £25k award has given me the skills and knowledge to be successful in fulfilling my ambitions to start my own business in the future.’

While entrepreneurial new venturing is a long-term prospect for many respondents, the majority agreed (60%) or strongly agreed (20%) that the experience gained through the EAS had helped them to be better all-round employees in the short term. As one noted:

‘... it certainly helped me through the interview processes and I have learnt to pay more attention to the business side of the company I work for rather than just the technical side of things.’

More than three-quarters of the respondents (82%) indicated that their attitude towards entrepreneurial venturing as a valid and rewarding career choice had improved, while 12% suggested that it had improved considerably. All except one felt that they were now better equipped to pursue an entrepreneurial venturing career.

Discussion and conclusions

While the limitations of a case approach as a basis for generalizations are recognized, given the paucity of existing research in the area and the unique role individual universities play in regional economies, this exploratory study provides some evidence of the impact of enterprise competitions. It should therefore be of interest to those seeking ways to further the entrepreneurship agenda in higher education. This study has stimulated the development of a research programme to evaluate the EAS using a quantitative methodology to establish benchmark and change data related to skills and attitudes: this will inform the development of the EAS and the debate on the impact of such competitions.

The EAS has sought to offer students the chance to engage in entrepreneurial activity and realize technology transfer. Our evidence suggests considerable success with respect to the former and some, albeit limited, progress with the latter. There is certainly a greater awareness of entrepreneurial people, who are held in higher esteem by competition participants, and a better knowledge of the existence of venture-support networks in Northern Ireland. Respondents valued their experience as participants and the kudos attached to reaching the final. The publicity afforded them as ‘winners’ was seen as a major boost to their personal confidence and to the potential of their idea. The majority of respondents indicated that they were now more positively disposed to the notion of starting a business in the future, more opportunity-focused, and more comfortable with the idea of managing the inherent risks in starting up a business. They also thought they now had a better understanding of key knowledge, skills and attitudes required to set up and manage a new venture, from business planning and marketing research to legal issues.

Some of those who took part in the EAS have entered employment in the short term rather than continue their venturing efforts. Most acknowledge an

increased interest in venturing as a career alternative and now feel better placed to engage in a start-up, but they have opted to obtain more experience before embarking on their own venture. A second group chose to enter employment having ensured that their opportunity was taken forward by others. One respondent is still intending to launch a business, but on a part-time basis while in full-time employment. The EAS has encouraged entrepreneurial behaviour but, not surprisingly, has achieved more modest results in terms of short-term venture creation.

The competition has, then, been successful in its primary aim of increasing student awareness of and engagement in entrepreneurship, and there has been some limited success in technology transfer. From a policy perspective the full impact of the EAS will be seen in future years as participants, prompted by their early exposure to and experiences of entrepreneurial venturing, and encouraged by their experience in business development acquired by working for other entrepreneurial practitioners, decide that being their own boss and owning a venture is what they want and now feel better able to achieve. Evidence from this exploratory study suggests that seeds have been sown in this regard.

These findings contribute to a better understanding of the value of enterprise competitions in a university setting, with implications for policy. It is recognized that most participants will not engage in entrepreneurial venturing directly after university; it would be a mistake to judge the effectiveness of competitions only on the basis of the number of ventures so formed. The experience gained of venture planning may influence participants to seek employment in SMEs and may seed longer-term entrepreneurial aspirations. Besides, those who never start their own business are likely to be better placed to be innovative in organizations owned by others.

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