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Special Issue on Entrepreneurship Education

Contents

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Editorial Board

According to Drucker (1985:143), 'most of what you hear about entrepreneurship is all wrong. It is not magic; it is not mysterious; and has nothing to do with genes. It is a discipline and, like any discipline, it can be learned.' Basu (2004:28) suggests that entrepreneurs often had aspirations different from those of common people. Other personal characteristics that supposedly differentiate entrepreneurship from business owner manager include initiative, a willingness to take risks, self-confidence, perseverance, resourcefulness, independence, persuasiveness, tolerance for uncertainty and ambiguity (i.e. seeing ambiguous situations as challenges rather than as problems), imagination, high need for achievement, and a strong belief in being in control of one's own destiny (Ibrahim & Soufani, 2002:22; Llewellyn & Wilson, 2003:16; Deamer & Earle 2004:24). From the definitions outlined above, it is clear that entrepreneurship holds the promise of future growth, expansion and long-term financial gain; that is why sometimes a small business that focuses merely on the survival of its owner cannot be seen as an entrepreneurial venture (Van Aardt *et al.* 2002:10). For the purpose of this article, even small businesses are considered as entrepreneurial ventures.

Creating Jobs through Entrepreneurship Education

The US Experience

The history of entrepreneurship in the United States is an example that calls for careful examination. Over twenty-five years ago, David Birch, a researcher at the Massachusetts Institute of Technology (MIT) began to report his findings in his seminal book *The Job Generation Process* (1979). Birch surprised all politicians, researchers and the business world at large when his research showed that the new and growing smaller firms created 81.5 per cent of the new jobs in the United States during 1969 to 1976. From 1993 to 1996, eight million jobs were created in the United States and of these, 77 per cent were by small enterprises. The overall contribution of small and medium size companies is shown in the change of American patterns of employment. During the late 1960s, one out of four persons went to work for a Fortune 500 company. In 1980s, the Fortune 500 companies employed one in five of the workforce. However, by the late 1990s, that number was just one in fourteen. This history of the explosion of job creation by small and medium enterprises is directly linked to important initiatives taken to promote entrepreneurship in the United States (Birch 1987). Creating jobs and fighting unemployment was a direct result of the promotion of centers and institutions in entrepreneurship and ultimately the training of entrepreneurs. These entrepreneurs were trained to take calculated risks by launching their own businesses.

Lessons for Cameroon

To successfully address unemployment among youth graduates, we need to develop various aspects of training potential entrepreneurs through tertiary institutions. Entrepreneurship education can be common course of study in higher education settings. A wide variety of curricular approaches exists, though many common elements are found across institutions and settings. These texts and programmes must be structured to introduce the concept of entrepreneurship and provide hands-on experience and working models for students to develop skills as entrepreneurs. The principles of entrepreneurship must be considered valuable for students at all levels.

In response to the rapidly changing national landscape, not only of high unemployment but more generally of economic growth and job creation, entrepreneurship is being increasingly emphasized as a critical resource (Kourilsky, 1996:2) Similarly, Timmons and Spinelli (2007:18) recognize that there is no substitute for starting a business, but it is possible to expose students to vital issues in all fields and immerse them in key learning experiences through case studies of successful entrepreneurs. Concerning this point on students' capacity building in entrepreneurship, a multi-sectorial policy in higher education institutions and centers of training is needed. For a long period of time, many graduates in all fields of study were not trained in entrepreneurship. However, many universities are engaged in various programmes to fill this gap on training of potential entrepreneurs. The courses include entrepreneurship and small business management, innovation and creativity, opportunity recognition and business plans. These courses are aimed towards developing and unleashing graduates' expertise about entrepreneurship. As it has been mentioned earlier in the case of the United States, the proliferation of entrepreneurs was associated with the emergence of centers and higher education institutions specialized in entrepreneurship. In universities, courses in entrepreneurship need attention and must be implemented at all levels and in all fields of study. For example, the course on 'Entrepreneurship' focusing on the management of creativity and innovation develops the nature of creativity and innovation, and how entrepreneurship involves the ability to identify market opportunities based on new ideas. The course may assist the student to recognize any opportunity within an economic environment. However, the course on Entrepreneurship and New Venture Creation is intended to build personal appreciation for the challenges and rewards of entrepreneurship; and to foster continued development of venture ideas (Löwegren 2006:26). The social sciences or engineering student needs the same entrepreneurial skills as the business student or medical student.

A business plan is needed to open a clinic or a law firm. An opportunity recognition does not exist for only business students, but to all those who are willing to embark on any entrepreneurial activities. Henry, Hill and Leitch (2003:12) point out that entrepreneurship training can complement the early stage awareness-raising function of entrepreneurship education, as it provides the more practical skills that entrepreneurs require when they are ready to set up their business. Ladzani and Van Vuuren (2002:156) state that organisations wishing to develop entrepreneurship education presuppose that the lack of training of entrepreneurs is the main reason for venture failure. In the same line, Ndedi (2012); Pretorius, Nieman and Van Vuuren (2005: 424) add that the transfer of the requisite knowledge and skills is the easiest part of training and is incorporated in most training programmes on entrepreneurship. However, the behavior to engage in the startup process is what really matters and is lacking in most entrepreneurship programmes. Cameroonian tertiary institutions such as Institute of Management and Entrepreneurship (IME) and the Université de l'Entrepreneuriat may draft comprehensive programmes in entrepreneurship with an aim to address the missing links from being experienced in the entrepreneurship education and development.

The State of Entrepreneurship Education

For many years, numerous entrepreneurship programmes have been introduced in many parts of the world. Often such programmes equate entrepreneurship with new venture creation or/and small business management education *"about"* entrepreneurship and enterprise rather than educating *"for"* entrepreneurship. Only rarely, the focus is on developing skills, attributes and behavior of the successful entrepreneur. (Kirby 2002:16). According to Interman (1991:12), there are three types of entrepreneurship programmes, namely:

- Entrepreneurship orientation and awareness programmes which focus on general information *about* entrepreneurship and encourage participants to think in terms of entrepreneurship as a career.
- New enterprise creation programmes designed to develop competencies, which lead to self-employment, economic self-sufficiency or employment generation.
- Programmes with a focus on small business survival and growth.

The emphasis of these programmes is on learning *about* entrepreneurship and how to manage a small business. However, entrepreneurship is about possessing or acquiring a particular set of attributes, skills and behaviors.

Students, who undergo the above mentioned programmes, learn about the entrepreneurial process, opportunity recognition, entry strategies, market opportunities and marketing, creating a successful business plan, financial projections, venture capital, debt and other forms of financing, external assistance for startups and small business, legal and tax issues, intellectual property, franchising, harvesting, entrepreneurship economics. These concepts and principles are important for business students to understand, especially if they are faced with challenges while creating their own enterprises. Awareness of entrepreneurship principles may not, *per se,* equip the student to meet the challenges of the entrepreneurial business climate of this era. Learning about entrepreneurship could be very interesting, but it does not to a large extent motivate students to actually become entrepreneurs. They end up knowing much about entrepreneurship, but cannot act upon an opportunity. Similarly, learning how to write a business plan could of course be invaluable to a student who may eventually be involved in some start-up entrepreneurial concerns. However, knowledge may not be enough to encourage students to act. This could be argued to be the missing link in the entrepreneurship education. Further, to efficiently and effectively address the shortage of entrepreneurs, and contribute in supporting government policies on job creation in Cameroon, tertiary institutions must provide a framework for a new curriculum planning and development that would instill some entrepreneurial skills in undergraduate learning process within the tertiary educational system.

Framework for Entrepreneurship Education

This article states that successful entrepreneurs have a set of personal skills, attributes and behavior that go beyond commercial interests. These attributes need to be developed among students if their entrepreneurial capabilities are equipped to meeting the challenges of the entrepreneurial climate of the 21st century. Therefore, there is a need to change both the content of courses and the process of learning on entrepreneurship education. According to Rae (1997:199) "while students still need to develop their business skills and understanding, more attention needs to be paid to the development of their entrepreneurial skills, attributes and behaviors, introducing modules and courses specifically designed to develop the awareness and characteristics of the entrepreneur"; these include, amongst others communication skills, especially persuasion; creativity skills; critical thinking and assessment skills; leadership skills; negotiation skills; problem-solving skills; social networking skills and time management skills. Similarly, to further explain the process of learning, human anatomical proof may become invaluable. Creating a new method of understanding, a

neuropsychological perspective may be necessary. According to Ornstein (1986), the brain is divided into two hemispheres. The left side handles language, logic and symbols. It processes information in a step-by step fashion. Left-brain thinking is narrowly focused and systematic, proceeding in a highly logical fashion from one point to the next. The right side takes care of the body's emotional, intuitive and spatial functions. It processes information intuitively, relying heavily on images. Right-brained thinking is lateral, unconventional, unsystematic and unstructured. It is this right-brained lateral thinking that is at the heart of the creative process.

Lewis (1987:41) points out that: "In traditional classes, students are expected to acquire knowledge one step at a time, adding methodically to their storehouse of facts until they have sufficient knowledge to pass an examination. This demands left-brain skills. The problems students are given to solve more often in traditional classes demand an analytical than an intuitive approach. This too is a task for the left hemisphere. Written work, by which ability is chiefly evaluated, must be organized, well-argued and logically structured – all left-brain skills. The students considered most intelligent and successful are those who strive after academic goals, can control their emotions in class, follow instructions, do not ask awkward questions, are punctual and hand in class assignments on time. Goal setting, emotional restraint, time-keeping and matching their behavior to other people's expectations are all left-brain skills. Children are meant to learn by listening, keeping notes and reading books. All these, too, of course, are tasks in which the left hemisphere specializes". Gibb (1987:38) argues that to develop entrepreneurs or more enterprising individuals, the focus of the education system in entrepreneurship needs to be shifted away from the traditional to what he terms "the entrepreneurial". Thus, the challenge is to develop a system of learning (and assessment) that complements the traditional and develops in its students the skills, attributes and behaviors characteristic of the enterprising or entrepreneurial individual. Olsen and Bosserman (1984: 53) suggest that "individuals will exhibit entrepreneurial behavior when they possess a combination of three attributes", namely:

- Role orientation – emphasizing effectiveness.
- Abilities – to think both intuitively and rationally.
- Motivation – the driving force behind action.

To achieve the above attributes, it seems necessary to adopt an approach to learning that gives students ownership of their learning, including negotiating with their tutor their own learning objectives, the resources, activities and processes required to meet these objectives and, importantly,

the way in which it will be determined whether these objectives have been met (to stimulate motivation, reduce dependency and provide experience of role orientation). The learning approach:

- Involves students in problem-solving in real-world situations, possibly in teams (to develop both intuitive and rational thinking, to recognize the multi-faceted nature of problem and solution and to encourage communication and co-operation).
- Encourages students to formulate decisions on data, which are immediate, incomplete, "dubious" and, as appropriate, personally generated (to stimulate effectiveness and the ability to cope with uncertainty).
- Provides students with role models who are involved in both the learning and assessment processes (to demonstrate role orientation, ability and motivation)

From the perspective of the education system, it is the ability to think both intuitively and rationally; to develop what may be termed the "balanced brain". As developed already, most education systems tend to adopt left-brain approaches to learning. The emphasis has been on developing critical or vertical thinking. This is a function of the left-brain; it is objective, analytical and logical and results in one or, at most, only a few answers. In contrast, creative thinking is lateral, imaginative and emotional resulting, through association, in more than one solution (De Bono 1970:60). Entrepreneurship must be taught through action that supports four cornerstones of entrepreneurship: an ability to impact one's personal environment, a high degree of self-confidence, an ability to create support networks, and an ability to create a linkage from vision to action. These cornerstones imply that an education in entrepreneurship has to be action oriented. The students have to engage in real life situations, establish relationships, and transform theory into practice. (Ndedi, 2012).

Idea generation is important and can be taught. Most entrepreneurship education disregards the idea generation process. The same may be seen in many South African curriculums on entrepreneurship education. In order to recognize opportunities, however, ideas and creativity ought to be crucial for the entrepreneur. According to Antonites (2003:12), creativity, innovation and opportunity finding (CIO) are the three variables that distinguish an entrepreneur from a small businessperson. However, students need a theoretical base to build the actions upon. Fiet (2000a, 2000b) asserts that theoretical knowledge increased the possibility for students to make proper decisions when they encounter different situations. In addition, it

is important that students not only acted, but also reflected about their actions to learn something from them. Therefore, theory and reflection are important ingredients in the entrepreneurship curriculum. In order to enhance the reflection-part, "learning logs" (Barclay 1996:10) and "learning seminars" need to be introduced as part of the curricula. It should envelope the entire gamut of entrepreneurship process, from idea generation to complete plan for initializing a project. Entrepreneurship education should enhance both action and reflection, and to a group of students from different faculties and backgrounds.

Business Incubation

Another element needed for an effective and efficient contribution from universities in the effort to tackle youth unemployment is the development of business incubators within universities with the aim of linking theoretical training to practical exposure. Business incubator is a facility designed to assist businesses to become established and sustainable during their start-up phase. Typically, this is done by providing: premises, business advice and business services, access to potential clients/suppliers database, as well as mentoring and other services intended to establish the new venture. Critical to the incubator is the provision of management guidance, technical assistance and consulting, tailored to young growing companies. These incubators must also provide to potential youth entrepreneurs information on appropriate space and flexible leases existing in the market, shared basic business services and equipment, technology support services and assistance in obtaining the finance necessary for a company's sustainable growth. The roles of these incubators are to assist potential entrepreneurs to transform their ideas into reality by developing initial action and business plans towards venturing into the future. Its ability to develop strategies and mechanisms to meet challenges that the business may encounter and provide possible alternatives as a way forward may serve as an outstanding milestone for an entrepreneur to break-even in business.

Conclusion

Society is the social and physical context in which people establish or acquire businesses. Entrepreneurship is important for any society to generate economic growth for social-economic welfare of the population in general, and graduates in particular. In this regard, it is important to note that entrepreneurship is the heart of any economic advantage. In Cameroon, where increasing young graduates are unemployed and facing years of joblessness, entrepreneurship is of paramount importance. Many Cameroonian institutions have embarked on programmes in

entrepreneurship and one can already study for a degree with majors in subjects related to new venture creation. This is a first step in introducing entrepreneurship into the curriculums of Cameroonian tertiary institutions. However, these programmes are only for management sciences students. They must be expanded to include a far wider range of disciplines (engineering, social and medical sciences students). Two exceptions are the Université de l'Entrepreneuriat which has embarked upon a programmes on entrepreneurship training for all students in all the fields and the Institute of Management and Entrepreneurship (IME) having a fully fledged Bachelors programme in Entrepreneurship training. This article emphasizes upon the training of entrepreneurs in the classroom, i.e. the development of an enterprising environment and approaches to learning in which entrepreneurial aptitudes and capabilities can flourish, alongside business acumen and understanding. It argues for the need to change the entrepreneurship curriculum and process of learning. Associated with these theoretical programmes, there is also a need to establish business incubators within universities; this will enable students to experiment with their projects and give them the necessary skills to embark on new ventures development. By doing so, tertiary institutions could play some prominent roles in job creation and poverty alleviation in the process of nation building in Cameroon.

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Innovative Approaches to Entrepreneurship Education: Illustration with CLEO Course of BITS Pilani

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Abstract:

Nurturing entrepreneurial zeal among youth through awareness and education is a powerful tool to encourage nascent entrepreneurs and create a robust economy. One of the major challenges before educational institutions is to devise, develop and implement entrepreneurial education and development programmes. The BITS experience suggests that the combination of BITS' strong alumni network, institutionalized industry linkages, flexible learning environment and high quality student input when coupled with National Entrepreneurship Network (NEN) and Department of Science & Technology (DST) partnership could lead to systematic efforts for promotion of entrepreneurship. This article discusses the pedagogy of entrepreneurship education adopted in a course titled 'Creating and Leading an Entrepreneurial Organisation' (CLEO); to create an ecosystem conducive for promotion of entrepreneurship development among educated youth. The pedagogy revolves around experiential learning, interaction with entrepreneurs, learning by doing and undertaking projects linking various modules.

Keywords: *Alumni network, BITS Pilani, Entrepreneurship development programmes, Experiential learning, institutionalized industry linkage.*

Introduction

The challenges before the Indian economy to exploit emerging opportunities in the global markets lies in its endeavor to promote entrepreneurship. Entrepreneurship is a vital input to the three factors of production namely land, labor and capital that contribute to the creation of wealth and employment opportunities. Entrepreneurs corroborate the much needed value to the market with new products and services. Nurturing of entrepreneurial zeal among youth through awareness and education can be a powerful means to encourage budding entrepreneurs and create a robust economy. One of the major challenges before educational institutions is to *devise, develop and*

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implement entrepreneurial educational and development programmes. The task lies in efforts to create a right balance between classroom and activities outside classroom that result in motivating the youth to pursue entrepreneurship as a career option. This article examines the broad framework for entrepreneurship education operationalised at Birla Institute of Technology & Science (BITS), Pilani through a course titled 'Creating and Leading an Entrepreneurial Organisation' (CLEO). The article discusses the detailed pedagogy of entrepreneurship education adopted in CLEO course designed to create an ecosystem conducive to promote entrepreneurship education.

Entrepreneurship Development: Review

Ivancevich (1991) argues for entrepreneurship as a method and system to enhance entrepreneurial behaviors and to bridge the gaps between the functional areas. McMullan and Long (1987) and McMullan (1988) emphasize the importance of entrepreneurship education to economic development and view entrepreneurship education as a vital component to be supported by government-funding. Luke Pittaway and Jason Cope (2006) focus on contextual factors which impact relationships, specifically interactions between students and entrepreneurs. These relationships can be viewed as both direct and indirect contributors to education within an institutional context (Brindley and Ritchie, 2000). Research on this aspect focuses on specific activities such as mentoring (Ridder and Vander Sijde, 2003); student consulting projects with small firms; and internships and placements (Kirby, 1998). Studies reveal multiple benefits of such activities in improving the effectiveness of entrepreneurship education programmes on campus. According to the policy prescription as stated in European Commission (2012) titled, 'Effects and Impact of Entrepreneurship Programmes in Higher Education', entrepreneurship education should be mandatory to all disciplines and 'learning by doing' should be an important part of the training process. The field of entrepreneurship education has grown enormously which is evident from the increased student enrollment; creation of formal entrepreneurship centres and cells; national and international business plan competitions; new entrepreneurship curricula and programmes; endowed chairs and professorships, etc. However, philosophy and approach to create an ecosystem on campuses have varied across different institutions and universities that range from a single course module on business plan and preparation to integrated curricula that include marketing, finance, competitive analysis, new product development and technology. The pedagogy in entrepreneurship education largely depends upon the ecosystems that nurture the entrepreneurial skills. Technology

entrepreneurship is specially challenging since the success depends upon the ability of the venture team to maintain a sustainable advantage vis-à-vis competitors.

Prominent institutions that have created a good ecosystem to promote technology entrepreneurship include Stanford Technology Venture Program, Stanford; Lester Centre for Entrepreneurship & Innovation, UC Berkeley; MIT Entrepreneurship Center, etc. Stanford Technology Ventures Program (STVP) located in the heart of Silicon Valley, has its entrepreneurship centre at Stanford University's School of Engineering. The centre provides students with entrepreneurial skills that help them use technology innovations to solve societal problems. The centre has international standing and is known for incubating several companies such as the CISCO, Hewlett Packard, Yahoo, Google, Sun Microsystems, etc., the first generation technology entrepreneurship ventures which have changed the process of development. Stanford's current Community of Scholars includes 18 Nobel Prize Laureates. Lester Center for Entrepreneurship & Innovation at UC Berkeley is the primary locus for the study and promotion of entrepreneurship, innovation in management and new enterprise development at the University of California. The centre creates and disseminates knowledge on entrepreneurship and facilitates interaction between business and university communities besides encouraging students to create new businesses. Similarly Massachusetts Institute of Technology (MIT) has made its own distinct contributions in entrepreneurship education. The MIT Entrepreneurship Center provides content, context, and contacts that enable entrepreneurs to design and launch successful new ventures based on innovative technologies. The centre aids MIT students, alumni, and colleagues with an access to array of educational programmes, networking opportunities, technologies, and resources, both at MIT and around the world. The research and development efforts at MIT are remarkable as its licensing office files around four patents a week and licenses hundreds of inventions to industry. A study indicates that MIT alumni have formed more than 30,200 active companies that employ around 4.6 million people and generate annual revenues of $2 trillion – producing the equivalent of the eleventh-largest economy in the world (MIT News Report 2015). MIT's entrepreneurial ecosystem consists of wide ranging education, research, and social network institutions that contribute to venture creation endeavors in one way or the other.

In an Indian scenario, few prominent institutions that have developed an ecosystem for promoting entrepreneurship include IIT Bombay, IIM Ahmedabad, IIM Bangalore, IIT Delhi, IIT Chennai, IISc Bangalore, BITS Pilani,

etc. Most of these institutions have incubation centres and E-cells operated by students under the guidance of faculty members. They also have seed funding support, linkages and network with alumni entrepreneurs, besides the regular course curriculum. IIT Mumbai had formed 'Society for Innovation and Entrepreneurship' (SINE) in 2004 for formalisation of an IT-driven incubator that was started in 2000 with active involvement of alumni members. SINE's mission was to create an ecosystem that will foster innovation and knowledge based entrepreneurship among the IIT Bombay community leading to the creation of wealth and social value through successful ventures. IIM Ahmedabad had set up 'Centre for Innovation Incubation and Entrepreneurship' (CIIE) in 2002 initially as an academic research centre. CIIE had launched India's first accelerator programme – iAccelerator in 2009-2010. Similarly, entrepreneurship cell popularly known as NSRCL at IIM Bangalore engages in research and mentoring activities besides promoting the growth of the new enterprises through its business incubators.

The Government of India has undertaken various initiatives to set up an institutional framework to promote innovation and incubation in varied fields. Some of the initiatives of GOI include Technology Incubation for Development of Entrepreneurs (TIDE) scheme by Department of Electronics and Information Technology (DEIT), Technology Business Incubators (TBI) scheme under National Science & Technology Entrepreneurship Development Board by Department of Science & Technology (DST), Bio-informatics Centre (BIC), Biotechnology Industry Research Assistance Council (BIRAC) schemes by Department of Biotechnology (DBT) and Rajiv Gandhi Udyami Mitra Yojana (RGUMY) scheme by Ministry of Micro, Small and Medium Enterprises (MSME). Under TIDE scheme, 121 start-ups have been incubated in 27 incubators under three distinct phases, i.e. 2008, 2010 and 2012 up to 2014. Each start-up on average has extended employment of around 12 persons. Similarly, about 53 Science and Technology Entrepreneurship Parks and Technology Business Incubators have been set up across the country by National Science and Technology Entrepreneurship Development Board (NSTEDB), Department of Science and Technology (DST). The purpose was to provide a fillip to techno-entrepreneurship across the country. The incubators have been providing various services such as mentoring, networking, seed funding, and access to research labs to explore and innovate new technologies.

Methodology

The article adopts theoretical entrepreneurship framework and entrepreneurship development models that have resulted as an outcome of

strategies for promoting entrepreneurship education in some of the world's leading institutions. It also uses the existing framework and approach developed at BITS Pilani to foster entrepreneurship. The study has collated inside and outside classroom learning processes initiated at BITS Pilani to promote entrepreneurship development. The approach was towards developing a framework for entrepreneurship education and development with a key focus on experiential learning.

BITS Initiatives for Entrepreneurship Education

Birla Institute of Technology & Science (BITS), Pilani emphasizes on the importance of promoting entrepreneurship. Centre for Entrepreneurial Leadership (CEL) was formed during 2002-2003 to provide an impetus to student-driven entrepreneurship activities under the guidance of faculty. CEL was set up by the institute as one of the centres of excellence as a result of the student enthusiasm coupled with the initiative and support from Birla Institute of Technology and Science Alumni Association in USA (BITSAA). The vision of CEL was to create the spirit of entrepreneurial leadership to inspire BITS community to play a prominent role in diverse entrepreneurial activities in the country and abroad. CEL-BITS is well-acclaimed for becoming the co-founding partner of National Entrepreneurship Network (NEN) supported by Wadhwani Foundation, USA. Four other co-founding institutions selected for the purpose are IIM Ahmedabad; IIT Mumbai; Institute of Bio-informatics and Applied Biotechnology, Bangalore; and S P Jain Institute of Management & Research, Mumbai. NEN is India's leading catalyst and supporter of entrepreneurship education in the academic setting and strives to inspire and support new and future entrepreneurs, thus creating jobs opportunities in India. CEL, BITS in partnership with Wadhwani Foundation has accelerated its efforts to develop and promote nationwide network of entrepreneurial development centres.

The efforts of NEN have started yielding results and it is evident from the success of Entrepreneurship Week that was initiated for the first time by NEN and organized all over the country between February 24 and March 3, 2007. The event included participants from 170 institutions. More than 1,00,000 energetic, innovative students demonstrated extraordinary imagination, leadership and commitment. The week's goals were twofold; to celebrate the entrepreneurial opportunities in India, and to improve the ecosystem for entrepreneurs. Since 2007, entrepreneurship week is organized every year with a different theme on the campus. The week is packed with entrepreneurship activities, events and awareness campaigns. In 2014, E-Week with a theme of 'Innovating for India' that was organized involved 300 institutions from 19 cities. The event engaged more than 7,00,000 people

with a variety of events ranging from record-breaking walkathons to holding panel discussions and workshops. The activities provided opportunities for aspiring entrepreneurs to enhance their awareness, develop professional attitude, handle logistics, solve problems and respond to societal needs through their innovations.

CEL – Activities

Centre for Entrepreneurial Learning (CEL) with its integrated approach to entrepreneurship development is involved in various activities and programmes, which has leveraged BITS strengths. The activities and programmes of the centre focus on six key deliverables namely:

- Entrepreneurial Education and Research
- Entrepreneurship Education Development Programmes
- Entrepreneurial Student Activities
- Publications on Entrepreneurship
- Technology Business Incubator
- Alumni Networking Events

Subsequently, the institute set up an 'Entrepreneurship Development and Intellectual Property Rights' (ED & IPRs) unit in 2006 to promote entrepreneurship in an integrated manner. The key difference between CEL and ED & IPR unit lies in formal recognition of entrepreneurship development activities and programmes. Conversion of research into technology-driven commercial ventures leading to creation of intellectual property is supported through a structured process by the latter. The main objectives of the unit include:

- To create entrepreneurial ecosystem in and around the campus.
- To provide momentum to student-related entrepreneurial activities under Centre for Entrepreneurial Leadership.
- To extend incubation facilities to prospective incubates, which would result in start-up ventures.
- To facilitate speedy commercialisation of R & D outputs
- To facilitate the process of Intellectual Property Rights (IPRs) for faculty and students.

Besides entrepreneurship-driven activities, the institute has vibrant academic courses and activities. It offers courses such as Entrepreneurship; Creating and Leading an Entrepreneurial Organisation; Global Business,

Technology and Knowledge Sharing; Services Management Systems and New Venture Creation. These courses have been developed and designed after formation of CEL. These courses were introduced to overcome the gaps in the curriculum identified by students and faculty. Most of the entrepreneurial-related courses are electives in the curriculum opted by students purely on a voluntary basis.

CLEO Course: An Analysis

Creating and Leading an Entrepreneurial Organisation (CLEO), an academic course aims at creating an entrepreneurial venture, learning the skills to effectively handle it and evolve strategies for its sustenance and growth. The objective of the course was to help students to understand concepts of entrepreneurship such as idea generation, opportunity recognition and evaluation, getting started and scaling up, etc. There was an attempt to include every aspect of knowledge related to 'Creating an entrepreneurial venture', right from conceptualizing the idea; starting the venture; and managing the business growth. The teaching modules in the course covered topics such as fundamentals of entrepreneurship, elements of leadership; nature and importance of opportunity assessment, identifying business opportunities, preparing a business plan, launching a business, legal aspects to entrepreneurship, intellectual property rights issues, legal aspects of business, finance-related issues, venture capital, VCs evaluation of business plans, technical aspects of the project, people skills, marketing and branding, creativity and communication, corporate strategies, etc. The highlight of the course was the *'business planning exercise'* undertaken by the students. The exercise does not aim to create another document by the student; instead it resulted in gaining hands-on experience through learning by doing, diagnosing an opportunity and obtaining clear perspective about potential of the opportunity. Students were expected to develop confidence to create an innovative venture and to satisfy customers, by creating value for them. The purpose was to encourage students to develop courage and confidence enabling them to translate their ideas into reality.

Pedagogy

Conventional learning methods actually develop non-entrepreneurial habits. Conservative methods generally tend to train people to be reactive rather than to undertake initiative; focus on past learning instead of embracing new ideas; and accept status quo rather than focus on constant improvement. To address the gaps of the conventional learning, CLEO course focused on *"experiential learning* "and hands-on approach of *"learning by doing".* Pedagogy followed in the course included participative learning

through discussions, exercises, role plays, cases, presentations, lectures, and interactive sessions with entrepreneurs, video projections, discussions and self-identification of skills with the help of various instruments. The description of the pedagogy is provided below:

- **Cases:** More than five start-up cases were analyzed during the span of the course.
- **Presentations**: Each student was required to choose a book related to entrepreneurship, review the book and make a presentation.
- **Pitching an Idea**: Each team was expected to learn the art of pitching a business idea in 60-90 seconds and deliver it.
- **Articles**: Selected articles from business books and journals such as *Harvard Business Review* (HBR), *The Economist*, economic dailies, etc. were discussed in the class regularly.
- **Lecture/Sessions**: Lectures (both regular and invited) coupled with the analysis of various skills through psychological instruments, exercises; puzzles and problem solving constituted an integral part of the pedagogy.
- **Assignments/Projects/Workshops**: Workshops and invited lectures on niche topics (such as intellectual property rights, venture capital, etc) were conducted. Weekly take-home as well as classroom exercises and assignments were part of the course.
- **Exercises learnt during Entrepreneurs Educators Course (EEC):** Workshops organized by NEN-STVP-IIMB were useful – Ice Breakers, Name Tag, Wallet Making, Funny Ideas to be converted into a business proposition; interacting with different types of shop keepers; mind mapping, etc. resulted in productive exercises.
- **Special Lectures by Entrepreneurs:** A series of online and live talks on entrepreneurial topics by leading entrepreneurs from across the globe was arranged. Entrepreneurs and leading professionals participated to share their thoughts and experiences on specific themes related to entrepreneurship.
- **Presentation of Business Plan:** Each team presented its business plan which was evaluated by two faculty members.

The role of instructors was critical to the course and the success vested on their enthusiasm to deliver the course modules along with its tools. Through various teaching instruments, the instructors disseminated the

theoretical and practical knowledge of entrepreneurship and its relevance. They enabled the students to understand the traits of an entrepreneur with a view to diagnose their own personality and motivated them to undertake entrepreneurship as a career option. The students were equipped to recognize their strengths and weaknesses vis- à -vis the ideal profile and evolved strategies to inculcate the desired skills. The instructors aided students in developing skills to pitch their business ideas. The course was broken into broad tasks to accomplish the objectives:

CLEO Course: Tasks and Objectives:

1	Understand and appreciate the importance of entrepreneurship – Awareness
2	Entrepreneurship leadership – Building team and managing people
3	Identify business potential of an idea – Opportunity recognition & assessment
4	Develop the business idea – Basics of business plan & marketing
5	Incorporate Revenue model into your business plan – Develop Financial Plan
6	Learn the art of raising finance – Where and how to approach for funds?
7	Developing business strategy – Launching and Growth of Business
9	Legal issues in managing business – Intellectual Property Rights & other issues

The above tasks were implemented with a clear activity plan and were supported by pedagogic tools such as exercises, cases, video clips, slide presentations, etc. At the end of the course, students had to deliver a business plan and were expected to acquire desired skills to launch and manage a venture. Students' enthusiasm to undertake entrepreneurship as a career option was visible from the number of students opting for the course every semester. More than 35-40 students in each semester are choosing this course voluntarily since 2004-2005. Once enrolled in the course, many students preferred to undertake leading role in the activities of Centre for Entrepreneurial Leadership (CEL). The centre has been providing a platform for students to gain practical experience in organizing events, generating resources, planning and executing international business plan competition, organizing entrepreneurship week, conducting workshops, tech bazaar, technologies for rural development, etc. In general, it was found that students who are exposed to courses in entrepreneurship and involved in

the CEL activities tend to undertake entrepreneurial ventures. Some of the students also joined the technology business incubator to further develop their concepts, products and undertake market research.

Research and Content Development

CEL has identified four key areas to undertake research related to entrepreneurship namely Applied Technology and Entrepreneurship; Women Entrepreneurs and Rural Development; Entrepreneurship and Economic Development; and Entrepreneurial Leadership. Faculty members undertake research projects and develop case studies on entrepreneurial themes. Students undertake project studies under 'Special Study Oriented Projects' under the supervision of a faculty member. Besides organizing regular seminars and conferences on entrepreneurial themes, CEL has been hosting a national convention on *Energizing Entrepreneurship in Academia through Innovation* since October 2006. The primary objective of the convention was to arouse responsiveness about innovation, venture capital and to offer possibilities for networking by bringing together financiers, consultancy firms, entrepreneurs, government agencies, universities, R&D institutions, etc. to a single platform and engage in discussions. An interesting feature of the convention is "The Technology Bazaar" which provides an opportunity for the enterprising students, researchers and academicians to present their innovative ideas, designs and prototypes that are evaluated by experts. The platform also helps the prototype owners to network with mentors and venture capitalists. 'Meet an Entrepreneur Lecture Series' were structured and designed to tackle core issues that entrepreneurs face in building enterprises and managing its growth.

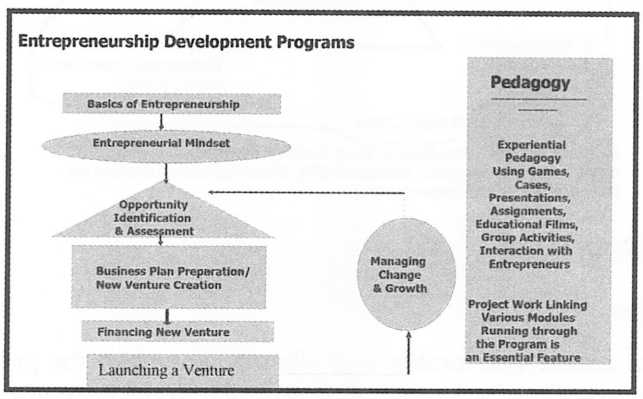
Alumni Networking Events have also supported the endeavor to nurture entrepreneurial environment in the campus. BITS and its strong linkages with the alumni has been the guiding force behind various activities of CEL. Alumni have extensively participated in the knowledge sharing through activities such as mentoring, guidance and financial support to deserving business start-ups. To expand its pool of potential participants and create the required demand for its various programmes, CEL also began to focus on awareness program called BITS–Big Bout (BbB), where large numbers of students were exposed to entrepreneurship development.

Framework for Entrepreneurship Development

The pedagogy of entrepreneurship development programmes revolves around experiential learning, interaction with entrepreneurs, learning by doing and undertaking various projects. The purpose is to enable students to identify and assess opportunities, create value proposition

to customer, and finally prepare them to build business models that can be shaped to implement a business plan. Emphasis on expert mentoring, incubation, etc. is also provided in the process. The structural framework for entrepreneurship development programme (See Fig 1) focuses its efforts in an integrated manner to impart knowledge and inculcate entrepreneurial skills. Entrepreneurship development activities and events undertaken by the centre have been integrated with objectives varying from awareness, i.e. knowledge/comprehension to attitude change i.e. intention to entrepreneurship/venture creation, etc. Attribution quality measures have been developed to ensure the impact of various activities which lead to improvised content and methodologies to achieve better results.

Figure 1: BITS Framework for Entrepreneurship Development Programme



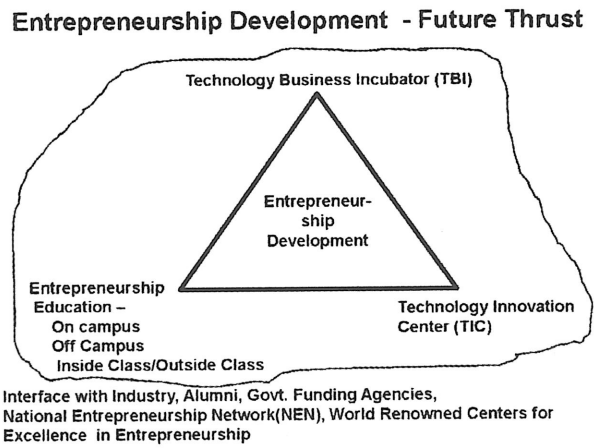
Source: Author

Future Thrust

BITS has identified 'innovation and entrepreneurship' as one of the key areas for channelizing students and faculty creativity leading to entrepreneurship development. It offers support and encouragement to more than 5-7% of total student initiatives and 10% of faculty research initiatives that result from the worthwhile entrepreneurial ventures. It should lead to creation of at least 50 ventures in high-tech high-growth industries in 5 years and further accelerate the process. The entrepreneurship development programme shall focus on Entrepreneurship Education, Technology Innovation Centre, and Technology Business Incubator with a strong interface with the industry, alumni, National Entrepreneurship Network (NEN), government funding agencies and other leading centres of excellence in entrepreneurship development as shown in Figure 2. BITS has a great advantage as a co-

founder of NEN, in pursuing its endeavor to promote entrepreneurship. NEN partnership has become a gateway for development and sharing of high quality resources, access to world class educational resources and programs across the network. It has enabled BITS to evolve and develop innovative, impact-driven entrepreneurship programs on the campus.

Figure 2: Innovation and Entrepreneurship at BITS



Source: Author

Conclusion

In order to create a favorable and vibrant ecosystem for promotion of entrepreneurship, all stakeholders including the government, university system, funding organisations, venture capitalists, mentors, role models, successful entrepreneurs, etc. need to collaborate to make an effective contribution. The education system needs to play a critical role to unleash the talent and channelize the innovative capability of youth by inspiring them to be job providers rather than job seekers. The pedagogy of entrepreneurship development programme in a CLEO course revolves around creating awareness, experiential learning and learning by doing. BITS experience suggests that the combination of alumni network, institutionalized industry linkages, flexible learning environment and high quality student input when coupled with National Entrepreneurship Network (NEN), and Department of Science & Technology (DST) partnership is instrumental in promoting entrepreneurship. BITS' efforts have already yielding results that is reflected in students' positive attitude towards entrepreneurship courses and business incubates resulting each year. BITS framework for entrepreneurial development has contributed by preparing and enabling students to explore and avail emerging entrepreneurial opportunities.

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Article

Pedagogical Innovations in Teaching Entrepreneurial Finance and their Impact on Students' Financial Behaviour

P. Baba Gnanakumar[1]

Abstract

Entrepreneurial finance is a course designed for students aspiring to create new ventures. The course addresses the key issues faced by entrepreneurs in managing money. This study aims to measure the effectiveness of teaching entrepreneurial finance by examining behavioural changes in the students. The study conducted among undergraduate students explores whether there are any changes in their behavior after they have undergone this course. The behaviour was measured with three dimensions namely, entrepreneurial confidence, tracking the sources of finance and marshalling the finance. Entrepreneurial confidence is the self-motivated financial behaviour needed for an entrepreneur. The findings indicate that there is a lacuna in the pedagogy tools to deal with entrepreneurial confidence activities while teaching entrepreneurial finance. If we teach entrepreneurial confidence activities along with the basic concepts of finance with appropriate pedagogical tools, the financial behaviour of the students might change.

Keywords: *Entrepreneurial Finance, Financial Behaviour, Students, Teaching Pedagogy*

Introduction:

While the Indian literacy rate is 74.04% with 487.6 million constituting its labour force – the second largest labour force in the world, financial literacy among Indians is still low. The term financial literacy refers to the individual's ability to read, analyze, manage and communicate about the personal financial condition that affects material well being (Stone, 2004). It can be broadly defined as the capacity to process financial information and make informed choices about personal finance. Around 600 million people in India do not possess a bank account. According to Master Card's Index report published in June 2013, India ranks 15th in financial literacy with index points of 59. The report states that Indians lack ability to keep up

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with bills, set money aside for big item purchases and clear credit cards bills in time due to lack of surplus cash since the income levels are not sufficient to cover expenses. The financial literacy score for Indians aged 30 years and above is 59 and the score is 61 for those who are aged below 30 years (Choong, 2013). It is believed that financial literacy programmes organised by various organisations such as Bombay Stock exchange (BSE), National Stock Exchange (NSE), National Institute of Securities Market (NISM), Money Wizards, Reserve Bank of India (RBI), and Insurance regulatory Development Authority (IRDA) have contributed to the changing scenario. In addition, SEWA Bank (India); Al Amana (Morocco); Teba Bank (South Africa); Equity Building Society (Kenya); and Pro Mujer (Bolivia) CARD Bank (Philippines) and the Microfinance Centre (MFC) in Poland are engaging towards creating entrepreneurial finance in the form of microfinance services among the rural mass. Indigenizing financial literacy is a core value in entrepreneurial finance. Motivating the young minds to understand the importance entrepreneurial finance needs transformative approaches. In India, young people use credit cards but they lack complete knowledge about credit card system such as maximum or minimum balance on credit card or lag in payments. Such gaps in knowledge may hinder an individual's ability to grasp knowledge in entrepreneurial finance. With this background, the article discusses the pedagogical innovations in teaching 'Entrepreneurial Finance' and its impact on students' financial behaviour.

Entrepreneurial finance is a course designed for students who aspire to engage in creating new ventures. The course may also be suitable to those who are interested to accrue a broad view of financing landscape for firms and ventures. The course addresses the key issues faced by entrepreneurs in managing money. It is argued that the entrepreneurial stigma associated with managing money is likely to reduce, if the course is taught with the aim of creating and imparting entrepreneurial skill. Teaching entrepreneurial finance is a non-linear process, and it can be understood from the 'life cycle' of an entrepreneur. The success of teaching entrepreneurial finance in the beginning stage can be measured with the changes in the personal financial behaviour of a student. Within this context, this study aims to find out changes in the financial behaviour of students after successfully completing the entrepreneurial course at the undergraduate level. The article discusses the structural changes essential to revamp the curriculum in the field of entrepreneurial finance. The primary objective of the study is to measure the changes in the financial behaviour of the students and to identify teachable and reachable paths in learning entrepreneurial finance among the undergraduate students. The facilitating objective is to identify

the entrepreneurial activity which is given more importance while teaching the undergraduate students.

Methodology

The curriculum for research has been administered in the first-year degree programme in commerce. The curriculum design has been planned by the Bombay Stock Exchange (BSE) Institute, Mumbai and undertaken in Coimbatore. The teaching pedagogy has been re-engineered in four stages. In the first stage, the foundation level of entrepreneurial finance has been identified based on past research. The awareness level of the students about the financial behaviour has been measured by conducting online research. In the second stage, the teaching pedagogy for each activity involved in entrepreneurial finance has been established with real time experience learning system (RTELS). The third stage of the research was organised after the completion of first-term period of 3 months. The pre-and post-behavioural change among the students with respect to entrepreneurial finance has been measured using Chi-square test. In the final stage, we have established the value-added modelling (VAM) as proposed by Bryan (2010) for teaching the non-reachable factors identified in the previous stage. The standard for VAM has been fixed on basis of the financial education research undertaken by Citigroup foundation. The interactive sessions on financial education designed by the City group community development has been used as the model pedagogy for teaching the basic concepts in entrepreneurial finance (citigroup.com, 2014).

Curriculum Planning and Implementation

Stage 1: Contextual Intelligence: Overview of the Debate

Brenheim's (1998; 2001) research contended that the financial education's ultimate aim is to increase the application aspect of financial literacy among the undergraduate students. According to Hogarth (2006), the consistent themes running through various definitions of financial education include; understanding the issues related to money and asset management; banking, credit, insurance, and taxes; understanding the basic concepts (e.g., the time value of money in investments and the pooling of risks in insurance); knowledge of planning, implementation, and decision making; and evaluation regarding financial issues. Research suggested that the learning process in finance should increase the knowledge aimed at a fuller understanding of the subject and its practical applications (Worthen & Sanders, 1987). All these studies suggest that 'managing money' is one of the core aspects in an entrepreneurial finance curriculum.

The business trait for understanding the entrepreneurial finance is through learning about the sources of finance. We link the source of finance with students' source of financing for education. In the United States, two-thirds of the college students are using loans for their education (Coy, 2012); compared to India, where only less than 10% of the students avail loans (Dore, 2011). Hence, to locate the business traits in entrepreneurial finance, we use the case of education loan to teach sources of finance in the first year of graduate level. Contextual intelligence is essential while teaching entrepreneurial finance. It is the ability to understand the limits of our knowledge and to adapt that knowledge to an environment different from the one in which it was developed (Khanna, 2014). To create contextual intelligence, we have identified the financial behaviour of the college students from past research. Every year, $75 billion was spent by college students (Teenage Research Unlimited 2012). Among high school seniors, 35% of them use credit cards; however, 40% of them were found to be unaware of how to estimate the savings rate from their budget (Mandell 2008). Almost half the students pursuing under-graduation possess about 3-4 credit cards (Sallie Mae 2009), nearly 60–70% do not know the annual interest rate which they are paying for their cards (Warwick and Mansfield 2000). Based on these research findings, we have included the 'marshalling of financial resources' to design the contextual intelligence for designing the entrepreneurial finance curriculum. The foregoing discussion suggests that the institutional context at the foundation level of entrepreneurial finance is essential to include the sources of finance and 'marshalling the financial resources'.

Stage II: Real Time Pedagogy

In the second stage, the study focuses on the teaching pedagogy for entrepreneurial finance. Case teaching methods are essential in teaching finance to undergraduate students. The new generation students require classroom learning experiences that model and exercise their work attributes. A study by Viscione and Aragon (1978) observed that each aspect of the course design ranging from case selection to classroom atmosphere must be an interactive discussion rather than dominating one. Based on these findings, the study incorporates case studies on personal finance and deliberations through blogs. The social cognition of the learners depends upon their motivation to understand the subject's core. The provocation should be based on the action plan of the input in teaching basic concepts of finance (Anthony, 1998). Hence, the study includes motivation as a key factor.

Financial curriculum is generally dealt under the inclusive education which can be supported by social networking tools that enable deliberation skills. McKinsey Global Institute (MGI) research discovered the enormous potential that could be harnessed using social tools to augment awareness, team work and sharing within the establishments. Exhibit 1 shows the advantages of using collaborative work as portrayed by MGI. Students are using blogs and forums for their collaborative discussion. The banking industry is using community groups to help their customers. Several e-community groups have voiced interest to train and being trained to deliver financial literacy to their low-income clients. The advancement in internet and usage of open source documents enables easy learning. According to the Online Nation, the number of students using the internet for learning is increasing at the rate of 69% (Allen, 2007). It would be more insightful to use user-generated online content as pedagogy to teach financial services (Kelton 2011). The media content teaching has been enabled in Android platforms which enables 24 × 7 hours of learning. Another necessary teaching pedagogy needed for teaching finance-related subjects for undergraduate level is the concept of financial real news. A Network of Financial Institute report (2006) states that inclusive financial literacy can be achieved when the core concepts of financial literacy are evaluated and revamped based on the current knowledge in banking/financial/insurance sector (Godsted & McCormick 2007). Hence, the study has included research-based articles related to finance as the advance learning area in undergraduate level. Table 1 shows the different type of real-time teaching pedagogy propagated by different authors in teaching entrepreneurial finance curriculum.

Table 1: Online Teaching Pedagogy

Sl. No.	Real Time Teaching Pedagogy	Research Citation
1	Motivation	Mandell & Klein (2007)
2	Curriculum Design	Hogarth 2006
3	Lecture (sharing the resources)	Viscione and Aragon (1978)
4	Case Studies	Cooley (1996); Erickson (1999)
5	Application	Worthen & Sanders (1987)
6	Bottom-line Concepts	Warwick and Mansfield 2000
7	Critiques	Pettit, J (2012)
8	Forum and Blogs	Hirad and Zorn (2001)
9	Articles Reading	Ardalan (1998)
10	Research (Advance Learning)	Escarraz et al; (1997)
11	Quiz Evaluation at Each Stage	Godsted & McCormick (2006)

The teaching pedagogy for each activity involved in entrepreneurial finance has been established with RTELS. Based on prior research, scholars have identified RTELS elements on 'teachable paths'. It includes motivation for learning, case studies, application of subject, bottom-line of concepts, critiques on developmental issues, blogs for discussion and test for evaluation at each stage. The study has designed a new model of teaching in the first-year degree level based on past research in education and finance. The framework of Organisation of Economic Co-operation and Development (OECD) model has been identified as the base of formulating the new learning system (See Exhibit 2). This model explains the need to identify the beliefs and attitudes of the students before teaching the application-oriented subjects. The model portrayed that the student outcome should be measured with change in job-related attitudes. Hence, we made an attempt to recognise and understand the changing aspects in students' behaviour.

We made use of the professional competence of teaching basic finance from the Bombay Stock Exchange Training Institute, Mumbai. The teaching tool included understanding finance with games, online teaching materials on basic investment methods and learning through case studies. Sri Krishna Arts, Science College and BSE Training Institute shared the contents. The beliefs and attitudes related to learning system have been shared with RTELS platform. The RTELS platform was constructed by "My Klass room. com" – the service provider. The course structure was based on the findings of past research. We evolved 11 criteria while structuring the RTELS. Besides classroom deliberations, the course content was also uploaded in Android platform using open source materials enabling students to view it at any time. The templates include the method of teaching by motivating the students to learn the basic concept of financial curriculum, learning concepts through case studies, commercial terms with Wikipedia and foundation of finance by creating bottom-line concepts in investment ideas. Following the RTELS exercise, we used the pedagogy to teach the first-year undergraduate programme course for 4 months. We also used 'teachable paths' with RTELS. The teachable paths are motivation for learning that include case studies, application of subject, bottom-line concepts, critiques on developmental issues, blogs for discussion and tests for evaluation at each stage.

Stage III – Evaluating the Pedagogy

In the third stage, we examined the pre- and post-behaviour of the participants (students) with the aim of identifying the 'reachable paths' by evaluating the impact of pedagogy after completion of the course on 'fundamentals of investment'. The evaluation system is based on comparing the pre- and post-course study behavioural patterns (Linn & Slinde, 1977;

Howard et al., 1979; Rockwell & Kohn, 1989; Sprangers & Hoogstraten, 1989). Pre- and post-tests appear to be the most pervasive approach to understand outcome measurements on financial literacy (Lyons et al., 2006). An evaluation of teaching methods can be measured on basis of the changes in beliefs and attitudes (Danes et al., 1993). Retrospective pre-texts (RPTs) were described, in which participants are asked to answer questions based on their level of knowledge and behaviour after the programme. They are made to think in retrospect regarding their behaviour prior to the programme. Previous research found no significant relationship between high school financial education and investment knowledge; but there was a significant relationship between college-level financial education and investment knowledge (Andrew, 2012; Harter et al., 2009). Varcoe's et al., (2005) research listed the variables to measure financial behaviour. It included savings, ways to decrease insurance costs, comparison of cost and shopping behaviour. We measured the financial behaviour of the participants of the experiment with behavioural variables such as spending analysis, sourcing knowledge, and future planning. The variables identified in the first stage have been integrated with the above mentioned variables. We collected behavioural data from the participants in two stages. The first stage data was collected during the bridge course while the second stage data was gathered after the completion of the course on 'fundamentals of investment'. The components of the scale include ratings based on financial behaviour, financial knowledge and financial self-efficacy. Since the participants were same, the problem of shift bias in pre-post designs was minimized (Howard & Dailey, 1979; Rockwell & Kohn, 1989; Sprangers & Hoogstraten, 1989). Chi-square test was used to assess the financial behaviour of students with respect to 'pre- and post-behaviour' after teaching financial literacy in the curriculum. A dichotomy response (yes or no kind) was adopted to measure the pre- and post-behavioural aspect. Within this context, we established the following hypotheses.

H0: There is no significant change in students' behaviour before and after undergoing training in the financial literacy curriculum.

H1: There is a significant change in the behaviour of the students before and after undergoing training in the financial literacy curriculum.

The pre- and post-test results are displayed in table 2.

Table 2: Chi-Square Test of Pre- and Post-Behaviour Analysis

Sl. No.	Financial Questions	Calculated value	Table value (5% level of significance)	Significance
	Behaviour			
1	I tracked some or all my expenses	24.34	13. 848	Significant
2	I compared prices when I shopped	29.45	13.848	Significant
3	I set aside money for future needs/wants	38.64	13.848	Significant
4	I used a layout for spending	27.34	13.848	Significant
5	I repaid the money I owed on time	8,43	13.848	Not Significant
6	I wrote goals for managing my money	27.82	13.848	Significant
7	I generally achieved my money by management of goals	9.34	13.848	Not Significant
	Knowledge			
8	I knew the cost of buying on credit	23.56	13.848	Significant
9	I knew questions to ask when shopping for credit	34.56	13.848	Significant
10	I knew about investments in securities	24.68	13.848	Significant
	Self-Efficacy			
11	I believed the way I manage money will affect the future	32.44	13.848	Significant
12	I felt confident about making decisions that dealt with money	7.87	13.848	Not Significant

Differences between the pre- and post-behavioural changes are tested with *Chi-square* test. The results are analysed with 95% confidence limits. Null hypotheses have been rejected in nine cases, and accepted in three cases. Based on these findings, it is possible to conclude that the classroom curriculum activities are helpful in enhancing the financial knowledge of the students. Nevertheless, there is no change in behaviour of the students with regard to repayment of debt, goal setting and level of confidence among the students in decision making. The results suggest that there is a significant association between the financial behaviour of students in nine out of twelve aspects. The significant factors are identified as 'reachable paths.' It includes tracking the source of finance, cost comparison, forecasting, sequencing the payments, aging schedule, cost of debt, credit terms, short-term investing and time value of money.

Stage IV: Decision making

The findings of the above three stages has aided in identifying the 'teachable' and 'reachable' paths for tutoring entrepreneurial finance. The three aspects such as debt financing, redeeming the debt and risk aversion are essential under 'teachable paths' but may not be relevant as 'reachable paths'. Hence, we decided to revamp the learning system of entrepreneurial finance by identifying certain changes in course content to achieve the new desired level. Consequently, we have adopted VAM for teaching the non-reachable factors identified in the previous stage. The standard for VAM has been fixed on the basis of financial education research undertaken by Citigroup foundation.

The marks or the attendance of the students does not have any effect on measuring the performance of the students. Instead of the traditional grading system, we use VAM to evaluate the student's attributes. VAM has also been used for evaluating the teachers. VAM isolates the teacher's contributions from factors other than the teacher's control known to affect student's test performance, including the student's general intelligence, poverty, and parental involvement. This study uses VAM for measuring the students' ability to comprehend the values and incorporate them within their lifestyle. VAM methods have contributed to stronger analyses of progress and the validity of evaluation methods. Indigenizing financial literacy allows students to make knowledgeable financial choices, discuss financial problems and plan for the future. Exhibit 3 shows the VAM for the curriculum design. This model consists of three stages, i.e., creating contextual intelligence, establishing pedagogy and rating the students. The teachable paths are identified in the first stage. The reachable paths are identified in the second stage. The remodelling pedagogy is based on the

non-reachable paths. The exhibit has variables that are unable to reach, even though, they are teachable. Hence, it was important to revamp the pedagogy to encounter these factors before rating. Only if all the teachable paths are reachable, we can rate the students. Entrepreneurial researchers have stated that psychometric screening is more suitable for rating the candidates (Rao & Mohit, 2007). Competency mapping for the students was performed on basis of the psychometric screening. Exhibit 4 shows the correlation based on the mapping of 40 students. Competency mapping of the participants of entrepreneurial finance indicates that the undergraduate students are good in comparing the financial constraints and the interest rate. However, the confidence level is low when compared with other factors. This may be one of the reasons for lower entrepreneurial values among the Indian students when compared to the students of developed countries. The 'entrepreneurial confidence' activities are teachable but may not be able to 'reach'. If these constraints are dealt by the teaching pedagogy, then, it is possible to infuse entrepreneurial values among the young graduates. For example, the correlation between redemption and tracking of money is –0.73. While designing the teaching pedagogy for redemption of debt and tracking of money (sources of finance), it is essential to structure the teaching modules so that they are taught with an intention of solving repayment modes.

Conclusion

The success of teaching entrepreneurial finance is measured in terms of changes in personal financial behaviour of the students. This study found that curriculum used for teaching the entrepreneurial finance changed the behaviour of the students in the fields of tracking the source of finance, cost comparison, forecasting, sequencing the payments, aging schedule, cost of debt, credit terms, short-term investing and time value of money; but there is no change in behavioural pattern in the fields of repayment of debt, goal setting and level of confidence. Hence, there is need for revising the entrepreneurial finance curriculum. To revise the curriculum, we performed the competency mapping of the behavioural values. When we mapped the financial behavioural variables, we found that there is a negative correlation between entrepreneurial confidence variable and other variables. It indicates that there is a lacuna in the pedagogy tools to deal with entrepreneurial confidence activities while teaching entrepreneurial finance. If we teach entrepreneurial confidence activities along with the basic concepts of finance with appropriate pedagogical tools, the financial behaviour of the students might change.

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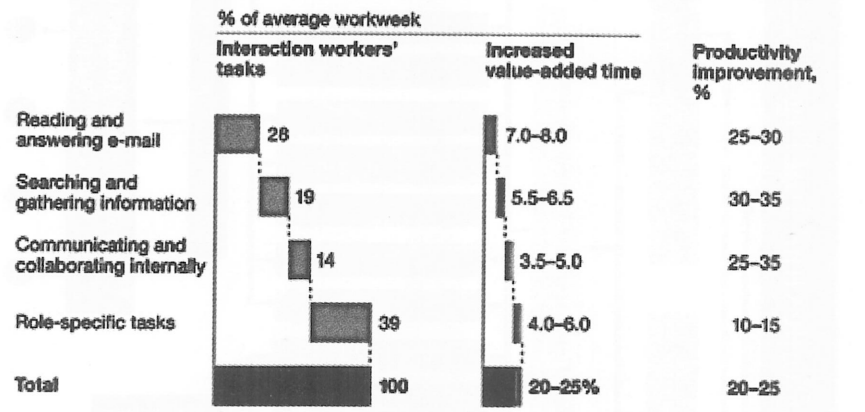
Exhibits

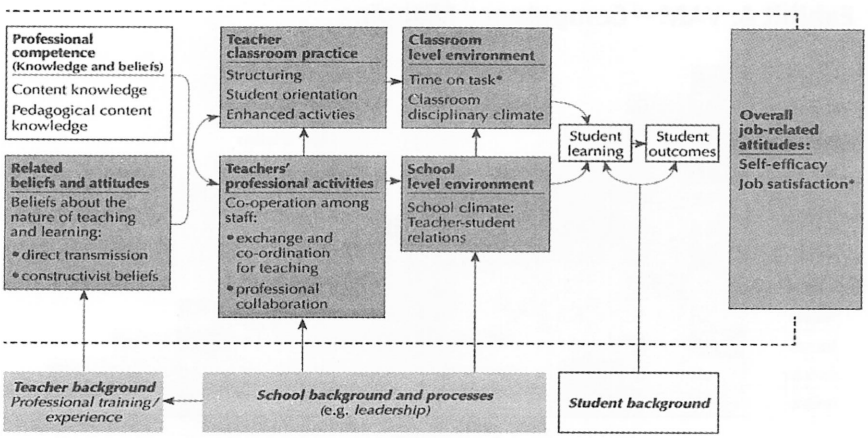
Exhibit 1: MGI Learning Network



Source: International Data Corporation (IDC); McKinsey Global Institute analysis

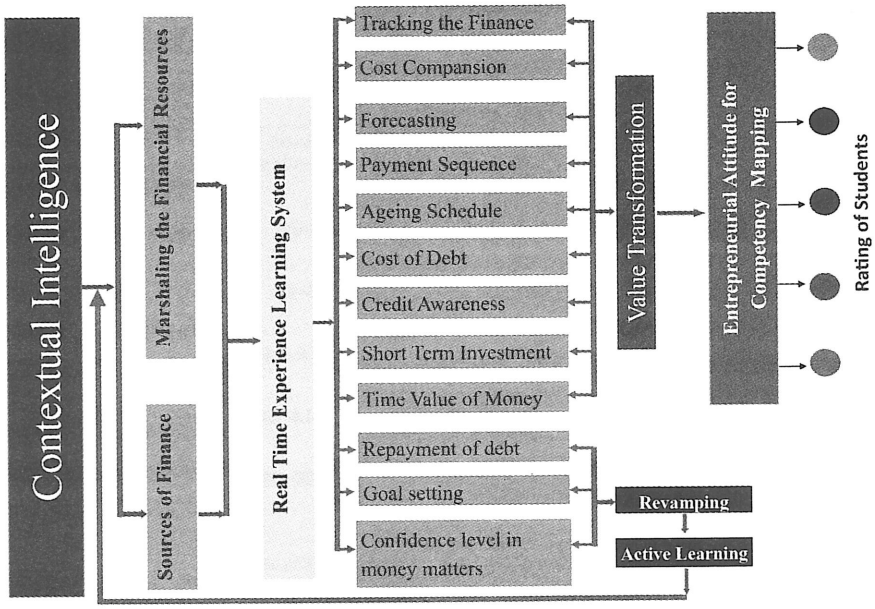
Exhibit 2: OECD Model

Framework for the analysis of teaching practices and beliefs



Note: Constructs that are covered by the survey are highlighted in blue; single item measures are indicated by an asterisk (*).
Source: OECD, *TALIS Database*.

Exhibit 3: VAM Modelling



Source: Author

Exhibit 4: VAM – Competency Mapping

	Tracking	Comparison	Forecasting	Sequencing	Ageing Schedule	Cost of Debt	Credit Awareness	Investment	Time value	Redemption	Goal Setting	Confidence
Tracking	1.00											
Comparison	0.66	1.00										
Forecasting	-0.21	0.40	1.00									
Sequencing	-0.42	0.60	0.63	1.00								
Ageing Schedule	-0.01	-0.14	-0.31	-0.71	1.00							
Cost of Debt	0.26	-0.01	-0.68	-0.32	0.55	1.00						
Credit Awareness	-0.42	0.78	0.70	0.64	-0.33	0.72	1.00					
Investment	0.47	-0.57	0.58	-0.13	0.69	0.49	-0.54	1.00				
Time value	0.78	0.62	-0.12	-0.27	0.54	0.63	0.22	-0.51	1.00			
Redemption	-0.73	0.64	0.54	0.44	-0.23	-0.46	0.33	0.06	-0.52	1.00		
Goal Setting	0.68	0.72	-0.65	0.08	0.40	0.52	-0.13	-0.16	-0.10	-0.13	1.00	
Confidence	-0.14	0.43	-0.33	0.71	-0.50	0.17	-0.32	0.03	-0.41	-0.15	0.24	1.00

1.00 *Highly Correlated*
0.00 *No Correlation*
-1.00 *Negatively correlated*

Source: Author

Support for New Product Development: Case Study of an Innovative Product – 'Tarang Pariwartak'

Punit Saurabh[1] and Shiv S Tripathi[2]

Abstract:

This paper presents a case-study on the development of a technology-based innovative product, 'Tarang Pariwartak', developed by a student entrepreneur at an incubation centre of a higher education institution (HEI). The case study follows an experiential and qualitative research design to present an analysis of the process of developing a real-life innovative product, its prototype testing and feasibility study for commercialisation. It discusses the various aspects of the support provided by the HEI, government agencies and industry by highlighting the stakeholders and processes that facilitate or hinder the innovation process. At a theoretical level, it contributes to the literature on innovation by consolidating and conceptualising on the experiences of a young entrepreneur in an incubator centre within a resource-rich higher education institution. The findings help in building a model for effectively promoting entrepreneurship at HEIs and developing supportive policy interventions by the government.

Keywords: *Academic Entrepreneurship, Higher Education Institutions (HEIs), Incubation, New Product Development.*

Introduction

Today innovation, incubation and entrepreneurship are the new buzzwords in any educational institute – be it a school or a higher education institute in India. Most of these educational organisations are propelled and impelled with the responsibility of promoting innovation and entrepreneurship activities. The question is in reality how many of these institutions actually support a creative idea, provide incubation support and ensure that the innovation gets commercialized. The problem remains as only few institutes in India are well-equipped to provide a suitable ecosystem for innovation process. In other words the ways in which innovations are actually supported

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by the higher education institutions (HEIs), by creating an innovation ecosystem remains unclear. Whether innovation is limited to writing project reports or restricted to developing and testing the prototypes; or whether there are some innovations that see the light of the day after undergoing the commercial process seems ambiguous. If the latter is true, then it is vital to explore the processes and practices followed by the HEIs. With this as a background, the article investigates the role of HEI-based incubation centre in supporting and promoting innovation. It focuses on the process undertaken by innovators towards innovative product development and commercialisation at an HEI-based incubation centre. It also includes support provided by the governmental agencies through policy interventions.

Role of Higher Education Institutions

Innovation and entrepreneurship ecosystem at HEIs is considered as a key factor for building knowledge-based economy. To build a robust knowledge-based economy, we need to harness the knowledge created by the nascent entrepreneurs. It can be effectively done by HEIs which can aid and assist potential innovators with foundational support and boost their entrepreneurial spirit. The role of HEIs in promoting economic development with the aid of innovation is extensively highlighted in developed nations. In contrast, in the context of an emerging nation such as India, technological innovation has received inadequate attention for entrepreneurial growth and economic development.

The initial emphasis of the Indian policy makers, entrusted with the task of conceptualising the centres of learning was to create 'HEIs' that could produce skilled workforce employable for economic activities. With the ever-increasing economic challenges posing a competition between developing and developed economies, the HEIs are no longer viewed as factories for producing employees for the companies, but are now visualised as centres for promoting innovation and entrepreneurship with the potential to create 'future employers' or 'Entrepreneurs'. HEIs are increasingly seen as potential locations for initiating successful companies due to their proximity with industries and advanced research infrastructure. They focus on innovative research; utilise students as skilled cost-effective and intelligent labour; exploit the expertise available with professors. These and several other factors provide ample scope for promoting innovation and entrepreneurial activities within their campuses. HEIs are also being recognised by the respective governments as a place for initiating high-end research to suit their objective of promoting economic development, self-reliance in strategic areas such as defence, aerospace, etc. HEIs are viewed as a place

for promoting industry-centric technology development in their research labs as well as act as training ground for various skill-based programmes. As the university ecosystem is found to be rich in technical, infrastructural, manpower and other resources, it is viewed as appropriate for setting up high-tech industrial clusters, labs and research centres. HEIs across the world are seen as the citadels for furthering entrepreneurial growth, knowledge and innovation. They act as a cradle for knowledge creation and its significance is likely to augment in the wake of the corporate pressures and their search for alternative solutions other than their own R&D.

Literature Review

Etzkowitz highlights the increasing role of HEIs in knowledge creation resulting in economic development and signifies the transformation of HEIs as part of their academic mission Etzkowitz (2004). The first academic revolution (Rodrigues, 2009) transformed the academic structure and function of university from teaching-based university to research-based university (Etzkowitz, 2004). The second academic revolution, on the other hand laid emphasis on technology transfer between academic research and existing firms and the creation of new entrepreneurial ventures (Rodrigues, 2009). In the 1980s, the Bayh–Dole Act spurred the growth of academic entrepreneurship in universities across the United States (United States Patents and Trademarks Office, 2010). The act provided a framework where universities can have an entrepreneurial orientation and help the industry in developing innovation and patents. Academic entrepreneurship is about creating a conducive environment within the universities or HEIs that promote entrepreneurial culture so that, through technology transfer offices (TTOs), a technology can be transferred to the industry for commercialisation and make an economic impact through academic spin-offs (Clarysse et al., 2005 & Wright et al., 2007). An entrepreneurial social environment is likely to motivate and positively engage the scientist in that domain with entrepreneurial activities (Bercovitz & Feldman, 2008).

In the dynamic business environment, universities undertake an additional role when they try to become entrepreneurial universities either through social contacts between the state and universities or through linkages of state–industry–universities, referred as the triple-helix model (Etzkowitz & Leydesdorff, 2000). In a knowledge-based economy, universities can act as a medium for creation of new companies and innovations. There are instances where universities have created an ecosystem for innovation (Graham, 2013; 2014), but most of them represent the developed or technologically resource-rich economies. Studies on open innovation discuss the ways

that could generate electricity and help in increasing the efficiency of the vehicle (battery-operated vehicles). They were enthusiastic about the device and decided to focus on its further development and commercialisation aspects. Unfortunately, after conducting a thorough patent search, they found that a similar design was patented 20 years back for generating electricity from ocean waves. The revelation was a huge setback for the team and Sharat's friend began losing interest in pursuing the project foreseeing risk and negative income. Hence, in July 2008, after graduation, the three friends who were originally assisting Sharat quit the project to pursue careers in different fields. Although Sharat Kumar was left alone, he pursued his project relentlessly. By September 2008, he prepared another design of the regenerative shock absorber and this time he made a patent search to know whether that type of design had an existing patent. After detailed examination from US patent department, he gathered confidence to proceed with the design. Sharat Kumar prepared a small prototype of the design and it worked magnificently well. He immediately communicated the idea to Sunay Jain and Ankit Jain (Sharath Kumar's partners and college friends). He explained to them how this mechanism could be used to make a regenerative shock absorber as well as an ocean wave converter. He enquired whether they were in a condition to partner with him in developing this model prototype into a working model which could be launched commercially. They happily agreed and the journey towards making the first demonstration prototype started immediately. By the end of September 2008, Sharat and his team conceptualised a refined design on paper and contacted a professional patent service company and sought their assistance to conduct a patent search based on the design. By November end, they received the results of the patent search which reaffirmed their belief that there was no patent for a similar design. So they drafted the full patent application and in January 2009, they filed a patent. Their design was unique because: (a) it used the regenerative power technology where electricity can be generated using linear motion and vibration and; (b) it used Biorock technology so that it does not hurt the marine environment as much as other conventional ocean wave converters do.

Incidentally, Sharat's company decided to discontinue the project on which he was working at Pune and Sharat was left with the option to either resign or else join other non-core projects. Eventually, Sharat resigned from his company and joined a BPO with the intention of working during night to support his livelihood and the project-related expenses. Sharat toiled hard to make the demonstrational prototype, which cost him sleeping nights and laborious hours during days to pursue his innovation. Later, he moved to

Ranchi in Jharkhand for personal reasons and continued to undertake odd jobs to manage his expenses and also simultaneously focus on the project. Sharat restarted the fabrication of the device in Ranchi in July 2009 and finally completed the conceptual model in October 2009. To demonstrate the technology before a larger audience and gauge the potential of the technology, he entered into an innovation competition during the techfest of IIT Bombay in 2010. After the presentation, Sharat and his team received an overwhelming response from the crowd and the judges, after being awarded with the first prize. The success and moral support from the crowd boosted Sharat's confidence about the device and the project. Following this event, Sharat moved to Bangalore and began focusing towards making a real working prototype. His team contacted REVA for funding the development of the regenerative shock absorber but they did not receive any positive response from them. Later, they went to ARAI (Automotive Research Association of India) Pune, met some people and tried to explain the strength of their technology. However, they did not receive any positive response from them as well. Hence, they decided and planned to shift their focus to ocean wave energy conversion technology.

In February 2010, Sharat joined a mechanical engineering company in Bangalore and he was simultaneously exploring various sources of funding to support his project. He examined options such as cloud funding, VC funding and government funding programmes, etc. However, at that stage, government funding seemed most promising as all the VCs wanted returns and were not willing to invest in R&D. So, he prepared a plan to obtain a grant through TePP funding. Through internet-based research, Sharat and his team realized that emerging technologies which have been recognised in competitions such as technology festivals or supported by DST, etc., or which had recognitions from industry had a good chance of availing grants. Since they were already recognised at IIT Mumbai Tech-fest, they decided to test whether DST would appreciate their innovation. Hence, Sunay Jain and Sharat Kumar worked on the application for DST–Lockheed Martin Innovation Growth Programme with the aim to win a gold medal and funding support. The technology was actually selected by DST-Lockheed Martin India Innovation Growth Programme and qualified into the semi-finals and was ranked among the top 60 innovations. As a result, they were invited to participate in a workshop on commercialisation of their technology, held in Goa. In the meantime, they were contacted by Chief Sustainability Officer of one of the largest conglomerates in India to discuss the prospect of their ocean wave energy technology. Sunay Jain and Sharat Kumar had two meetings at the conglomerate's office in Mumbai. They were even assured

of all the help to commercialise the technology if they could undertake the development and design of a working device. Sharat and his team could now boast of three recognitions, two from competitions and one from the industry, one step forward towards the desired grant. These developments helped Sharath's team to pitch their product and themselves at the forefront during the product development initiatives.

Resource Mobilisation

Despite the above encouragement, the foremost challenge Sharat's team encountered was the arrangements of funds. The second issue was related to the space needed to develop the device as they did not have any infrastructure or lab support available. Initially, they checked the possibilities of securing some support from the organisation Sharat was working for, but they did not seem to be interested. Thereafter, Sharat resigned from his job to work full-time on his project. He approached few higher education institutions in the country but did not obtain any positive responses. Sharat, later also felt that he might have not met the right people and realized that he lacked the required human network to augment his venture. He went to Alang in Gujarat, famous for ship-breaking, to explore whether it would be cheaper in that locality to set up a facility for preparing the working prototype. He chose Alang because he could easily procure materials at a low cost from ship-breaking yards that was needed for the project.

In August 2010, Sharat Kumar met Punit Saurabh, researcher of innovation and entrepreneurship at IIT Kharagpur. Punit was also a project manager of TePP during that time and offered generous support and cooperation in drafting the TePP proposal. They approached the head of the Ocean Engineering Department and presented ideas related to the ocean wave energy converter. The head was impressed and immediately assured them support for the project. Finally, Sharat's quest for a place to develop the device was over. He shifted to IIT Kharagpur in January 2011 and began the prototype work. In the meantime, he drafted the proposal for TePP grant and finally by end of March 2011, the proposal was accepted for financial support from DSIR under TePP for developing a working prototype. It took additional 4 months for the grant to be sanctioned and utilization for prototype development. The innovator was funded with INR 0.5 million to develop the prototype. However, Sharat was not happy with the outcome as he had initially requested INR 1.4 million for developing the product. Even after repeated requests, the DSIR refused to increase the funds decided by the TePP committee. The committee felt that the amount provided would be sufficient to complete the product development. Sharat was unable to explain and satisfy the committee regarding the advantages of the technology

as well as the cost required to complete the project. However, he did not lose heart and decided to alter the design of his product development at a lower cost to suit the sanctioned budget.

Sharat soon realized that the grant alone was not sufficient to fulfill his dream. It necessitated him to be a part of the IIT Kharagpur ecosystem to maximise the benefits. Even though he received consultancy support and guidance from the professors, he was unable to use the lab facilities, technical support and manpower essential to develop his project. Some resources were available on chargeable basis, but acquiring them was a hassle that required administrative procedures. To solve this issue, Sharat decided to join IIT Kharagpur as a student in the Masters programme in the same department which was supporting him. This arrangement solved the issues of technical support, infrastructure, and manpower besides easing out his expenses through project scholarship and Sharat was able to concentrate on his innovation development at the lab offered by the department. IIT Kharagpur had the desired infrastructure for product research and development in the field of Ocean Sciences and Energy. It had a dedicated centre for energy research and an entrepreneurship business incubator. By the end of July 2013, Sharat Kumar had successfully completed the fabrication of a working prototype of the product which he named as "*Tarang Pariwartak*".

The Concept

On the basis of the location, ocean wave converters can be classified (See Appendix 1) as follows:

- On-shore device – These devices are fitted on the sea banks in proximity to areas with a recurring phenomenon of strong waves prominence.
- Near shore bottom standing – These devices are installed at the shores and are in a bottom standing position to trap maximum waves crossing the sea.
- Floating near shore or off-shore – These devices are designed to float offshore or near the periphery of the sea shore to utilise wave energy for power generation.
- Bottom standing or submerged or not too deep – These installations are designed for trapping sea waves while submerged or partially submerged.

- Submerged, not far from water surface – These devices are below the water in a submerged state and designed for maximum wave energy conversion.

The design of *Tarang Pariwartak* is based on floating near shore or off-shore type. After the commercial viability is tested, it will be installed in groups near the shore in order to harness energy from the ocean waves.

Testing of the Devise and Prototype Development

The first phase of trials was completed and the project ended in January 2014. During this period, Sharat had also enrolled for an MS degree which he received in 2015. By that time, his products underwent sea trials, testing and validation of the result as per the parameters set by the expert committee. The first and the second trials took place at Vishakhapatnam and there was consonance with the locational advantages. Sharat sought the support of the Ministry of Science and Technology and aimed for PRISM[3] project under Department of Scientific Research for funding to commercialise his product. He is also collaborating with agencies having expertise in the domain of renewable energy. He was enthused by the fact that government agencies in the energy domain along with the industry arms were optimistic about his ideas and believed its market potential.

The technology comprises three parts: a motion converter, a power take-off system and electricity generation system (See Appendix 2). The objective was to develop a 1/8 scale prototype of *Tarang Pariwartak* in two phases. The first phase involved data collection on ocean waves in the country and its analysis. On the basis of this analysis, Vishakhapatnam was chosen for the first trials. The second phase comprised 1/8 prototype development and was called *Tarang Pariwartak* – 1 (See Appendix 3), which was the proof of concept. Later on a 1/2.5 scale, a model was developed and was called *Tarang Pariwartak* – 2 (See Appendix 4). This 1/2.5 scale model (diameter of 2 metres) of the proposed full-scale prototype is capable of generating a peak of 300 W of electricity in the range of waves of height 1–3 metres. The full-scale model (diameter of 5 metres) should be able to deliver a peak output of 7 KW.

Electricity generated through the full-scale project can be sold to the national power grid. Also, the 1/2.5 scaled down version of power generating buoys can be used to collect meteorological data about the sea. Besides the above benefits, there is scope for employment generation through manufacturing and maintenance, and the product can be exported too.

3 Promoting Innovations in Individuals, Start-ups, MSMEs (PRISMS)

The product development phase of the project is successfully completed, but the commercialisation of innovation requires huge funding support for testing, trials, manufacturing, infrastructure support and marketing before it is introduced in the market for sale. This is the major challenge for Sharat. Who will support his innovation for testing and full-scale commercialisation remains a big question.

Technical and Other Challenges

The main challenge encountered in developing a device that can harness energy from ocean waves was in developing a mechanism to convert the (variable amplitude) to-and-fro motion of the source (waves) into unidirectional rotary motion. Ocean waves are almost sinusoidal waves, it is easy to harness the energy of these waves from one and half of the cycle, but harnessing the energy of the waves from full cycle was a difficult task. The problem in harnessing energy from only one cycle is that the electricity will be produced, but will not be of constant power and requires much conditioning of generated electricity.

Although the project has been completed and is technically viable; in order to really see the light of the day, the product needs to be tested and trials to be made for successful commercialisation. Unlike other startups that are service-based or process-based, a technical product requires larger investments and the gestation periods of converting such inventions into commercial successes usually require long period. In this case, the innovator received whatever support was possible from the HEI (IIT Kharagpur) by way of scholarships and project grants. It needs to be noted that HEI may have constraints to make all investments required in such innovative projects. Since the innovator is also a student, there might be difficulties to complete the course requirements, and as soon as he exits the HEI, the innovation ecosystem is lost. The support of HEI (IIT Kharagapur) was crucial in the final product development and its success.

The Way Forward

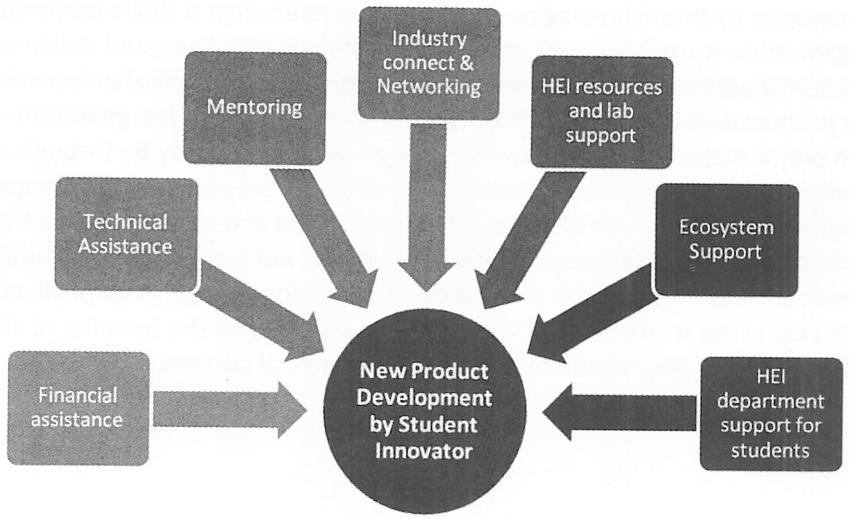
This technology is about conversion of ocean wave energy into electric energy. The up and down (to-and-fro) motion of the waves is initially converted into unidirectional rotary motion and then this rotary motion is used to run a generator. This is a buoy kind of a device which will be moored in the sea/ocean off the shore. (As this is an offshore device, more energy will be available for conversion into electricity, as the energy of the waves decreases as it approaches the coast.) This technology does not have any hydraulic or pneumatic devices (as most of the present devices have),

so loss of the energy (in form of heat) due to fluid friction of the working fluid is eliminated. At the same time, the high capital and maintenance cost associated with the hydraulic systems are also eliminated. To protect the environment for future generations, it is vital that we move rapidly to a more sustainable lifestyle, reducing carbon emissions of greenhouse gases and consumption of limited resources. Offshore wave energy has the potential to be one of the most environmentally benign forms of electricity generation with a minimal visual impact from the shore. Wave energy is essentially stored, concentrated wind energy, the waves being created by the progressive transfer of energy from the wind as it blows over the surface of the water. Wave energy could play a major role in the world's efforts to combat climate change, potentially displacing 1–2 billion tonnes of CO_2 per annum from conventional fossil fuel generating sources. Such installations would also provide many employment opportunities in construction, operations and maintenance. As an indigenous resource that will never get exhausted, wave power would help improving energy security in India.

Model of Entrepreneurial Support that can be Extended by an HEI

The authors have compiled the areas of entrepreneurial support that can be provided by a higher education institution (or university) as shown in figure 1. With aid from literature, they have identified the areas of support that can be extended by HEIs such as financial assistance (Wadhwa *et al.*, 2009); technical assistance (Sheldon, 1988); mentoring (Regis *et al.*, 2007); industry connect and networking (Etzkowitz, 1983, 2004, 2008); HEI resources and lab support (Boh, De-Haan & Strom, 2012); ecosystem support (Etzkowitz, 1983); and HEI department support for students (Petridou *et al.*, 2009). It can be noticed that all these factors exist in the present case of *Tarang Pariwartak*. The model in figure 1 can act as a framework for guiding entrepreneurial universities or higher education institutions to support budding entrepreneurs as part of their initiative towards entrepreneurship development. If a university or HEI has a TTO, they can utilize their corporate network and help entrepreneurs commercialize their innovations.

Figure 1: Areas of entrepreneurial support that can be extended by an HEI



Source: Author

Conclusion

HEIs can become entrepreneurial by providing an ecosystem to support entrepreneurship development which may result in attracting entrepreneurs with innovative ideas from all walks of life. *Tarang Pariwartak,* a promising product, required generous financial and stable ecosystem support to see the light of the day. HEI provided sufficient financial and infrastructural support by way of grants, scholarship, technical assistance, etc. Yet, it was not sufficient for a technology to experience full-scale commercial success due to long gestation periods in developing technology-oriented products. Most of the time, it is observed that the students at HEIs produce innovative products; yet the innovation is unable to progress beyond the prototype development stage. Most of them end up winning some awards or as demonstrations during technology fests, etc. There have been very few instances of innovation reaching a full-scale commercialisation stage. Beyond a certain point, HEIs fail to provide support to such innovations. Therefore, we can say that entrepreneurs flourish within the HEI ecosystem, but outside the system, the innovations might die. This is an area of institutional void that needs to be addressed in future research. In India, the technology transfer mechanisms do not exist at the HEI level where the technologies developed by the university can be offered institutionally to

corporate houses. To enable such mechanisms, universities need to become more entrepreneurial and aim at earning profits from the technologies developed by them, leveraging upon the ecosystem that a single corporate organisation is unable to afford. It will also help in building good industry–academia partnership and inspire the industry to seek the aid of universities for product development or with any other solutions. The Indian government can play a major role through some policy intervention (may be through its nodal agencies) where the universities can support the promising prototypes by providing them with the relevant financial and ecosystem support that entrepreneurs and technopreneurs need. It may not just result in nurturing creative ideas through the innovation and development of new products, but also assist to sustain the challenges and maximise the benefits of the product for a better future by achieving commercial success.

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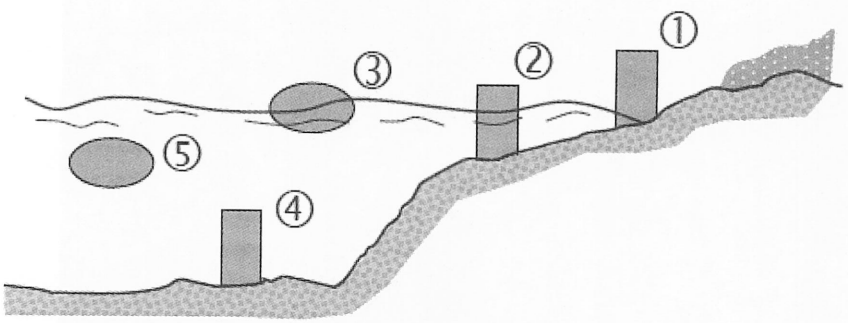
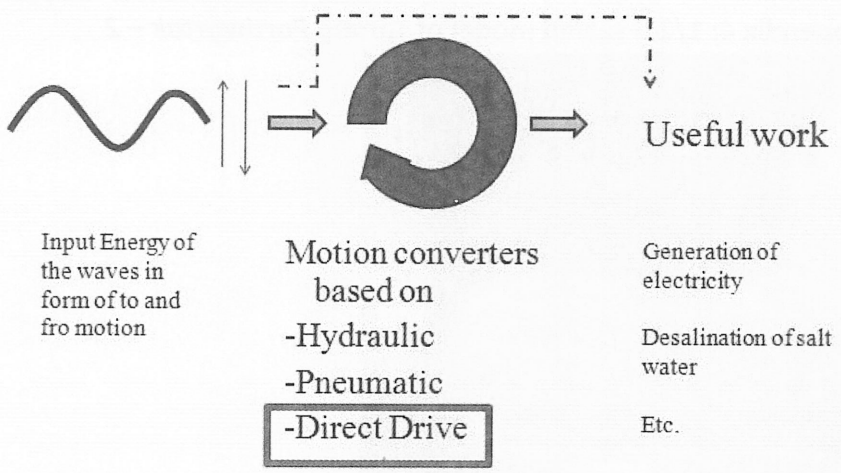
Appendices

Appendix 1: Types of ocean wave electricity convertors based on location



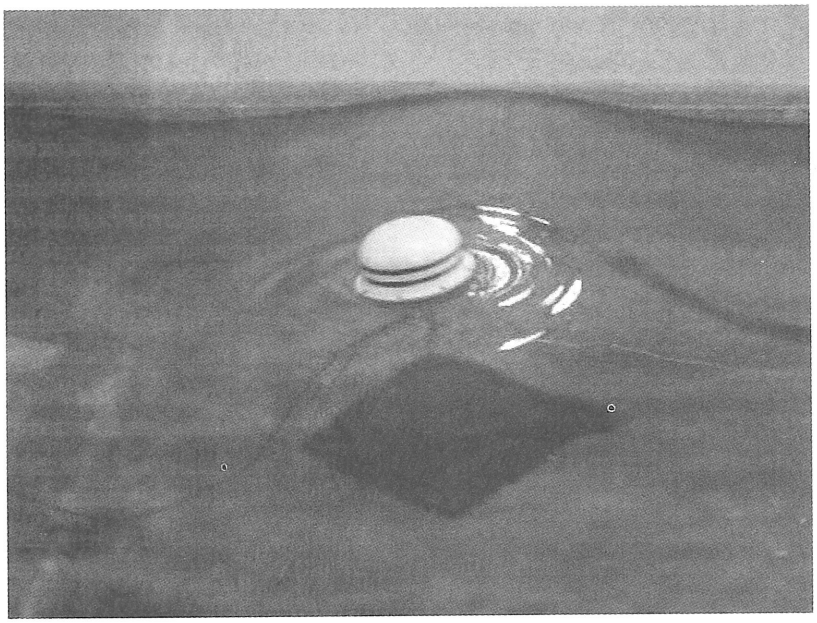
Source: Provided by the innovator

Appendix 2: Basic working principle of *Tarang Pariwartak*



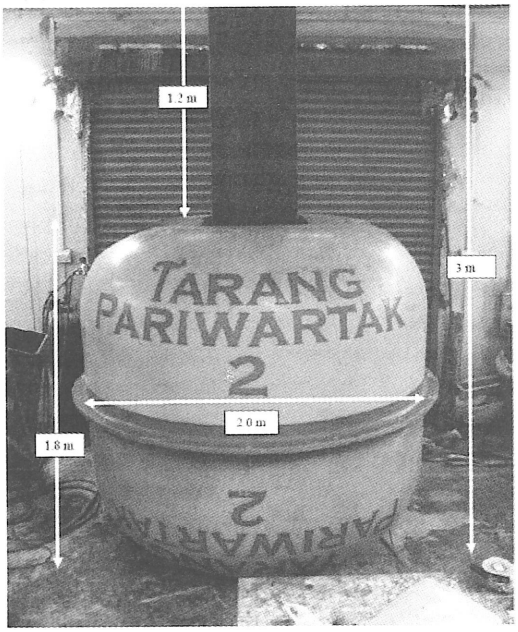
Source: Provided by the innovator

Appendix 3: 1/8 scaled model of Tarang Pariwartak – 1 undergoing lab tests



Source: Provided by the innovator

Appendix 4: 1/2.5 scaled model of *Tarang Partiwartak – 2*



Source: Provided by the innovator

Artisan Entrepreneurship Training and their Impact on Learning Effectiveness: Analysis of Group Interactions using Sociograms

Nandkumar Rathi[1] and Rolla Krishna Priya[2]

Abstract

This article reports on a study of group interactions and their impact on learning effectiveness in an entrepreneurship training conducted for artisans in the Kutch region of Gujrat, India, which is known as Asia's capital of Embroider. The participants of the training programme consisted of artisans in the age-range of 16 to 74 years and the training focused on making the artisans independent, self-sufficient, market-oriented and globally relevant. Entrepreneurship education is particularly relevant for artisans as it is aimed to chisel an innovative entrepreneur from an art-equipped individual. Sociograms was used as research tool to map the relationships and analyse the interactions between the artisans during the training. The findings attribute that learning effectiveness is a function of teamed deliberations and indicates that entrepreneurship training and the usage of participative tools can enhance learning effectiveness of the traditional artisan by equipping them with market knowledge.

Keywords: *Entrepreneurship Training, Learning Effectiveness, Traditional Artisans, Kutch*

Introduction

With the growing demand for indigenous artisans and their products; educators, business leaders and the government have realized the need for providing entrepreneurship education to the traditional artisans engaged in the indigenous process of developing and manufacturing products. Efforts are underway to impart quality entrepreneurship education in these sectors of rural India. However, often the latent potential of the indigenous masses, especially the traditional artisans', remains ignored. This study is an attempt to understand the training process of traditional artisans from Kutch, Gujarat. Kutch is a region in the north-western part of Gujarat in India.

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The major occupation of the region is cattle farming, lumbering, wood-architecture, metal-work, textile art (embroidery, tie-dye, block printing, etc.) and farming. The region is characterized by approximately a total of 25 varieties of embroidery, printing, weaving, etc., which are either sold in the local market, traded, show-cased in local and national fairs or traded through middlemen. The target group and respondents for this study is the 'traditional' textile artisans of the Kutch region. The term 'traditional' would pertain to those artisans, who have been engaged in practicing textile art for at least three generations, the last being their own.

Review of Literature

There are several studies focusing on the effect of Social Learning, which is the outcome of the growing significance of interactional learning in organisational spheres (Cohen & Bailey, 1997). Studies have focused on aspects such as interdependence of group, affinity and group-sharing, characteristics of task, group composition, etc. among the team members (Campion, Medsker, & Higgs, 1993). In some of the earlier literature group effectiveness has been defined in relation to the externally led team, i.e. supervisor-led teams. One of the significant studies in the past includes research by Gladstein, who has tried to evaluate group effectiveness on variables of the team namely group-level variables and organisational-level variables (Gladstein, 1984). 'Organisational communities' as coded by Lave & Wenger, typically emancipate the constantly transferring knowledge bases that tried to study how precision knowledge templates will be assimilated and reproduced in the future (Lave & Wenger, 1991). Further studies have been made to realize the significance of the material artifacts in the sphere of learning and their trade-offs in team-learning process (Carlile, 2004). Two significant studies have contributed to settling on the correlation between variables such as group synergy, organisational environment, learning process and its effectiveness such as 'material artifacts,' on their cumulated and inter-dependent effect on group effectiveness (Hackman, 1987; Gladstein, 1984). Their conclusions state that the on-going team interaction led to the summative group effectiveness as a whole. Job complexity, nature of the job (i.e. art weaving), and indecisiveness, were the other variables that were studied as the moderating factors for adult (andragogy) group-learning phenomenon (Gladstein, 1984). Some of the other formats of studies that received significance in the context are the comparison between self-managed teams and the productivity displayed by supervisor-led teams. Precedents indicate that comparatively, self-managed teams were effective in events of tasks that demanded psycho-motor faculties, planning, inter-dependence and cognition. On the other hand, supervisor-led teams were

found to be effective in tasks that demanded psycho-motor skills with not much inter-dependence (Mattson, Mumford, & Sintay, 1999). Although there was extensive research on the group characteristics and inter-learning process, studies on aspects of adult learning or andragogy seem neglected. The current study is a case of understanding the adult-learning behavior, factors and the learning outcomes. The study is an intervention to understand the effect of learning behaviors of adults with the outcome in the form of art designs and development of entrepreneurial instincts.

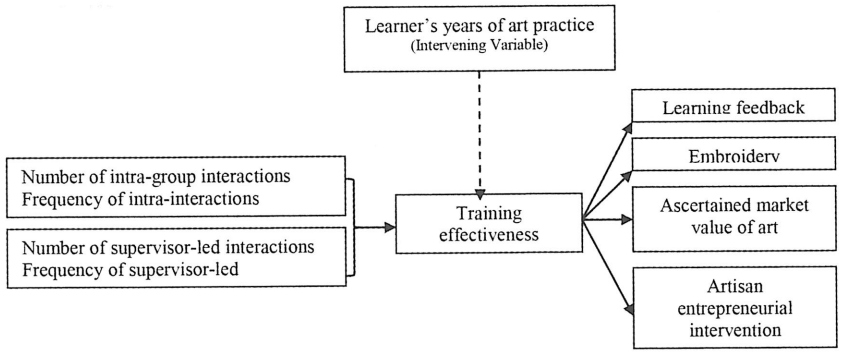
Concepts and Methodology

The widely accepted definition of 'effectiveness' can be viewed as the performance and ability of group members to work together in successive tasks, and derive satisfaction from the execution of the job/task (Gladstein, 1984). Another concept that needs mentions is the term 'traditional artisans', which as defined by the training institute as those artisans who are engaged in the process of art practice through lineage, i.e. practitioners by ancestral origin/ descent and not the first-generation artisans. The study was initiated at an artisan training institute in Kutch, while the learners were pursuing their art and entrepreneurship education. The learners constituted of traditional artisans, in the age group of 16 to 74 years. The researchers conducted this study in the course of six months. They randomly selected a lecture that had seven participants (i.e. traditional artisans), with a teacher and two facilitators. The learning process was a blend of both self and supervisor led interactions which have been mapped and analyzed. The researchers observed and mapped the course of interactions during the live sessions in the class and subsequently map the learning effectiveness of the participants. Sociogram was used as research tool to map the relationships and analyse the interactions during the training. The methodology includes the application of the frequency and number of interactions in the art school, with the learning effectiveness that was evaluated through the perfection achieved in designs (embroidery), market value of those designs and entrepreneurial instincts.

Theoretical Framework

The learning effectiveness of the artisans was mapped using three channels namely; embroidery perfection, market value of art design (in this case embroidery) and finally the artisan's entrepreneurial intentions and instincts. Effectiveness of the training was measured by their engagement and associations with entrepreneurial enterprise/organisations or by acting as channel partners to larger art houses etc.

Figure 1: Theoretical Framework of the current research



Source: Author

From the above pictorial representation, it can be found that the independent variables, namely the group interactions (supervisor-led or self-led), have been mapped to ascertain the training effectiveness. It is indicative that years of art practice may extraneously affect the learning effectiveness. Hence, it has been taxonomically differentiated as intervening variable, which has been mapped for clarity. The interactions have been mapped using sociogram and the plotting has aided in determining the frequency and length of the conversations. Facilitators/teachers are also plotted as a subject, for the sake of monitoring and triggering during the course of study. The first stage provided a blueprint of the number of interactions, frequency of interactions, and number of subjects involved in the discussion (including the facilitator). The second stage involved ethnographic interviews with each of the seven students to understand the 'Learning Feedback'. This was followed by an interview with the facilitator/teacher to ascertain the Embroidery/Artifact perfection on various parameters of design such as conspicuity, durability, customer-orientation, art-orientation, market-value (to some extent), etc. During the third phase, the researchers could obtain the outcome variable of 'market value' after a lapse of 6 months when the artifact was sold to the market (either directly or through an art-consolidation channel or middlemen). The market cost of the same was derived. Finally in the fourth phase, researchers captured the outcome variable of 'entrepreneurial traits' by observing, recognizing (through qualitative methods), tracing artisans' behavior and examined whether he/she had participated in any action that resulted in an entrepreneurial stint.

The limitation of the current study is the issue of gender and age of the artisan that was not considered. In the current social set-up, gender is likely to play a significant role in determining the entrepreneurial intervention of

an artisan. Another major limitation is the fact that researchers have not noted the sustenance of artisan enterprise, as an intervening/determining variable in the study. The study has also generalized a day-long session as a representative of the 3-week Artisan Entrepreneurship training extended by the training institute.

Data Collection and Analysis

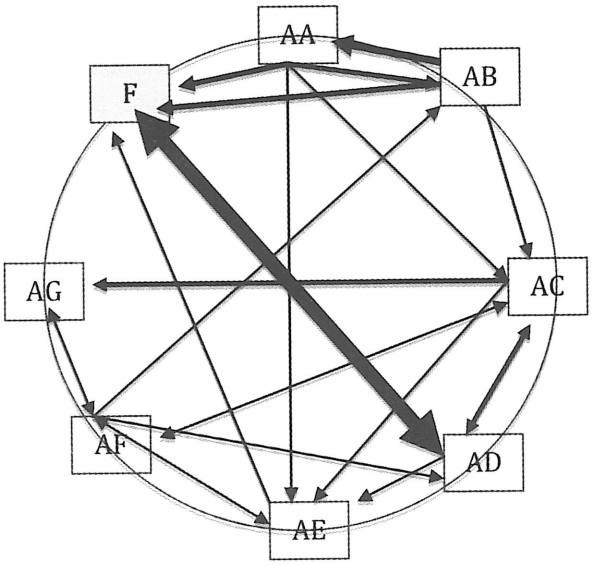
The researchers observed the subjects in a 60-minute session for four consecutive training sessions (only observations of one session is taken into consideration for the current research, as that was complete; perceived to be without any specific plotting errors). During the observation, the authors took notes, plotted sociograms and sometimes noted the significant interactions. The observations were converted into field notes for further detailed study and references. Immediately after the interactive sessions, learning effectiveness feedback and interviews were conducted to understand the effectiveness of learning. Ethnographic interviews with the subjects entailed questions about their relations with each other, interactions, and acquaintance besides trying to fathom the effectiveness of the learning event. Given the large number of interactions that happened among the subjects (observed in the first session); an additional categorical coding system was developed to ensure homogeneity of the coding practices. Later the authors i.e. coders matched their coding criterion. The third session was considered as the reference input for the current research because it measured the highest inter-rater reliability of 59%. The highest frequency of interactions that was mapped among the subjects referred to the following triggers namely – discussing the significance (3%), rationale of the learning (14%), color hues & marketability (48%), marketability of the product (21%), entrepreneurship instincts (11%) and paraphernalia (3%). To the out-degree and in-degree, we applied the social network analysis technique (Nelson, 1988; Wasserman & Faust, 1994). Here, out-degree represents the number of times the subject has initiated a discussion or interaction. In-degree represented the number of times the subject was drawn into the interaction. Plotting the degrees aided us to understand the major actors in the group and those who were peripheral (Borgatti, Everett, & Freeman, 2002; Wasserman & Faust, 1994). To map the volumes of out-degree and in-degree, three sociograms for each trigger was constructed by the researchers (Krackhardt, Blythe, & McGrath, 1995).

Sociogram – Research Tool

As stated above, the sociograms were plotted for each of the triggers namely; discussion of technical content, market orientation and entrepreneurial

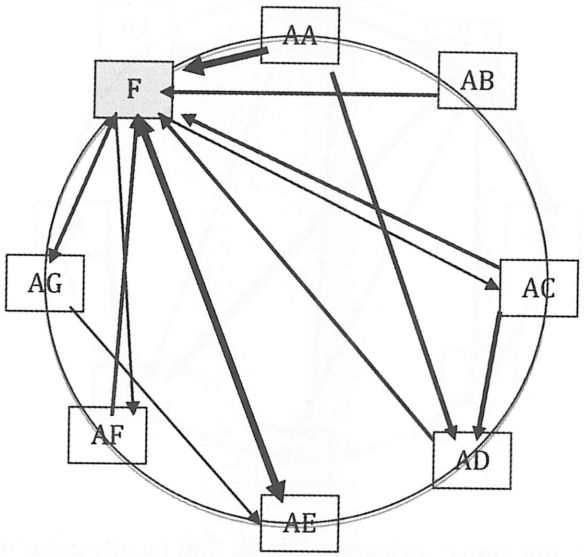
intervention. Within the group volunteers, the perception of learning has been diverse and the acceptance of learning effectiveness was also seen to be varying from each of the student subjects.

Figure 2: Sociogram for Art Technical Content (plotted for current study)



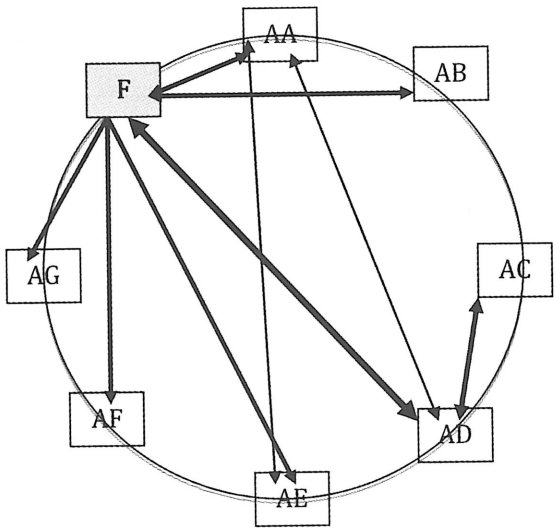
The depicted sociograms throw more light on the variations in learning. The ability to design beautiful and non-traditional embroidery was also seen as factor of individual creativity, innovation and expertise on the subject. Yet, it was found that there was some degree of correlation between the number and frequency of discussions with the learning effectiveness and outcome. In the following illustrated sociograms, the artisans are coded with a representative alphabet in serial order with prefix syllable A, denoting Artisan. The representation, coded with alphabet F, denotes the Faculty/ Teacher facilitating the learning process. Figure 2 represents the collage of self-led and faculty-led art interactions. The represented sociogram in Fig. 3 indicates that there was significant degree of communication among the artisans with respect to the technical content of the art work. Artisan AD represented huge one-to-one discussion with the faculty (hence has been demonstrated with a thick representation). More or less, it was found that there was healthy transaction between each of the artisans, both with each other and with the mentor. Some of the artisans were either drawn into the discussion or were negligent of the classroom group discussion.

Figure 3: Sociogram for Market-Oorientation (plotted for current study)



The above sociogram (Fig 3), shows a contrast with Fig. 2; it can be noticed that in the discussion, wherein the artisans were oblivious, the teacher takes the center stage. A little amount of out-degree is represented by Artisan AA, AC, AG and AE. However, except in the case of Artisan AE, the other outdegree has been meager as compared to the earlier in-degrees and out-degrees represented in the sociogram for Technical Content (Fig. 1).

Figure 4: Sociogram for Entrepreneurial Intervention (plotted for current study)



It is found from the above sociogram (Fig 4), that faculty assumes the center stage when it comes to the entrepreneurial discussion. The facilitator is in charge of the discussion, and there are also few artisans such as AA, AC, AD, and AE who operate independently. In the case of the artisans AA, AC, AD and AE, the discussion seems to be mild and not stirring the process of mutual learning.

Table 1: Leaning Effectiveness of the Artisans

	Interactions (IA) Outdegree (O) Indegree (I)		Market Orientation (MO)	Entrepreneurship (EP)	Learning Effectiveness (LE)
	IA-O	IA-I			
IA					
MO	-				
EP	-		0.35		
LE	0.75*	-0.05	0.65*	0.28^	

**Significant correlation indicated*
^indicates statistical indices based on the ethnographic interviews that followed the observation study.

Observations

After the three-stage process of discussions, the researchers immediately tried to understand the learning effectiveness of the discussion. The learners were asked to rate the learning effectiveness on a scale of 1 to 10. The learning effectiveness was calculated on the parameters of learning retention, development of market-oriented designing skills, and spontaneous–instant reaction to the learning process. The Facilitator (F) validated the responses of the volunteers.

Learning Effectiveness vs. Interactions: The learning effectiveness of the artisans was found to have correlation with the amount of in-degree and out-degree. The study was concluded by checking the correlation between the stated learning effectiveness and the frequency and magnitude of in-degree and out-degree of the communication. The same was found to be –0.05 and 0.75, respectively. Hence, it could be concluded that out-degree shares a positive correlation with learning effectiveness of artisans.

Learning Effectiveness vs. Market Orientation: Market Value exerted a significant positive correlation with Learning Effectiveness; thus indicating that learning effectiveness can enhance the market orientation of the artisans and thereby enhancing their chances of entrepreneurial endeavor. This conclusion was related to the futuristic entrepreneurial engagement that followed the study and was not supported by the interviews.

Entrepreneurship vs. Learning Effectiveness: Ethnographic interviews that followed did not gauge any significant relationship between learning effectiveness and entrepreneurial indulgence. It was found that hardly 28% of the artisan learners participated in the entrepreneurial stint, with not much indication on the success of their respective enterprises.

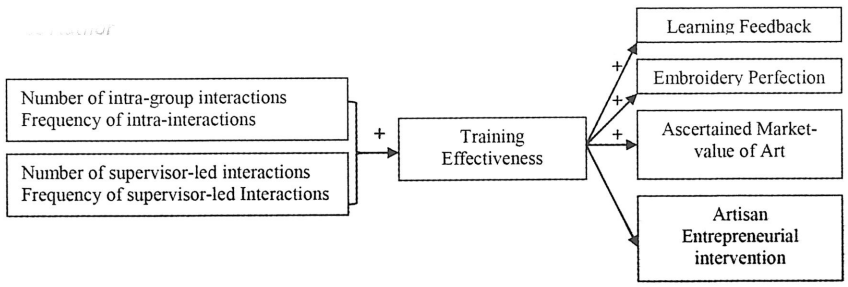
Indicative Inferences

The current field study indicates that learners adjust themselves into accommodative self-managed teams with high degree of independence under the supervision of a facilitator. The study also indicates that in cases of self-help teams, protagonists rope-in the dormant participants and try to make the best of their talents for the success of the organisation. In cases of self-managed groups (with little intervention of facilitator), participants spontaneously redesign their responsibility by taking onus of the group performance, build relationships, reinstate tasks and adjust themselves as actors for the development of the whole team. It has also been identified in the study that with increased involvement of the subjects, either by out-

degree or in-degree makes learning effective. Simple enhanced participation in classroom discussion enhances the learning effectiveness and market orientation. It could also be argued that learning may enhance the market-preparedness of the learners. However, the correlation between learning effectiveness and entrepreneurial indulgence could not be ascertained. The study could identify that the theme and the onus of the mutual-learning process emphasize creativity, communication, innovation and competence among the students (McRobbie, 2002). It could also identify that the group members favor and breed a continuous process of group identity construction (Doolin, 2002; Wrzesniewski & Sutton, 2001).

Hence, it is argued that the motivation to learn and find a solution when challenged instigates and inspires the teams to make adjustment with the diversity within the group and enable them to confront tasks despite the intervening factors such as class context, learning subject context and characteristics of the institutional climate. Therefore, the model could be represented as follows.

Figure 5: Mode for Learning and Training Effectiveness



Source Author

Findings

The study observed the following relational profiles.

1. Actors during the process of learning and discussions constantly induce cooperation (by out-degree), i.e. make information requests and initiate conversations that are generally appreciated by the team. They are also the ones who have optimum learning outcomes as compared to the dormant or those with high in-degree conversations.
2. Participants who were often the targets for deliberations, technical cooperation, etc. were the major reference points and they were deeply involved in the mutual learning process. These actors were

more likely to enhance themselves to be more market-oriented as far as the art is concerned.

3. Protagonists showing high centrality imbibed huge degree of information and were the key players for sharing relevant knowledge. These were the ones, whose learning effectiveness was found to be impressive and consequently market oriented.
4. The study could not indicate the affect of the learning effectiveness on entrepreneurial indulgence. Researchers recommend deeper research and intervention to gain clarity on these aspects that could contribute to the knowledge creation process.

Conclusions

The current exploratory research projects a detailed account of how training orientation of the artisans may make them more prepared for the market besides enhancing their art-relevant faculties. The study has made a categorical distinction as to how the artisans can enhance their creative skills; besides developing awareness and orienting themselves to the market-outlook essential for traditional artisans to promote their products. The current research to some extent has attributed that learning effectiveness is a function of teamed deliberations and discussions and hence indicates that usage of participative tools can enhance learning effectiveness resulting in market-ready artisans and art.

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