From Innovation to Industry Creation: Chartering the Role, Impact and Performance of Government Innovation Programs at Higher Educational Institutions in India

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Introduction

The objective of the paper is to understand the functioning, role, methodology of implementation of current government innovation programs within the ambit of Triple Helix aiming to find out whether the current government programs run within HEIs have emerged successful in creating innovative enterprises within the Indian context.

Powell & DiMaggio refers creativity (the generation of new ideas) as…..essentially an individual act, but one that relies principally on interaction with others operating from within the same "organizational field" (Powell and DiMaggio, 1991). Creativity could be referred as an expression of novel ideation rooted to the core of various interactions in the same field of influence. Creativity though synonymous with the current definition of innovation varies in many ways with it. Sayer et. el. defines Innovation (the successful exploitation of new ideas) as "a fundamentally social process built on collective knowledge and cooperative effort" (Sayer and Walker, 1992, p. 115) while Rogers (1983) defines it as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption". According to Edquist 1977, Eliashberg 1986, innovation has been referred as the second of three phases of technological change occurring in the following sequence: invention, innovation and diffusion (Edquist, 1977; Eliashberg and Chatterjee, 1986; Hall, 2005). A growing importance of innovation to entrepreneurship is reflected in the numerous studies addressing the role and nature of innovation (Drucker, 1985). Sabai et el. (2010) refers his analysis of prior research carried out by researchers, who have distinguished several types of innovation, such as: Product and process

(Knight, 1967); technical and administrative (Daft, 1978); and radical and incremental (Ettlie et el., 1984).

Bloch (2007) on the other hand defines product innovation as "the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses and includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics". Product innovation drive the current market needs and form the bedrock for initiating a firm foundation for a startup company, its growth, maintenance and sustenance.

The paper tries to highlight the role of Higher education Institutions (HEIs) in creation of an innovative and entrepreneurial ecosystem in the Indian context which has been adequately highlighted though the TePP program A lack of innovative products developed in India led the Government to think of a method to provide impetus to innovation ecosystem in India. This led to the setting up of TePP (Technopreneur Promotion Program) an initiative of Department of Scientific & Industrial Research (DSIR), Ministry of Science and Technology, Government of India run innovation funding program. It intended to build entrepreneurial and innovative product based businesses based on the platform of creativity, knowledge and innovation. Researchers acknowledge that Innovation lays the groundwork for setting up "creative industries" in the long run. Creative Industries as defined by DCMS **(** Department for Culture, Media and Sport, UK) is referred to "those industries which have their origin in individual creativity, skill and talent and which have a potential for wealth and job creation through the generation and exploitation of intellectual property" (DCMS, 1998). Creative Industry in general sense resembled to innovative industries in terms of common shared attributes. The aim was also to create a climate for setting up an entrepreneurial climate by creation of entrepreneurial universities through which creative industries could be initiated.

TePP mechanism relies much of its part on the support provided by the academic institutions which host the governments efforts by providing space and manpower support with expert guidance from industry partners but is riddled with complex issues which stands on its way to assume a bigger role. This is mainly due to undue intervention of the government agencies which need to be channelized and an alternative methodology which emphasizes more on strengthening the Academic-industry or E-E interface should be put to implementation.

Literature survey

A varied interest with regards to entrepreneurship related activities taking place under the higher education institutions (HEI's) has been a subject of focus among a wide realm of the researchers. The study is in consistent with the fact that the role of government, HEI and industry stakeholders and their ensuing interactions assumes greater importance for the innovation eco-system creation. Higher education institutions have been asked by the government to take a larger role in local economic development through innovation grant programme (Cooke et.el 2000, Boucher et el.2003)

The role of Higher Education institutions have been commended by researchers for their expertise in knowledge generation, maintenance and transfer which has been proven with the

creation of various industrial parks , knowledge parks, R&D parks very much in proximity to the higher education Institutions . The Silicon Valley at US, Silicon Alley at Bangalore, Shanghai, Hsinchu Science and Technology Industrial Park at Taiwan etc are examples of the impetus provided by academia in industry creation. Researchers like Acs (2004) believe that the public knowledge stock and knowledge spillovers are important economic drivers **for** regional development and growth (Acs et al 2004). Government support and R & D programs play an important role in economic development. Sikka (1997b) believes that R&D programmes enable industry to acquire a technology base in the country towards producing quality goods of international standard, to adapt and adopt foreign know-how while absorbing the imported technology, to strengthen its capacities and capabilities and to equip the scientific and technical (S&T) manpower to face the challenges in the future. Literature research on the subject reveals that technological collaboration between organizations or stakeholders for product innovation is a topic of considerable interest and study in recent years (Albertini and Butler, 1997; Millar et al., 1997; Chen, 1997).

Literature survey suggests that the role of Universities in supporting these government support program is crucial.(Powers & McDougall, (2005) believe that in the context of university technology transfer and commercialization, there has also been little research on possible contingency effects of particular institutional structures or processes. Lack of research was found to be higher in the case of government supported innovation funding programs and research in the Indian context related to innovation & commercialization. A major reason for the lack of research data regarding funding & commercialization support mechanisms in India is because most of them have been initiated within this past decade. Lack of research content, other then the official website of the concerned agencies was a major reason for non availability of government innovation program related information. Another important reason could be the lack of willingness of individual innovators to part with information which may be subject to intellectual property laws and trade secrets, apprehension of copying and other miss utilization by information seekers.

It needs to be clarified that previous research on government support programs within the ambit of Triple Helix has mainly concentrated on policy matters and its improvement. Though the efforts of the government in all such programs were considered substantial, yet not much focused research was found to be available on innovation support programs and the role of stakeholder interactions. Barely any literature was found to exist which revolved around an Indian government run innovation program being carried out in an action research mode. Rather, the existing emphasis was more in incubation support programs compared to direct Government aided innovation support program. Researchers like Jänicke (2008: 558) believe that “the most important implication is that ‘innovations’ specifically ‘eco-innovations’ invariably require political support” though some researchers like Hörte and Halila, (2007) believe that no such support is needed.

The paper is novel in respect to the fact that, it sheds ample light on the methodology being followed by Indian HEIs to promote innovation in Indian context. The roles of associated Triple Helix Stakeholders of innovation, as given by to Etzkowitz and Leydesdorff, (1997) have also been strategically highlighted to bring clarity on the methodology. An alternate model (Education-Enterprise Model) has been evolved to cater to the view of the researchers of

increasingly towards a coherent stakeholder interaction towards creation of a regional innovative ecosystem.

The paper also elucidates the role of Government funding program and its work methodology of implementation, its collaborators and stakeholder and its realm of influence. The Technopreneur Promotion program (TePP) has been discussed in the background of the Triple Helix Model and the newly adapted Education –Enterprise model. According to Etzkowitz and Leydesdorff,(1997) ,University–Industry–Government relationship can be considered as a Triple Helix of evolving networks of communication. There is a large amount of information regarding the Triple Helix model as given by Etzkowitz and Leydesdorff(1997) on the topic of stakeholder interaction. The Education–Enterprise Model as given by Biswas et. el (2010) has been discussed to thrown light on the interactions taking place between the Academia ,Industry and Government with regards to innovation ecosystem creation building and is comparatively nascent.

Methodology

The data presented in the study is collected from various sources involving print media, publications, internet sources, government documents made public, direct interactions with government officials involved with the programs across DSIR and outreach centers located at HEIs. The methodology adopted by the authors involves an action research approach to gather various types of valuable information and specific issues which had till now not been addressed by individuals and organizations dealing with innovation and commercialization. The authors who were part of the program from the very establishment at the host institution (IIT-Kharagpur), have been instrumental in managing the outreach center involved with TePP innovation program and the paper is an important output of their efforts.

Major constituents of the study revolved around various individual innovation projects under partial or full implementation with handholding and mentoring support of Outreach centers at there local regions. The study tries to find out the methodology adopted by HEIs in promoting entrepreneurship and innovation in Indian context. The entire innovation ecosystem of the HEI has been mapped with each funding program specifically mentioned to aid the knowledge on the domain. Followed by a macro level approach the study tries to understand the implementation of the government funding program at the micro level. The performance of the outreach centers in scouting the innovations, mentoring the scouted projects till the actual submission of the projects is closely followed. IIT-Kharagpur has been taken as the base outreach center with progress being routinely monitored from its scouting to its completion.

The study thus looks at the successful commercialization of the projects and the efforts made by the centers to provide financial support to the innovators using a case study approach. Typically, several visits at the outreach center and unstructured interview sessions with the innovators took place to know the extent of support provided by TePP at the academic institution / R & D lab. Innovation forums, meets and seminars provided a platform to the authors for wider research interactions between the stakeholders namely government, academia and industry and scope for studying the constraints, intricacies of the program and come to a logical conclusion.
The study thus tried to address the following research questions:

- What is the appropriate model, methodology adopted to understand the working of Triple Helix interactions in the Indian Innovation ecosystem at HEIs?
- What has been the role of government and the stakeholders in Indian innovation ecosystem?
- What are the pitfalls of the innovation program and how could they be improved?

The study is structured in 7 parts. They include the (1) introduction & objective of the paper, (2) literature survey highlighting the research gap (3)methodology (4) the theoretical model or framework adopted (5) Government innovation programs and its successes-failures (6) role impact & attributes of the innovation program (7) conclusions and management implications for improvement of the innovative ecosystem in Indian context

Theoretical underpinning of model for adoption: The Education-Enterprise Model

The Education Enterprise (EE) model (Biswas et. al., 2010; Saurabh et. al., 2009) is a special adaptation for BASIC (Brazil, South Africa, India and China) and emerging economies of the conventional Triple Helix model for providing the collaborative framework amongst academia, government and the private enterprise focused towards creating social entrepreneurship driven enterprises.

The Education-Enterprise Model

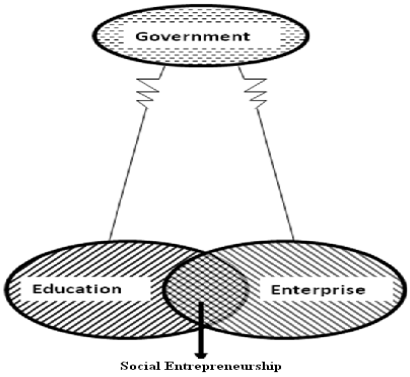

Figure 1: The Education-Enterprise Model

Etzkowitz (2008) points out that the creation of regional innovation ecosystem is a prerequisite to the creation of knowledge and innovation space where ideas generated in a 'Triple Helix' of multiple reciprocal relationships among institutional sectors (academia-government-industries) work together to achieve societal goals. The Triple Helix of University-Industry-Government relations consider the result of an interaction between functional and institutional dynamics in society as mutually beneficial. E–E model is a diversion from the Triple Helix Model and hinges more on the mutual interaction of the E-E model with Government as a partner. This is required not only for economic development in the form of developmental entrepreneurship, but also inclusively integrating innovation with the society. As per E-E model, the needs of the society

has been identified under four basic pillars of the society under the education ,environment, energy and health with all of them having equal role to play in the societal development. Most of the basic needs could be satisfied if entrepreneurs could cater to the needs under the EEEH domain.

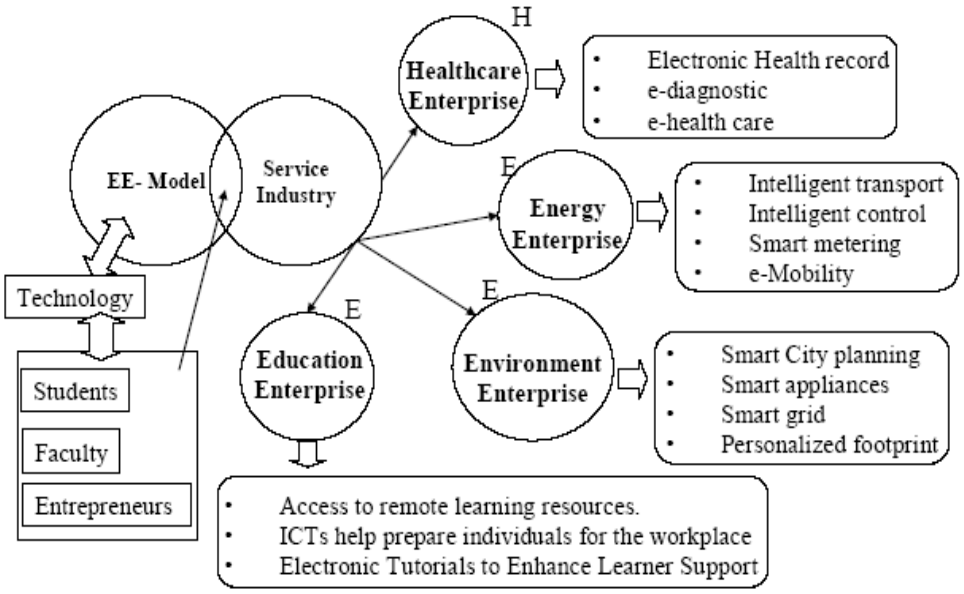

Figure 2: The Co-entrepreneurship model emerging from EE model by HEIs in EEEH domain

The EE model is evolved out of the necessities of rapid economic development necessary in the emerging nations without oblivious to sustainability, growth-inclusiveness, and societal homogeneities and free market integrations towards a globalised future with democratic fabric of strong local enterprise based business processes. This extracts the inherent opportunities of Triple Helix model with the entities of Education, Enterprise and Government, while avoiding the obvious pitfalls of its three variations described earlier. In the model the education and enterprise overlap to spin-off social enterprises to improve the social conditions especially in the emerging/BASIC nations. The government is very much part of the collaboration, but in a non-interfering manner which means that it allows for all necessary infrastructures, monetary and moral support without interfering in its working. Thus the model caters to the policy of decentralized power in the hands of the academia (which hosts the program and provides manpower and administrative support) and the industry (which provides the expertise to engage the project). The government role is restricted to monitoring the funding and its utilization.

The academia which provides the base for sustenance through knowledge creation under the EEEH framework creates entrepreneurs by using the faculties to train students to become entrepreneurs and innovators. The industry which benefits by getting consultancy and IP generation through innovations coming out of the academia allows the statist BASIC country governments to bring in the resources allowing the university campus to be in total free market mode, interacting with private enterprise with a judicious mix of enterprising students and motivated local entrepreneurs. While this will allow invigoration of existing business model

involving local people for intense local problems, but also lead to creation of whole new industry in cluster around the campus. Enterprises in the domain of energy, environment, education and health help find sustainable solutions to local problems based within the EEEH. Such enterprises will bring in rapid business formation leading to adequate social profit motives in addition to meeting the monetary objectives. Presently the TePP-DSIR innovation program is heavily influenced by the government due to its monetary stake involved, but which is a cause of concern. This undue intervention and the over the board "super interventionist role" has led the TePP program to lose its sheen which is a cause of concern. A healthy interaction between the stakeholders namely the academia and the enterprise need to be rekindled through the Education–Enterprise framework.

E-E Model implementation at IIT-KGP

According to Debackere (2000), academic research has become "endogenised and integrated into the economic cycle of innovation and growth". Inside the current knowledge based economy, the university acts as both "a human capital provider and a seed-bed for new firms" and innovation (Etzkowitz et al., 2000). As a result, governments are encouraging the development of the "entrepreneurial university" through policies designed to promote and sustain university-industry interaction (Fontana et al., 2006). IIT Kharagpur has built its own incubation & innovation ecosystem with the funding support of Government and other stakeholders. Presently, there are 40 companies incubated at Science and Technology Entrepreneurs Park, IIT-KGP which have been receiving dry incubation and wet incubation support. Dry incubation support involves the support provided in terms of monetary support; wet involves monetary support as well as space and associated infrastructure support. Many of them are the successful example of innovation to enterprise creation. IIT-Kharagpur has been working with the IIT-Foundation and other industry partners to set up world class research and educational infrastructure at IIT-Kharagpur which could benefit IIT-KGP and the industry symbiotically. The AVLSI (Advanced Very Large Scale Integration) lab set up by a confederation of 14 top companies under the umbrella of IIT-Foundation is a shining case of Academic –Enterprise Model being implemented at IIT-Kharagpur.

Role of IIT Kharagpur in Building the Infrastructure for Systemic Innovation

IIT Kharagpur has always been a hot bed of innovative technology development since its inception in the year 1951. It is prudent to supplement this vast knowledge reservoir with enabling entrepreneurial infrastructure. Science and Technology Entrepreneurs Park (STEP) was created in 1986 to fulfill such requirements however with time it needed to be scaled up to meet the needs of the modern day entrepreneurs with aspiration from an increased technology portfolios of an expanding IIT with expectations from grass-roots living near the IIT-Campus. Technology Incubation and Entrepreneurship Training Society (TIETS) has been operating as a virtual incubation program to address the entrepreneurial urges of the alumni, students, faculties of IIT for a period of over a year. This has successfully created an enriched entrepreneurial culture on the campus.

The demand for funding assistance has risen proportionately from entrepreneurs living outside the periphery and equal efforts are being made to delimit the assistance being provided for incubation to IIT faculties and students and bring the non-IIT component into the set-up so that it is more inter-linked with the aspirations of the society. The benefit of living in proximity to a Higher Educational institution of learning like IIT's has a positive impact in enterprise or venture growth creation in the realm of influence of HEI's. The grass-root entrepreneurs around HEI's can be mentored in presence of faculties and alumni entrepreneurs.

IIT Kharagpur also provides unique resource advantages in providing dry and wet incubation, legal support, mentoring, managerial support, product development strategy, high end lab infrastructure. IIT Kharagpur providing funding support to it's incubates by TBI seed fund, TDB, TIDE, MSMS and Government venture fund.

Table 1: Role of various stakeholders in functioning of various innovation, commercialization, incubation and refinement support at IIT-Kharagpur

SI.No	Name of Program	Industry role	Government role	Academia role
1	TePP (Technopreneur Promotion Program	✓	✓	✓
2	MSME innovation support program	×	✓	✓
3	TREMAP commercialization	✓	✓	✓
4	TIETS/TIDE funding for startups	×	✓	✓
5	TBI funding for infrastructure	×	✓	✓
6	TDB for Enterprise scale up	×	✓	✓
7	STEP incubation support	×	✓	✓

A newly established (July 2010) Rajendra Mishra School of Engineering Entrepreneurship (RMSOEE) is a revolutionary step forward by integrating the academic and practice aspects of entrepreneurship education. This is for the first time that a Higher Education Institution of technology has established such a kind of school in India where the output will be an entrepreneur and a potential world class enterprise. The RMSOEE is co-located with the STEP, and eventually as new infrastructural developments are completed, STEP incubatees will be relocated into the upcoming new incubation infrastructures at Gopali (an extension of IIT Kharagpur). Moreover, the vibrant ecosystem of IIT Kharagpur is an amalgamation of several incubation and innovation funding programs from DST, DIT, MSME, DSIR, and W. Bengal Government into the broad umbrella of Technology Incubation and Entrepreneurship Training Society (TIETS), which helps these budding entrepreneurs in their initial stage of start-up. This

ecosystem has already spun off over a dozen successful start-ups, and a whole lot more in the making.

(1) Ideation
(2) Incubation &
(3) Integration

Ideation is carried out through Entrepreneurship Cell, an UG student driven body which caters to promoting entrepreneurship and innovation within the campus as well as organizes several programs to aid the dissemination of entrepreneurship related knowledge. The courseware is also important method to promote ideation on entrepreneurship. Ideation is followed by incubation which generally includes the willing candidate to seek space; funding and mentoring support through several HEI based support programs.. The successful formation of the company, its maintenance and its ultimate exit to the market for facing open completion is the integration of the company into the market. The model thus showcases the academic and practice part of entrepreneurship at IIT-KGP.

TePP – A Case of Use Inspired Actionable Research

The study closely examined the performance and functioning of Technopreneur Promotion Program (TePP). TePP is an open innovation lab with a network of 30 Outreach Centers based across HEIs present in major innovation states/center/hubs involved with providing grant to skilled/semi-skilled/highly skilled people involving various domains. The study is a use inspired research carried out with the intent to use the research implications to benefit the improvement of the program and assist the growth, development and preservation of the civil society by collaboration of the E-E model adapted from the (U-I-G) relationship as referred in the Triple Helix model by Leyedesdorff, L (1999).

TePP research is inspired for :		Consideration of practical use of research ?	
		No	Yes
Need for fundamental Understanding ?	Yes	Pure Basic Research (Basic Research) {Neil Bohr} PBR	Use Inspired Research (Basic Research) {Pascal} UBR
	No		Pure Applied Research {Ediison} PAR

Adapted from Quadrant Model of Scientific Research (Donald Stokes 1997:, 73: fig 3-5)[2]

Figure 3: TePP research and its Use Inspired Research as denoted by Stokes Model

The use inspired research (UBR) as given by Donald Stokes as against the pure basic research (PBR) mode of research has recently been in vogue as most of the earlier researches were inspired by the PBR & pure applied research (PAR) and are hence more inclined towards creating sustainable value as well as address the socio-economic issues through the research.

Organizational Structure, Formation & Mode of Implementation of TePP

The Technopreneur Promotion Program (TePP) was conceptualized by Department of scientific and Industrial Research to create an innovation ecosystem in the country by providing the much needed support to individual innovators who are generally rich in ideas but lack of financial capacity to implement them. As mentioned earlier, DSIR wanted to create programs based on the bedrock of use inspired research with actionable plan on the ground.

Prof. Samir Brahmachari, Secretary DSIR, & DG, CSIR (Council for Scientific and Industrial Research defines TePP as a dynamic program to promote inventiveness and creative spirit amongst common people, by giving grants in aid support for converting their ideas into techno-economically viable products/processes and endeavors to create an innovation eco-system for better prosperity and creation of employment opportunities among masses." The program took off in the year 1998 and since then has been able to support a number of innovations across a wide domain within India. According to the official website (www. dsir.gov.in) as of December 2, 2010, there were 450 innovations in various stages of funding. A number of these innovations have been commercialized with active support provided by TePP. The figure (4) below shows the flow of government and IIT Kharagpur support to the innovators and entrepreneurs from the innovation to its commercialization and small enterprise creation.

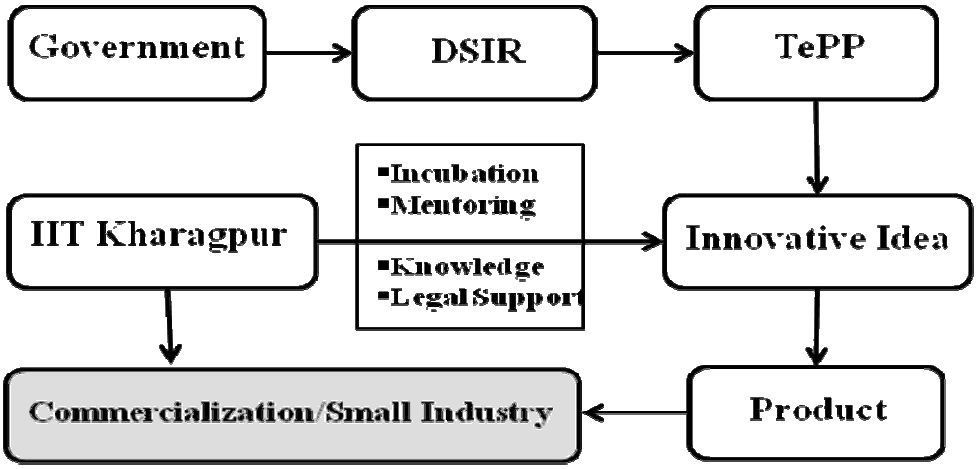

Figure 4: Role of IIT Kharagpur from Innovation to Industry Creation

The program was initially a joint initiative of two government agencies under the Ministry of Science and Technology (MoST) ,DSIR & TIFAC (Technology Information, Forecasting &

Assessment Council) but lately TIFAC ventured into a separate program for commercialization of innovations under TREMAP (Technology Refinement and Marketing Program). Like TePP, TREMAP too relies on similar strategy to promote innovation related activities by enlisting technology Business accelerators or incubators, Science and Technology (S&T) parks located at higher educational institutions (HEIs).

Researchers believe that the current scenario undertakes innovators to initiate entrepreneurship and innovation as a team work which has been referred by Schoeder et.el 1986 as ``Innovations are not initiated on the spur of the moment, nor by a single dramatic incident, nor by a single entrepreneur" (Schroeder et al., 1986).On contrary to the statement,, the program supports individual innovators instead of a team of innovators who wish to undertake the project under the program to put their idea into a product .. The innovators have the flexibility to hire a team with the monetary support from the support program. In a manner, the TePP promotes innovators to also become successful managers as they have the freedom to decide the timeline, methodology, parameters and manner in which the innovation could be prototyped.

In keeping up with the requirements of the project implementing agencies TePP has framed its own mechanisms to undertake the activities starting from identifying the right place and organization to set up outreach centers, establishment of the necessary setup, infrastructure at the indentified place, authorizing dedicated resources, manpower and monetary support system, methodology for supporting innovations, types of support to be provided, mentoring of monitoring activities, decision setup etc.

TePP –DSIR: The overall ecosystem across varied TUC centers

Since the beginning of the program in 2000, approximately 10,000 raw ideas have been screened by the outreach centers (TUCs) acting as the liaison office of DSIR. As the program involved active mentoring of raw ideas to actual product conceptualization till project submission of the established concept, the presence of the centers at HEIs has proved very helpful for the individual innovators, TUCs and the DSIR. The TUC gets active support from academicians and domain experts who provide the handholding support to the innovators to harden raw ideas into workable prototypes.

The process of screening is a regular exercise to select the best ideas who could be asked to submit a final proposal. In general cases, 1 out of 4 rough ideas are selected by the TUC for actual proposal submission. Once the proposals are selected for submission to the TePP screening committee after its expert evaluation by academicians and industry domain experts, the proposals are forwarded to the Delhi headquarters. the TRC (TePP Screening committee) comprising of eminent scientists, academicians , administrators, financial experts etc review the projects approved by the governing committee in terms of monetary and financial viability before recommending the approval and final receipt of grant by the innovator. The entire process of scouting of project, screening & due diligence before actual receipt of grant in aid generally takes as much as 1 month to 6 month. The timeframe for project completion, initiation ,monitoring by TUC and Project monitoring & review committee (PRC) generally varies from 6 months to 2 years at most, but sometimes the project gets delayed by as much as 2 years forcing

many innovations to loose there motivation, project viability and commercial edge over existing competitors.

Presently TePP has 450 innovations under different stages of initiation to completion. Excluding the 450 innovations, at least 50 products have already been commercialized by the innovators with TePP support for commercialization duly provided by the Ministry.

Brief Analysis of IIT-Kharagpur TePP Outreach Centre and its Performance

TePP Outreach Center, IIT—Kharagpur along with its network partners provides grants, technical guidance and mentoring to independent innovators to emerge as entrepreneurs by incubating their idea and enterprise in two phases. The Outreach Center at IIT-Kharagpur started its orderly functioning from the Year 2007 and since then has been actively engaged to promote the cause of innovation in not only the state of West Bengal but in the entire Eastern part of the country after successfully being designated a regional TePP Outreach center in the Year 2009

Table 2: Analysis report of TUC-IIT-KGP

Sl. No.	**Particulars**	**1st Year(2007-08)**	**2nd Year(2008-09)**	**3rd Year(2009-10)**	**4th year (2010-11) (as on Feb 2011)**	**Total**
1.	No. of proposals Scouted	55	70	90	120	335
2.	No. of proposals forwarded to TSC, DSIR	10	40	26	32	108
3.	No. of proposals recommended by TSC	4	15	12	8	39

Given above is a detailed breakup of progress made by TUC in catering to innovation. The TUC has presently 32 projects under active implementation out of a total 39 funded projects sanctioned by DSIR to innovators.. Till date, 3 projects have already been completed and 2 products have also tasted commercial success, all within a period of 4 years. 5 projects are nearing completion after receiving the second installment of support for promotion to the seamless support program of TePP which provides 45 lakhs or $ 100000 for commercialization to innovators.

There are though, several problems associated with TePP functioning which needs to be highlighted. 15 projects 15 are still waiting for receiving the second installment of government support for completion of prototype development even after 2 years from initiation of the project which is a serious issue of amongst many centers. 7 projects have recently been initiated by innovators who are involved with prototyping. The entire effort took more then 7 months to reach from the stage of idea scouting to the release of first installment which has irked the innovators to a great extent. Further, 7 projects could not begin actual implementation as the

innovators refused to implement them citing compliance, regulatory and personal reasons. Inspite of the problems, TePP has been able to achieve success in helping innovations reach the commercial phase. A case study of IIT-KGP based TePP supported innovator and entrepreneurs has been highlighted to prove the success of the program and its objective.

P2Power Solutions: A case on innovation to enterprise (I2E) creation

Founded in the year 2005 by Mr. Shwetank Jain, an IIT Kharagpur undergraduate in Electrical Engineering, the company works to deliver innovative engineering solutions with specific focus on energy efficiency and power quality enhancement at distribution level. Their avant-garde technology, help industries strengthen their power assets. Installation of P2 Power products almost eliminates failures and trips due to inefficient power quality, and reduces overall operating cost. P2STAT-n is an active voltage source converter with DSP based digital controller to provide reactive power compensation for both lagging and leading currents. The most important aspect of P2STAT-n is the instantaneous response to the sudden load fluctuations. It is an active solution compared to the currently available passive solutions.

After joining IIT Kharagpur in July 2002 in Electrical Engineering, his interest towards entrepreneurship and innovation grew drastically having been inspired by the past successes of IIT bred entrepreneurs. He approached IIT-KGP administration in search for a new idea or activity that could help him become an entrepreneur who guided him to search for a product or service which he could develop and market to various business houses. The academia also helped him to connect to various power sector companies which provided him with valuable ideas. Upon intense research he realized the growing importance of power in all segments of the society. The limited development taking place in this sector during that time leads him to believe in the existence of a bright opportunity to develop and explore new ideas under innovation support programme at IIT Kharagpur (TePP). With limited knowledge in the field of power Electronics, he joined under an eminent professor of Electrical Engineering, IIT-KGP for his B-Tech project in the field of Power Electronics who later motivated him to work across the idea of iCon – The Power conditioner. Still Swetank had reasons to feel worried as he needed monetary support to startup.

While conducting a market research on the feasibility of such a product and the alternatives available, he presented his business plan in Concipio 2006, a business plan competition held at IIT Kharagpur, which won the first prize. His success helped him to present his idea to a panel of renowned professors for incubation under TIETS (Technology Incubation and Entrepreneurship Training Society), IIT Kharagpur. After a series of discussions and presentations, the idea got incubated under TIETS, IIT Kharagpur and the company 'P2 Power Solutions' was born on 12th September, 2006. The support provided by TIETS was crucial as it helped the company to fill a gap arising out of the need for support which could have forced startups to seek support from VCs and loose equity in return. This gap was filled by the IIT-KGP supported funding programs. The company immediately went forward with preparing for product development.

IIT-KGP provided him seed loan funding worth $ 35000 (approx) for the development of prototypes and testing the technology commercially. He won his first commercial order from Dainik Jagran, Kanpur in February 2007 for the commercial testing and prototype installation of his product. He completed his commercial testing successfully in October 2007 and made the necessary improvements in the design keeping in mind the commercial nature of the product along with the necessary customization. During this time he also applied under TePP which helped him to develop the novel technology further and help him make it into a market viable product.

He opened his first manufacturing office at STEP, IIT Kharagpur in January, 2008 and initiated the development of an advanced version of the product which incidentally also won a second commercial order from IIT Kharagpur in February, 2008. IIT-Kharagpur has a tradition of supporting institute bred innovators by buying the very first newly developed product and installing it at the institution. This was to motivate other customers to buy the product and remove any worries regarding the quality of product from willing buyers. The order was worth $100,000 which helped the start-up to grow incrementally and get further orders.

During the critical phase of product innovation, commercialization and diffusion the company received much needed support from TePP-DSIR center at IIT-KGP & MSME (Micro Small medium enterprises) center to develop a novel technology along with their existing product. Initially TePP provided $ 25000 (approx) followed by a grant support of $ 10,000 (approx) from MSME. This technology of neutral compensation had never been developed before but P2 power had already tested its feasibility in the lab. P2 power had already completed the first stage of funding under TePP but it needed more support under the commercialization category. The support would have helped P2 power to develop multiple prototypes and install it at an IT park to check its commercial feasibility. The company also intended to develop novel technologies in the field of Power Electronics which would help customers access to innovative green energy friendly products to cope up with the global warming. The company wary to accept VC funding support as it feared parting away with the company's equity.

In September 2010, TePP provided another trench of support amounting to the tune of $50,000 as first installment followed by a support of $50,000 to the company in another six months with a commitment made by the innovator to invest 50% of the total support on behalf of the innovator. The total cost of the second part of the project was worth $200,000. As of now the company has a market cap of $ 1 million with $2 million worth of contracts at hand from all over the country. In the next five years they look forward to grow exponentially into a $ 20 million firm with a varied product portfolio ranging from Power Quality enhancement to Power Management Tools. The country recently opened its headquarters at NOIDA (New outer industrial development authority) New Delhi with its own dedicated R&D, Administrative and marketing wing. P2 Power continues to operate from its STEP-IIT-KGP office at West Bengal.

Findings & Interpretations

(a) The case of Shwetank Jain highlights the role played by Academia, Government and Industry in supporting innovation and enterprise creation. It also helps us undertand the role of Government programs at HEIs in supporting entrepreneurship.

(b) A close interaction with the funding agencies, stakeholders and innovators reveal several gaps in the smooth running of TePP. Though several projects have advanced to the stage of commercialization and some have also been put to commercialization, yet the number of such successes is inadequate (only 2 as of date) at the IIT-KGP TUC end. Shwetank Jain's case is one of a kind but in order to have more innovators to replicate the work done by Shwetank Jain, Government agencies and Academia need to work in tandem. Presently, the "divorced" relationship existing between the academia, Industry and Government is going against the good efforts made by TePP in the past which needs to be amended through positive action.

(c) A serious communication gap between the agencies/ stakeholders exists which has led to major delays in completion of the projects starting from its approval, initiation and closure of the projects. This has also led many prospective innovators and entrepreneurs to desist from initiating innovation and entrepreneurship related activities.

(d) There is a wide degree of variation in which the various stakeholders (innovators, funding agencies and Academic institutions) define innovation as and which is leading to misrepresentation of the very premise of innovation where it exists. This has contributed to confusion arising among the innovators forcing them not to go for innovation and enterprise creation.

(e) A slowdown in the number of TePP supported projects has been observed which can be referred to heightened degree of due diligence meted out by the funding agencies. The slowdown could also be referred to the lackadaisical attitude of the proposal scouting, monitoring and handholding agencies, TePP outreach centers in this case and the Government funding agencies.

Conclusions & policy implications

The researchers believe that existence of TePP is important to an emerging nation like India as it leapfrogs from a developing economy to a globally integrated economy as it helps home grown companies to ward of competition through state-of the art innovative products and remaining ahead in the domestic and global market. Still a lot of efforts have to be put to promote innovation in the Indian sub-continent

It was observed during the research that there was lack of information available with the common people regarding the existence of government support program for innovation. Hence, additional efforts should be made to create awareness about the TePP program and its capability

to promote innovators and entrepreneurs. It was also observed that though there was scope for sending larger number of innovations yet there was a decreasing trend observed in number of projects being sent through the TUC center to the Ministry for funding. Efforts should hence be made to reduce the downslide of number of quality proposals being screened and submitted through the TUC end. Another observation that was made by researchers was that, host institutions often comparing about lack of discretionary power to fund small innovations for the students. The request was often ignored by the ministry citing several reasons which demoralized the program coordinators. In the background of the above mentioned problem, it is suggested that TePP program could to be decentralized to give more power to Academic institutions hosting the TePP center to fund micro-TePP innovations .and monitor the TePP project Fund (TPF) proposals.

Another major problem observed by the researchers while analyzing the programs was the delay observed in scouting, proposal submission, due diligence, funding, project monitoring and closure of the project. As mentioned earlier, that most of the projects could not bee completed even in double the time provided to them due to several issues relating to academic institution based TUC, expects from industries and the government agency supervising the project. Based on the above reasons, sincere efforts should be made to reduce the delays taking place to fund, manage and close innovations.

Several bigger states and territories of India like Bihar, Jharakhand and Orissa with a high demographic ratio do not possess a single TUC while there are several states in India which posses several of the TUCs ,a case of irregular distribution of innovation infrastructure. Sincere efforts should be made to undo the unequal treatment meted out to these states to encourage them to promote innovations.

Direction for further Research

The research implications aim at providing vital inputs /feedback which will assist the agencies to take necessary corrective actions to redress the problems and strengthen the working of TePP. The role of TePP is critical but to increase the impact of TePP, more efforts needs to be put to maximize the submission of quality projects from prospective innovators. This has to happen with academic Government agencies and the industry partners jointly pitching their efforts together. The research being done in an action oriented mode will provide learning based experiences to stakeholders while assisting the researchers to sharpen their research skills in the innovation premise. It is also expected that the performance of government supported programs will gain more prominence as India moves ahead from a developing to a technologically advanced developed economy in future

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