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Enhancing intrapreneurial skills of students through entrepreneurship education

a case study of an interdisciplinary Engineering Management Programme

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Abstract—Innovation orientation in a modern society is experiencing extensive complexity due to rise in globalization, revolutionary changes in technologies and standard of living. Intrapreneurship defined as the innovative initiatives undertaken inside an organization is an effective strategy to address these complexities systematically. Successful ideas within an organization occur due to the tireless persistence and practical imagination of intrapreneurs who are the smart innovators actively involved in the design and creation of new products, ventures and business models. Today there is an increasing global demand for such intrapreneurs and different universities are therefore adopting various entrepreneurship education and training programmes to cater to this. Pedagogy in higher education is also witnessing a significant rise in new interdisciplinary programmes specifically designed for non-business students such as art, engineering, and science students so as to develop their organizational management skills. This paper sheds light on these growing trends of different University programmes and examines their effectiveness. It utilizes an in-depth study of one such successful case: the MSc Engineering Management programme in the University of York, United Kingdom in its role of enhancing intrapreneurial skills of global students. This paper explores how this programme has successfully incorporated active and experiential learning tactics within its teaching modules to gradually train and build up the intrapreneurial skills for working in multidisciplinary teams and industries.

Keywords— Intrapreneurship, Intrapreneur, Entrepreneurship Education, Engineering Management, Engineers, Innovation, Creativity.

I. INTRODUCTION

Intrapreneurship is defined as a collection of formal and informal activities within an organization leading to the implementation of innovative ideas and behaviors [1]. This innovation implementation process not only leads to the creation of new business ventures but it also generates other innovative activities and orientations such as development of new products, services, technologies, administrative techniques, strategies and competitive postures [2]. Intrapreneurs within these organizations are the smart innovators and according to Pinchot [3] they are '*dreamers who*

do' and their contributions are not just limited to creating or developing new products or services but it also extends towards turning these new ideas or prototypes into profitable realities. Organizational culture can derive significant benefits by adopting intrapreneurial strategies in terms of learning benefits, employee retention, strategic renewal and capability building [4].

The current economic environment has been described by different organizations as highly competitive, demanding and challenging. Innovation orientation of a modern society is experiencing extensive complexity due to rise in globalization, revolutionary changes in technologies and standard of living and according to Lankinen et al [4] such a complex scenario demands extensive and rapid changes from organizations in terms of being proactive, innovative and taking calculative risks. An innovation culture that can be attained through intrapreneurial initiatives can add a unique competitive advantage to the organizational framework [5] and Seshadri and Tripathy [6] believe that it is one of the key steps for companies seeking to succeed in today's turbulent times. Intrapreneurs have the potential to thrive in such hostile environments as they have the necessary skills to find new combinations of resources that helps in attaining this competitive advantage [4]. Baruah and Ward [7] found intrapreneurship to be an effective solution to tackle and manage organizational complexities associated with innovation progression. The authors therefore recommend the adoption and practice of intrapreneurial initiatives as a key priority in any organizational strategy. However, Seshadri and Tripathy [6] highlight that today organizations are increasingly struggling to unleash the intrapreneurial energies of their workforce and so a better understanding of intrapreneurs is needed in order to facilitate them and propel the organization to new realms of excellence. On a similar note Pinchot [3] adds that there are no set formulas for determining in advance who can or cannot be an intrapreneur but Lessem [8] firmly believes that intrapreneurial abilities can be developed. So, can these skills be developed through a university programme?

One of the earliest propositions in the early 90s by Hisrich [9] was that university curricula can in fact help in identifying potential entrepreneurs and intrapreneurs and develop their

skills. Today there is a growing global trend of different entrepreneurship education programmes in several universities. This paper will explore the effectiveness of such programmes and investigate if intrapreneurial skills can be strategically developed among students at the university level through such entrepreneurship education programme.

II. THEORETICAL BACKGROUND

Romero et al [10] observe entrepreneurship education to be a relatively recent phenomenon which is steadily growing over the last decade across Europe. Wilson [11] projects such entrepreneurship education to be the most important step for embedding an innovative culture in Europe by changing mindsets and providing necessary skills. Galloway and Brown [12] terms entrepreneurship education to be a significant contributor to the improved quality of graduate start-ups, as well as societal and intellectual attitudes to entrepreneurship in the longer term. Kuratko [13] highlights a growing trend of new interdisciplinary entrepreneurship programmes which are being developed specifically for non-business students. This is supported by Seshadri and Tripathy [6] who show that intrapreneurism today can manifest itself in any role or function within an organizational framework thereby making intrapreneurs prevalent in any technical or non-technical functions; senior, middle or junior management levels; line or staff functions; manufacturing or service related roles. This therefore justifies why there is a rise in such interdisciplinary entrepreneurship programmes.

Being intrapreneurial according to Pinchot [3] is a state of mind which is not necessarily set in early childhood but can be developed at any point in life given the desire and opportunity. Organizations often hide creativity and talent and Menzel [14] feels that engineers who can act as the special professional workforce to produce and develop innovations within an organization sometimes might lack the specific skills to play the intrapreneurial roles. Menzel et al [15] suggest that potential intrapreneurs should be identified early in their careers and their skills must be developed through intrapreneurship programmes and trainings and this grooming process can start at university. Romero et al [10] feel that it is not sufficient for entrepreneurship education to just focus on building skills and capabilities but the emphasis should also be expanded towards changing personal attitudes so as to prepare students to work efficiently in this dynamic, rapidly changing entrepreneurial and global environment.

Wilson [11] strongly emphasizes that entrepreneurship and innovation should be deeply embedded into the curriculum in order to ingrain a new entrepreneurial spirit and mindset among students. Educational paradigms should build a distinct mindset for intrapreneurship which according to Menzel et al [15] is developed through reflection, collaboration and analysis to action involving a diversity of stakeholders. Entrepreneurship education is about developing attitudes, behaviors and capacities at the individual level and Wilson [11] believes that this involves applying those skills and attitudes which can take many forms during an individual's

career, creating a range of long-term benefits to society and the economy. One of the gaps in this field is the lack of research that investigates the entrepreneurial and intrapreneurial effectiveness of such entrepreneurship education programme particularly among engineering students and this paper will thereby address this as a key objective.

III. RESEARCH METHODOLOGY

The degree of innovation achieved by a creative firm depends significantly on the intrapreneur or intrapreneurial team according to Camelo-Ordaz et al [16]. Today there is an increasing global demand for intrapreneurs and Parker [17] questions if organizations can strategically groom prospective and future intrapreneurs. Different universities are therefore adopting various entrepreneurial education and training programmes to cater to this demand for credible intrapreneurs. Pedagogy in higher education is also witnessing a significant rise in new interdisciplinary programmes specifically designed for non-business students such as art, engineering, and science students so as to develop their organizational management skills. According to a recent poll [18], there are around 74 universities across the UK offering 132 different interdisciplinary postgraduate degrees on entrepreneurship education. This particular study is based on one such successful example: the MSc Engineering Management programme in the University of York, United Kingdom. It utilizes an in-depth study of this taught Masters Programme specifically aimed at ambitious graduate engineers aspiring for higher level management positions in technical management or self-employment in the high technology sector. This case study follows the guidelines and frameworks suggested by Eisenhardt [19]. In order to investigate how different core components within this programme can boost an intrapreneurial mindset, telephonic interviews were conducted with fifteen different alumni of this programme currently employed in various industrial sectors. The alumni were asked to describe their role in the organization they are currently employed and then identify any intrapreneurial characteristics they developed from the MSc programme which they are now utilizing in this organization. In order to construct the case, other crucial information was gathered from various sources such as the internal departmental website, annual reports and articles.

IV. CASE PRESENTATION

Entrepreneurship education according to Wilson [11] should provide a combination of experiential learning, skill building and mindset shift. For educators, designing effective learning opportunities for specific entrepreneurship students according to this author might be a challenge. To attain efficient results, should such programmes aimed specifically at engineering students be delivered in any specific manner? Menzel et al [15] believe that teaching entrepreneurship and intrapreneurship to engineering students through a theoretical approach may not be ideal. They believe that students must be exposed to intrapreneurship both in theory as well as in

practice and be able to develop an idea into a compelling business case. Therefore such programmes need a distinct clarity in terms of their purpose and goals. The Engineering Management programme at the University of York sets an example with its distinct set of objectives in terms of delivery and results which will now be discussed in detail:

A. Overview of the Engineering Management programme

The Engineering Management programme is a one year full time MSc course offered in the department of Electronics in the University of York and it was first introduced in the year 2010 to cater to this growing demand for a management course crafted specifically for engineers. One of the primary focuses of this programme is to “*allow technically qualified students to develop their engineering management knowledge and skills within a technical context and with a specialist management emphasis*”.

For Souitaris et al [20], an entrepreneurship programme should include a portfolio of complementary activities and they suggest incorporating four key components:

- a 'taught' component with one or more modules
- a 'business-planning' component
- an 'interaction with practice' component
- a 'university support' component

The MSc Engineering Management programme has all these key components embedded in its curriculum. As an interdisciplinary entrepreneurship programme, students from a wide variety of specializations such as mechanical engineering, environmental science, computer science, electronics, electrical or civil engineering to name a few can enroll in it. For most of these students, management studies might be a completely new area and therefore one of the key emphasis in this programme is to develop generic or transferable skills which are an important part of intrapreneurial and entrepreneurial effectiveness. Generic skills such as creativity and innovation, capacity for analysis, problem formulation and solving, planning and time management, communications (written and oral), team working and interpersonal skills, research skills and activity management are gradually built through the various modules within the programme. The programme currently has the following key modules:

- Management and Marketing of Technology
- Law for Engineering Management
- Introduction to Project Management
- Technical Literature Review
- Enterprise
- Accounting and Finance
- Ideation
- Enterprise
- International Business
- Strategic and Operations management
- Research Methods
- MSc Project

These modules are organized within three terms with each term having approximately 10 weeks that incorporates

lectures, workshops and course study schedules. The highlight of this programme is a 60 credit study module in the form of a Group Project that requires students to propose a technical and business solution to a substantial real engineering problem. Apart from these, the programme also utilizes a conventional continuous assessment. Self study materials are uploaded in an online portfolio called the VLE which is accessible to all the students through the university web pages. As a new initiative, an e-learning log was introduced in 2013 in conjunction to this taught MSc programme to facilitate the development of the skills of personal reflection and self development. This tool has been developed from the various student experiences of this programme over the past few years and it acts as a great catalyst for building up the generic skills, behaviors and attitudes.

B. Active and Experiential Learning Strategy

The ultimate objective of enterprise and entrepreneurship education is to develop entrepreneurial and intrapreneurial effectiveness which students can attain to different degrees depending on variables such as their personality, prior learning, motivation, ability and context [21]. Probst [22] adds that in order to develop intrapreneurial skills, it is important to introduce students the skills and characteristics of intrapreneurs so that they can aspire to develop or enhance these characteristics. The following figure shows the key stages leading towards entrepreneurial effectiveness [21]:

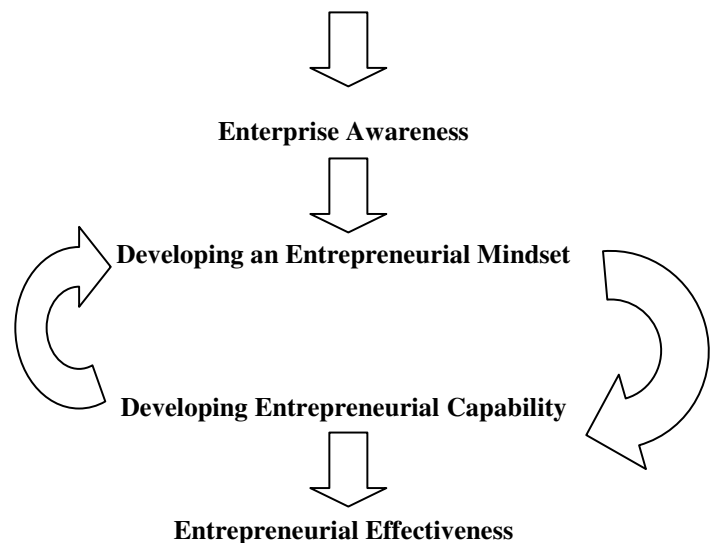


Fig. 1: Developing entrepreneurial effectiveness [21]

Any entrepreneurship education programme that utilizes the right curricular and extra-curricular learning activities can contribute significantly towards the development of entrepreneurial and intrapreneurial skills. Students involved in such programme do not approach their learning in a linear fashion but their learning process may pass through different stages in an iterative fashion and may even engage with different stages simultaneously according to a recent report by

the Quality Assurance Agency for Higher Education [21]. Such students as per this report might have diverse starting points and transition points into the future. A similar holistic model proposed by Ward [23] combined the aspects of both entrepreneurship and intrapreneurship and it involves stages through which an individual has to pass as part of intentional or unintentional enterprise training. Ward [23] emphasized the importance of such generic models in higher education while designing curriculum for developing entrepreneurs or intrapreneurs and enterprise modules.

Different student activity based approaches such as experiential learning; action learning and active learning can be utilized to attain entrepreneurial and intrapreneurial effectiveness. Behara and Davis [24] highlight the importance of active learning in business education which focuses on student learning through active engagement with the learning process. Examples of active learning involves case studies and group projects which would require students to use higher-order thinking along with critical analysis or evaluation and synthesis leading to a better foundation for improved learning. Lacuesta et al [25] feel that the use of active methodologies can facilitate the development of competences and skills among students as it familiarize themselves with professional qualities required in the business world such as critical capacity, communication ability, planning ability, autonomy or group working ethics. Entrepreneurship education must therefore embrace curriculum that would give students opportunities to experience real-world challenges and teach them techniques to strategically address them.

One of the distinguishing factors about this Engineering Management programme is that although it recommends students to have some industry work experiences prior to the course, it also welcomes students with limited or no business work experiences. Having students with such diverse backgrounds, the programme has therefore carefully utilized a combination of active and experiential learning strategies with projects and assignments synonymous to real world engineering situations which are quite pivotal in their learning process and effectively develop generic skills. Such multidisciplinary and mixed learning strategies will help students achieve a balance of skills and knowledge in terms of enterprise awareness, entrepreneurial mindset and entrepreneurial capability [21]. Learning about and experiencing enterprise as part of a university curriculum can offer several benefits such as giving students an alternative career option, the confidence to set up own business or social enterprise [21] or the logical facilitation to be credible and strategic intrapreneurs.

An educational programme designed to develop intrapreneurial skills must focus on learning by doing, developing solutions under pressure, synthesizing information from different sources, solving problems or learning from failure [22] [26]. The modules incorporated in this MSc programme are aimed at developing such generic skills in terms of specific discipline-related and transferable skills. For instance the module: *Introduction to Project Management* covers different aspects of organizational projects in terms of

its management, specification, life cycles, tools and techniques for analysis, quality assurance and ethics. Students will be able to analyze a project and produce specification through work breakdown, critical path analysis and risk evaluation from this module experience and such skills are effectively transferable in their role as intrapreneurs or entrepreneurs. The module: *Management and Marketing of Technology* allows students to produce a marketing plan for a new technology based product or service. The module: *Strategic and Operations Management* equips students with an understanding of different forms of company structure, mission statements and its link to corporate values, policies and practices and quality management. Such modules as highlighted in the earlier model helps students in participating in enterprising learning and activities thereby developing their enterprise mindset. The module: *Accounting and Finance* gives students the basic foundations of accounting and finance in terms of company performance, investment opportunities, product costing and pricing. This module will affirm students with the knowledge of investment, cash flow forecast, profit and loss account and balance sheet. The *Technical Literature Review* module will develop critical research skills in terms of literature analysis and focused writing skills. The module: *Ideation* will allow students to communicate a new idea through a written proposal and will familiarize them with the techniques for creativity and idea generation, approaches to idea refinement and selection. The module: *Enterprise* deals with the issues of commercial exploitation, competitive environment and marketing options and students in this module are asked to explore a real new/novel technology or product and advance it to the point of a genuinely workable business plan. These modules are highly capable of deriving entrepreneurial capability among students with confidence as they get a close experience of real life projects or business scenarios and challenges. This therefore leads them towards the path of entrepreneurial and intrapreneurial effectiveness.

The 60 credit MSc Group Project combines experiential and active learning and this platform provides an excellent opportunity to gain experience working in a team and conditions similar to any industrial project. The overall experience of the group project emphasizes the development of an entrepreneurial mindset and entrepreneurial capability as per the model in the earlier figure leading to reflective, interpersonal and transferable skills necessary in an intrapreneurial role.

C. Effectiveness of the Programme

This MSc programme is the most popular post graduate courses offered in the Department of Electronics in the University of York and it attracts students from countries as diverse as China, India, Pakistan, Germany, Saudi Arabia, Nigeria, Turkey, Kazakhstan and Indonesia.

To study the intrapreneurial skills development and effectiveness of the programme, fifteen successful alumni from this program who are currently employed in different industrial sectors were interviewed. The interviewees were asked to describe their current job roles and then identify

which key characteristics they related from the MSc programme in their organizational roles. Most of the participants highlighted the importance of being intrapreneurial in the current competitive environment. As one of the alumni currently employed in the IT sector says, *"Being innovative is a big part of my job...I have to find new ways for solving a challenge in a project...there's always a need for thinking outside the box"*. Another participant identified the need for obtaining a balance between technical skills and business skills to enable maximal innovation in the current business scenario, *"You have to be very dynamic and flexible. Being good just at the technical level or in a single skill is not good enough. You have to have other skills to move forward such as communication, leadership and management skills"*.

In the interviews conducted as part of this study, team work, problem solving and creative thinking were found to be the common intrapreneurial characteristics most alumni associated with and trailed it back from their experiences from the MSc programme. As one participant reflects, *"I have learned how to use different techniques to brainstorm new ideas and the competitive group activities.....Modules such as Enterprise, Marketing and Management of Technology allowed me to see the great value of thinking creatively"*. Some of the participants highlighted the importance of entrepreneurship theory in the MSc programme which helped them in developing their reflective approaches. They pointed out how the course offered substantial pre-professional experience in terms of micro-management of projects and creating an awareness of the right methodologies to derive the right output. Most of these participants identified the benefits they derived from this experiential learning as it gave them the experience of real life-like industrial scenarios and familiarized them with the vision of working in an organizational environment. One of the participants summarizes *"what differs this programme from others is that we got to work on life like projects and have life like challenges.....handling relationships with team mates, taking different roles in teams, leading a team, solving a problem, having tight deadlines, having uncomfortable situations during project delivery, uncertainty, and many other challenges which I am having everyday in my current job and also have had experienced them in many of the projects we did in the programme.....So I would say experiences which have had involved me in diverse and real life challenges have helped me to develop my innovation skills"*. Another participant describes how the group project gave them a good understanding about the importance of co-ordination and communication among team members and how that directly influenced the quality of their work. The participant observed its direct relevance in her current job profile which is related to customer relation management and involves a lot of co-ordination and communication skills. A similar point was identified by another participant who says *"Working in different groups has allowed me to be more collaborative. It has given me skills such as how to manage and talk to different people in a group, diplomacy, resolving conflicts and working together towards achieving common goals"*.

The interview results highlighted the effectiveness of this entrepreneurship programme in terms of creating an entrepreneurial and intrapreneurial mindset along with substantial enterprise awareness. Intrapreneurial skills are effectively developed through reflection, collaboration and action analysis and therefore entrepreneurship programme aiming to develop intrapreneurs must incorporate the right teaching strategies such as active learning or experiential learning. Such tactics will give students a pre-professional experience by offering them skills building techniques through life-like projects or real engineering problems synonymous to any organizational culture. The nurturing and grooming of intrapreneurs does not necessarily have to start in an organization but it can be introduced at an early stage such as in a university curriculum. In terms of their contributions, these entrepreneurship programmes are important in today's challenging environment as they can offer an efficient platform for entrepreneurial/intrapreneurial skills awareness and development along with pre-professional grooming and nourishment. However, there must be a distinct clarity in such interdisciplinary programmes in terms of their purpose and goals so that the objectives of entrepreneurial and intrapreneurial effectiveness are satisfactorily addressed.

V. CONCLUSION

Intrapreneurship today acts as an effective solution towards the various growing complexities within an organizational framework. There is an increasing global demand for credible intrapreneurs however; organizations are struggling to strategically unleash the intrapreneurial energies among its workforce requiring them to introduce various training and development programmes. Such grooming and development of intrapreneurial and entrepreneurial effectiveness can be introduced at an earlier stage through specific university programmes. Several universities across the globe are adopting different interdisciplinary entrepreneurship education programmes to cater to this growing demand. Being a recent phenomenon, there is a lack of research on the effectiveness of such programmes. This paper fills this gap by investigating the influence of one such successful programme: MSc Engineering Management in the University of York which offers a unique combination of active and experiential learning techniques to strategically build up intrapreneurial skills. The modules in this programme are aimed at developing generic transferrable skills which is why the work schedules, projects and assignments are synonymous to real world engineering situations. The experience of real life-like industrial scenarios in this programme has benefited students giving them a genuine taste or familiarity of an organizational culture. This reflective and transferable skills development strategy was found to be quite effective and was clearly evident in alumni interviewed as part of this study. Such entrepreneurship programmes can therefore contribute a lot in today's economic environment and they can be successful if they have a distinct clarity in terms of their purpose and goals.

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