The Macrotheme Review

A multidisciplinary journal of global macro trends

VIEW FROM THE CROW'S NEST: The role of technopreneurs in crafting an ethical business climate - with a special emphasis on nanotechnology

Kasthoory Rajalingam

Department of Science and Technology Studies, Faculty of Science
University of Malaya, 50603 Kuala Lumpur,
Malaysia

Abstract

The term "technoprenuer" is relatively new and is positioning its prominence through the linkages of science, engineering and management. It is a job description, which has unfolded through the realization that the knowledge of entrepreneurship is insufficient with the absence of a sound grounding of technological related substance. The intersection between both knowledge platforms strikes a complementary link between R&D and commercialization. In foresight, the task of executing responsibilities through seeking mutually discretionary pathways that can ethically support the requisites of both knowledge platforms has been implicitly understood as a succeeding factor in strengthening R&D and commercialization. The cause for this implicitness is because ethics within the role of a technopreneur has not been enforced within the university curriculum. The reason being is that the university curriculum is more focused in generating marketable graduates instead of ethical graduates due to the demanding needs of industry's ambiguous standards. Currently, the relationship between industry and academia is a one-way street whereby industry is not reciprocating towards university supply, which has been engendered through rigorous industrial demands. It is unwarranted to find that with all the university reciprocation, hiring today, remains to be predominantly contact based rather than merit based. The current calling for soft skills has placed a solid 3 to 4 year undergraduate study in second place by industry. Even the years of academic training received by highly qualified individuals, that doubles that of the 3 to 4 years of undergraduate study have been found to be over-qualified from the stances of industry. The last decade has witnessed the true meaning of human capital being subjugated by industry's lack of ambiguous definitions. Hence, this green paper presents an authorial perspective as to how the role of technopreneurs will be able to construct an ethical business climate with a special emphasis on nanotechnology.

Keywords: Technoprenuership, ethics, nanotechnology

1.   Introduction

The newly submerged term known as "technopreneurs" is not a regular term, which can be searched through the dictionaries; as it is a coined word, derived from the combination of two terms pieced together, which are "technology" and "entrepreneur". This term palpably surfaced, as the need towards the acquirement of individuals equipped with two pertinent features, which are the application of technological knowledge and the knowledge expertise of creatively entrepreneuring a given technology, became greatly understood. Evidently, these features have become a desirable necessity in order to transfigure the multiple ways technology can outreach its utmost altitude from prototype to product success in the market place. Currently, the subject of technopreneurship is not taught in many universities. Matters of fact, few universities have understood its pertinence and have offered it as a subject in their curriculum. However, it is difficult to state whether one subject in technoprenuership can actually inculcate future technopreneurs in the near future.   It will take a reasonable amount of years to furnish a programme that can enable students to apply methods that would prove successful in a major platform, which requires this position the most.

Observantly, though the term technoprenuership is still relatively new, universities worldwide have either instinctively or mechanistically offered programmes, that combines both engineering and management in their curriculum but never referred it to that of technopreneurship. Nevertheless, it was left to the creativity and talent of the students to amalgamate the two and transcend beyond theory towards the attainment of practical impossibilities. Thus, this has not been possible for anyone but only the few who ritualistically and visualistically valued and appreciated his or her absorbed theories for future applicable and experiential spheres. In today's educative climate and since the past decade, the university curriculum has evolved tremendously to suit students' needs and to enable students to fit into the competitive working arena, but with all the evolvement, there is still a distinctive split between industry and academia, whereby the industry ferociously combats to state that no university theory can ever replace practice. This could be true to some extent and evidently proved in certain disciplines. That is why it would be surreal to see both entities work in perfect combination. No matter how ferociously industry combats to state that no university theory can replace practice and no matter how academia would like to produce graduates to suit their needs, it is an utter dismay that the industry today is not been able to define explicitly what they want in future graduates especially technoprenuers, except for the emphasis made on soft skills rather than hard skills. Soft skills, even though is crucial to communication and leadership, still remains a mere side dish and cannot replace the pertinence of a 3 to 4 year hard-core training offered by a university. However, the need for technoprenuers has been greatly understood lately by both academia and industry, which is why the term has surfaced. Nevertheless, what is required in a technoprenuer is currently theoretically ambiguous but is practically positional within the platforms of industry who wants the fullest control in identifying their own set of technopreneurs based on their own set of non-transparent criterion. The non – transparent criterion within the realms of industry is disproportionate to what is being offered by university and ironically, not all technoprenuers from diverse platforms resemble each other in terms of the similar criterion. This leaves academia perplexed and bewildered since academia can only offer programmes that are ethically mutual to one (1) set of criterion – a criterion, which is not necessarily accepted unequivocally by industrial standards.

That could be the reason why graduates are not viewed the same way by industry. Soft skills are continuously being harped by industry as the safest way to refrain themselves from identifying what they really want in a technoprenuer or graduates from diversified disciplines. The utmost requirement placed on soft skills by industry creates an unwarranted phenomenon of hiring based on contacts rather than hiring based on merit. Soft skills are usually forms of proficiencies that develop and progresses during a student's university learning lifespan and its proficiency level differs from one individual from another. Therefore, if it is the differentiation of soft skills, which is what, is differentiating the criterion sets required for future technoprenuers and university graduates, then academia will not be able to serve for this purpose. This could be a possible reason why advanced and higher academic studies are sometimes being purposefully regarded as overqualified by industry who is more in favor of soft skills. This does not infer that soft skills has become the new qualification of industry but observantly finds that the industry favors people with soft skills because they are more adaptable, adjustable and bendable than graduates who are dominantly equipped with strong hard core academic training and intellect. Having identified this dilemma, it is an irony why industry is not even willing to invest additional training for academically qualified graduates but is willing to invest in the training of individuals who are armed with merely soft skills. The former if realized will be a tremendous contribution to the workplace compared to the latter but it is not widely being practiced. This quintessentially raises a question as to what do soft skills mean according to the stances of industrial standards? Is it defined as the art of conveying highly advanced information in simplified form to be understood by cross-functional departments limited to purely work related matters or is it defined as the art of networking capabilities with multiple arrays of people inside and outside the organization, which is not limited to purely work related matters or is it the art of social mingling within and outside the organization? It is the lack of these clear and definite industrial definitions, which obstruct academia from producing graduates towards meeting industrial needs. If soft skills mean networking capabilities and social mingling, then academia will definitely be unable to serve this purpose because networking methodologies and social mingling does not require a university education and is not explicitly recognized as a subject under the university curriculum. Furthermore, networking is a term, which has yet to be explicitly defined in terms of clear boundaries by ethical standards. If the situation progresses to the extent of allowing industry to control the definition of human capital, then what does academia have to offer in the long-run?

Another consequence that can expectably transpire from this is when academia completely surrenders to the utmost needs of industry, which can negatively reform the main mission and objective of a university education. The traditional modes of acquiring knowledge through studying, transmitting knowledge through teaching and deriving new knowledge through research will be substituted with modes like learning multiple ways to become the "predator instead of the victim" in the workplace, diffusing fallacious information to your firm's opponent and creatively synergizing new methodologies for self-elevation but to the destruction of others. Thus, will be the new "course material" of the new university curriculum, if ever a university education succumbs 100% to the fulfilling needs of the industry. What is more detrimental is the plausibility of having academics who will equally fall prey to the ideologies being spread within industry and lose faith in their own orthodox but fecund ways, which have proved to be efficacious in the past. Observantly, academia has been criticized over the years for being overly obsessed with prescribed definitions and lacking creativity, but definitions go a long way in defining job descriptions and boundaries to clear the path for ethical standards and conduct.

That is why the role of technoprenuers, which is the fusion between knowledge of engineering technology and the knowledge of entreprenuering engineering technology, is discernibly linked between the absorptive platforms of both academia and the constructive and affirmative thresholds of industry. The former evidently requires a solid breeding of a single or compact comprehension of multifarious disciplines and the latter requires the immersions and understandings of diverse inter-relationships and intra-relationships of external stakeholders, management and human capital. Nevertheless, the latter will be a challenging task to "curriculumize" due to the realistically diverse forms of people oriented conflicts taking place in workplaces, which require ingenious forms of personnel management - that which can only be consciously grasped through experiential doing. The closest a university curriculum can get to realize the latter is to entrench case study forms of critical thinking skills in every management course undertaken but would not be able to encompass it in entirety due to the absence of real time stakeholders, management and human capital to participate in course discussion proceedings. At present, case study forms of critical thinking skills are undertaken within MBA and executive programs in universities around the world, which attract many individuals armed with a Bachelor degree and industrial experience who are expected to imaginatively put pieces of their experience and knowledge together to solve case study oriented problems. However, these programmes are severely short term. Even short term MBA and executive programs would not be able to encompass it in entirety due to the absence of the regular real life stakeholders, management and human capital to participate in course discussion proceedings. Nevertheless, the only difference it holds compared to any other university business program is that the participants enrolled in the MBA and executive program happen to be holding high-ranking positions in companies. This group rarely consists of fresh undergraduates with a few years of service. Furthermore, these MBA and executive programs are largely financed by companies themselves, who selects their staff to attend these programs, that which costs an exorbitant amount of money. It is hardly affordable and only few program participants are self-financed. The question arises as to why a high-ranking official with years of service and experience wish to attend an MBA or an executive program. Does this mean that theory and knowledge derived from a university program can allroundedly surpass and supercede what years of practice can offer? Alternatively, is the MBA and executive program simply an avenue for outreaching networking possibilities with outstanding individuals? If networking is the true essence why a high-ranking official wishes to attend an MBA program or an executive program, why are they not willing to alternatively participate in high quality academic conferences where they can share their industrial dilemmas with high-qualified academics rather than spend exorbitant amount of dough to finance and attend these programs? On the other hand, is it that these MBA programs and executive programs have received tremendous publicity and word of mouth in the last decade, which thereby acknowledges anyone who attends it as privileged and out of the ordinary? If high standards have been distinctively made present in these programs, then it is a titanic sized complement given to a program or participant attending these programs, considering that these privileged progams for the few are never available at less cost or free of charge. This paper will attempt to provide an understanding towards what should predominantly be required by the role of a technoprenuer and what needs to be embedded within the subject of technoprenurship. Therefore, this resonates a calling towards the fortification of the subject of technopreneurship and the role of technopreneurs towards designing an ethical business climate for emerging technologies such as

nanotechnology. Primarily, what is the language of technoprenuership and what are the traits that need to be ascertained?

2. What is the language of technopreneurship?

The term "language" emphasized here with respect to technoprenuership means scientifically or technologically armed with managerial morphology articulated based on the variability of one's own disciplinary fields. It is not to be connoted to that of a foreign dialect but to that of a global argot of technological communication. Why science and technology have been separated into two dissections in the above statement is because one who is proficient in science does not mean he or she is proficient in technology. One who is parasitically a professor of physics or chemistry or biology is unlikely to be proficient of the names of the latest products and discoveries out in the market, which have been derived from scientific intelligence or has the slightest clue on how to operate these gadgets compared to a technologically savvy individual without a science degree who has all the names of the latest innovative products in his or her fingertips. Nevertheless, the technologically perceptive individual without the science degree who has all the names of the latest breakthrough technologies will not have the slightest clue as to how the product was engineered or what components and materials can be found in the product whose names he or she simply cannot forget. Simultaneously, a scientifically proficient individual who is academically and puristically trained in one scientific discipline such as a professor of physics or chemistry or biology is able to understand and identify the ins and outs of particles, components, materials and their respective structures, which goes into the formation of a breakthrough technology. However, the question arises as to where do these two (2) different types of individuals belong in terms of R&D and management? A scientifically proficient individual who is academically and puristically trained in one scientific discipline should solely belong in the R&D department where his or her expertise can be thoroughly utilized, since their entire academic breeding environment has been ritualistically laboratory based. It would be unlikely and desultory to isolate them from their own comfort zone in order to contribute in the management of R&D technology. A highly scientifically proficient individual can make acute interpretations of scientific findings from various patois and understandings to management but is highly unlikely be able to enterprise or transmit these findings to another level, that which transcends beyond the scientific laboratory. This on the other hand, would be the ideal job description of a technoprenuer. This is the main reason why technoprenuers are not referred to as "scientific-prenuers". There are many highly scientifically proficient individuals who are interested in venturing in the business of entrepreneuring R&D technology but the results can be disastrous since scientific brilliance inflicted with hard core money-mindedness can interfere with the ultimate product offering. Both needs to be kept distinct and distant. Matters of fact, there is no such thing as "scientific-prenuers" until today. Therefore, one would argue as to which discipline would be effectively related to that of technopreneurship.

The study and subject of technoprenuership will still require the fundamental knowledge of science. Nonetheless, a subject in science should be specifically developed for the field of technoprenuership. The existing subjects in science currently available and offered in universities are not catered for the needs of technopreneurship. A fundamental all roundedness of science should be able to incorporate the disciplines of physics, chemistry, biology and engineering for the needs of technoprenuership. Thus, unless technopreneurship is offered as a full degree program at the undergraduate level rather than a core subject within an undergraduate or Master's

program, this will be a challenging task. Individuals with a natural knack of technological perceptiveness should pursue this field. This program should therefore be complemented and entwined with core subjects like R&D management and entrepreneurship. Unless subjects like technological management, knowledge management, total innovation management and total quality management can be "curriculumized" for theoretically applicable and real-world possibilities as well demonstrate a correlation to that of R&D management, these subjects should be cleared out from the undergraduate technopreneurship programme, as they are better suited for a Master's program or a Doctorate program, which is more research based. The reason being is that these subjects are well suited for researchers and academics, who commonly practice the usage of high-level academic austerity in the development of advanced methodologies to assist in the name of industrialized R&D. In addition to this, what is deemed as pertinently necessary is the inclusion of business ethics within the technoprenuership program to ensure future technopreneurs cognize with the fact that ethics is not just for passing a theory class but to realize that ethics is serious information often purposefully and intentionally neglected by industry. Ethics today, is often made out to be a ridiculous form of humor in industry rather than a serious obligation to be practiced by management. Therefore, one subject in business ethics will do no good for the technopreneurship program; rather it should be affixed within the chapters of the science and management courses offered within the technopreneurship program. In other words, the affixation is to propel pursuing students to think critically of each chapter, from not only a technological perspective but also an ethical perspective. Ethics is a colossal subject and can be deduced and inferred from the perspective of a large number of disciplines. Its substance matter has become extremely wide the last decade that it can even be offered as a standalone programme. Nevertheless, in terms of developing future technopreneurs, the subject of ethics can go a long way in developing a discretionary moral path of a technopreneur within all his or her undertakings. This is why the subject of ethics is often set aside and is often masqueraded by industry's focus on soft skills. Earlier in this paper, it has been mentioned that many firms are in the lookout for individuals who are adaptable, adjustable and bendable. Adaptability, adjustability and bendability can be viewed as optimistic traits but it is often utilized advantageously to infringe and defy the proper rules of conduct and tenet. Thus, the university arena should have the strength to define their future technopreneurs instead of allowing industry to have full control over what defines a technopreneur. Nevertheless, the university curriculum developed for the technopreneursip program should inculcate the rigorous art of conveying highly advanced information in simplified form to be understood by cross-functional departments in both written English and spoken English, limited to purely work related matters. This has to be reinforced from start to finish of the programme since it can take away the laborious toil of merely absorbing theory every now and then. This is what "soft skills" would mean according to the stances of academia. It is well defined and with definite purpose.

3.   Who should teach technopreneurship?

The manifestation of technopreneursip should be a display of multi-angled impressions that can be infused through the formation of multi-angled course subjects, which can be taught by solo and purely disciplinary trained academics. Nevertheless, the practice of this technopreneurship programme should portray a firm mission and objective to produce future technopreneurs. With that mission and goal in hand, academics whom are entrusted with this responsibility should transfer their knowledge and know-how to students from their own perspective only. However, at the end of each class lecture, an academic should be able to show relevance and importance of his

or her taught matter to that of the role of technoprenuership. This is pertinent because not all students would be able to ritualistically and visualistically value and appreciate his or her absorbed theories for future applicable and experiential spheres. Highly qualified academics should hail from science, management and ethics to be able to pass on their subject matter to their students. The reason is that, even though they are academics and not real life technopreneurs, the reality is that they have engulfed in advanced theories and research for years, which have trained them to visualize and absorb the minute details of their own subject rapidly. Another reason is that they will ground you to fundamental underpinnings effortlessly. If a person from industry were to take the place of a highly qualified academic in the university to teach the subject of technopreneurship, they will share with you overwhelming examples (usually examples of other companies and not their own company) and share their great experiences but will not be able to describe or authenticate the real methods used as in how he or she got to resolving his or her real life dilemma. The reason is that methods used by them could be unethical and not welcome in academia. It is also important to prevent these purely experiential individuals from spreading false industrial ideologies to budding technoprenuers. Therefore, no matter what experience or multi-assorted examples they bring with them, they will have to bind by the subject matter developed by academia for the subject of technopreneurship. Furthermore, marking assignments, grading students' project papers and counseling are not in the interest of industry-based individuals. What is more detrimental is the plausibility of having teachers and academics themselves who will equally fall prey to the wrongful ideologies being spread by industry based individuals and ultimately lose faith in their own orthodox but fecund ways, which have proved to be efficacious in the past. Affirmative ideologies are currently being infused by academia. That is why more and more universities are creatively engineering multi – optional new programs for graduates to fit into market needs. Therefore, it is the sole responsibility of the academic, entrusted in the development of budding technopreneurs, to inspire and instill the fundamental underpinnings of theory for future challenging and applicable practices.

4. Technopreneurship for nanotechnology

All the above equally applies for nanotechnology. Nevertheless, nanotechnology being an emerging technology needs to be viewed through a different set of lenses. The technology of nanoscience is gradually permeating as an incremental structural add-on to improve the prevailing functionalities and operations of existing products. The possibilities and benefits coming from revolutionary breakthroughs remain to be visionary but endless. Due to the endless potentialities that have been envisioned from nanotechnology, the identified risks have also tumultuously risen from boundless laboratory analysis and testing. Nevertheless, amidst all the unshielded attacks from pundits, the research of nanotechnology has not seized to continue rigorously. Nanotechnology research publications persistently elevates in number in many countries. The number unwaveringly proves as a scientific indicator that nanotechnology research is taking place. However, the number does not prove that commercial outputs have resulted from the rise of nanotechnology research publications. This means, scientific findings whether basic or applied have not reached to the level of interest for commercial value. Another way this can be construed is that scientific findings are not moving in parallel with current trends and requirements, which is why commercial profit makers are unable to see value. Matters of fact, there are only a few scientific papers, which have reached commercial realization. Nonetheless, non-paper based industrialized R&D look for immeasurable ways to market their prototypes and even though patented, never disclose their entire content and methodologies unlike paper based

research. Simultaneously, some nanotechnology prototypes do not even end up in the shelves as a successful product. Nonetheless, there have been many, which have reached success. It is difficult to identify these nano-based products because not all successful products containing nano material are branded as "nano". There is no specific law reinforced to ensure that manufacturers label their nano-contained products as "nano" in order to create public awareness of the usage of nano material. Therefore, what is being elucidated in this paper are two extremes: One: There are nanotechnology application based research publications, which do not attract commercial interest and Two: There are nanotechnology prototypes produced from industrialized R&D, which are struggling to make an entrance as a commercial product or desolately failing in the marketplace. Therefore, the role of technopreneurs will be greatly needed in assisting both opposite extremes.

A technoprenuer engaged during the beginning years of university-based research can provide his or her sound intellect to uproot the core relevance of university research and demonstrate its proposed importance to companies so that research can be guided by benchmark based weightage values. This can be done by a thorough investigation of market trends and exploring closely resembling products available in the market, so that functionalities and requirements can be incrementally improvised and surpassed to meet a company's profit making needs. Profit is the main interest of companies today but it will take a technoprenuer to appreciate that scientific brilliance was used to achieve profit. Market researchers are usually associated to this job description but market researchers will not be able to provide a full report or consultation of what needs to be performed further after a market report has been accomplished because they are not trained with technological and management competence. Technopreneurs should be able to ensure that profit-making temptations do not get in the way of university research. In terms of industrialized R&D, technopreneurs will be required to execute the responsibility of periodically indulging in the periodical levels of completions and developments of R&D specialists stage by stage and thereby, becoming an indispensable link between the R&D laboratory and management. It is during these stages, whereby the technopreneur will need to meticulously articulate anomalies described by R&D specialists to management to ensure that not a single anomaly goes overlooked in terms of health and safety even before the prototype hits the inspection board. This is where ethics play an important role. Not a single anomaly needs to be compromised in the name of profit making interests. Not a single anomaly should be compromised to adjust the escalating costing predicaments. Technopreneurs, in other words should be hard wired in making a distinctive connection between present anomalies, past anomalies and forecast future anomalies to safeguard against disastrous outcomes that may result during post development and production. This is a hard thing to do because past anomalies hardly resemble present anomalies, as both form of anomalies often appear unique. Therefore, forecasting future trajectories at the beginning of R&D will prove to be an essential skill of a technopreneur in the area of industrialized nanotechnology R&D. In terms of the disciplines associated to technoprenuership for nanotechnology, a new course in science needs to be developed specifically for nanotechnology especially if nanotechnology were to be initiated as a standalone programme. The new course in science will need to incorporate the fundamental all roundedness of physics, biology, chemistry and engineering from the perspectival bases of nanotechnology to withstand and prepare for the upcoming nano revolution. Knowing and understanding key jargons extensively used by R&D specialists and scientists will disallow any form of misinterpretation and misinformation from transpiring.

5.   Conclusion

A balanced equation between industry and academia has only been attained by a few who have detected, discovered and observed the best of both worlds. However, many have chosen the path of "parking themselves" in one of the two worlds. This long-term practiced singularity has caused both worlds to drift into two extremes and thereby, marking their territories with their own languages of austerity. Nevertheless, this singularity has helped identify the strengths and weaknesses of both platforms. Thus, after weighing both sides, it is true to say that academia has evolved into a multi-optional ground of programme selection for students who wish to position themselves as marketable graduates in the next 3 to 4 years. The programme of choice, the combination of subjects and the time to dwell into future career planning, are all provided to potential graduates. The 3 to 4 years are reasonably sufficient to mould an individual to fit into a job description defined by academia based on industrial requirements. Yet, they are many who find themselves displaced, mismatched and not suitable for the needs of industry after graduation. This is because each firm and company has a different set of criterions, which industry finds strenuously difficult to define. This palpably shows that the academic platform is far more flexible than industries, who have creatively engineered a broad selection of subjects to ease the burden of future graduates. Industry should reciprocate by providing additional training if required to graduates and highly qualified individuals rather than shadily harping on the requirement of soft skills. Therefore, the role of technopreneurs, who are the future driving force in propelling an R&D prototype right from the R&D department into successful commercialization, should precisely be defined technologically, managerially and ethically by academia, so that their territories are upright, just and strikingly discernible especially for the emerging nanotechnology.