ACADEMIC ENTREPRENEURSHIP: TIME TO RETHINK ACADEMIA AS ENTREPRENEURIAL HABITATS.

EXECUTIVE SUMMARY

Globally, organisations are recognising the importance of knowledge based economy as a context that has a moderating impact on the institutions, their agendas and deliverables. In response, institutions are actively engaging themselves in creating knowledge intensive assets to sustain new wave of knowledge economy. Academia, as symbols of pure learning institutions are reviving and reengineering their academic goals in terms of their sustainability and marketability potential so that they can work closely with the industry and can create interfaces those catalyses entrepreneurial motives. Historically, academia across globe was considered as pure teaching and research institutions with no drive for commercialisation, but the evidences of MIT and Silicon Valley have necessitated academia to rethink their role in the wider economy. As a consequence, academic stakeholders need to inquire over various agendas as: Does academia need to behave as a stagnant repository of knowledge or dynamism in terms of entrepreneurial outlook need to be thought upon. What are the predictors for academic entrepreneurship and how these predictors shape up the academic response to the growing knowledge based economy? Is academic entrepreneurship a sustainable feeder to industrial breakthroughs thereby paving the way for creation of entrepreneurial clusters? The present work aims to address these fundamental questions so that apt justifications can be provided on the basis of existing literature on the subject matter, new horizons can be put forth so that new forms of inquiry can be raised.

In this direction, the present study aims to put forth the strategies that academia need to create so that the entrepreneurial quadrilateral can be designed that comprise of person, processes, behaviour, place and linkages between them. The person refers to entrepreneur, processes refers to entrepreneurship, behaviour refers to entrepreneurial mindset and place refers to habitat. It is imperative to understand that designing entrepreneurial quadrilateral is context sensitive, reason being that people, processes, behaviours and the geography varies across academic landscape. The present need is to acknowledge that every academic institution is a specialised hub of knowledge and the resultant interplay amongst various entities will create different entrepreneurial scenarios, thus making academic entrepreneurship a context ridden area of research. The present paper will lay down various propositions supported by past empirical evidences that will support context sensitive aspect of academic entrepreneurship on one hand and on other will assist in designing habitats that support entrepreneurship across academia.

Keywords: Academic Entrepreneurship, Habitat, Entrepreneurial Quadrilateral

1. INTRODUCTION

In knowledge based economy academia is facing divergent forces of innovation and simultaneously catering to the basic academic agenda of teaching. Presently academia is looked upon as contributor to nation's innovation system on one hand and on other pure teaching and research institutions. This divergent but equally important role of academia makes it important to understand the evolution of academia from teaching to research and finally commercialisation (Powers. J., & McDougall. P. 2005). Defining academic entrepreneurship is a daunting task as the interpretations varies across different academic contexts. Academic entrepreneurship refers to enterprise creation, academic innovation, spin offs and commercialisation of academic research (Hannon. P, 2013). On other hand academic entrepreneurship can be defined as set of entrepreneurial behaviours, skills and attitudes that drive institutional entrepreneurial spirit. This definition being more intangible in its content can imply multitude of interpretations. Hannon. P (2013) explains that institutional intangibles like behaviour, skills and attitude develops institutional entrepreneurialism that

further acts as a differentiator across various academic institutions, and a source of competitive advantage.

In pursuit of gaining competitive advantage, academic institutions are increasingly engaging themselves in entrepreneurial activities, as a response to the change in higher education scenario. With the advent of globalisation and increase in industrial activity across globe, academia is increasingly being recognised as a sustainable source of innovation for industry. Globalisation coupled with increase in mobility of ideas and knowledge flows across nations has led nations to create knowledge repositories /innovation hubs that will strengthen national innovation system. These innovation hubs and knowledge networks nurture upon the academic research deliverables and there are historical evidences that support the arguments of increased academic involvement in entrepreneurial endeavours. Some of the major cases of engagement are listed below:

- The survey results of Association of University Technology Managers (AUTM) signify that in US, 347 research products were disbursed from 88 universities with high commercialisation potential (AUTM, 2010). Licensing as another form of academic entrepreneurial route showed significant increase of 11.44% from 1999-2000, wherein it is important to note that more than 600 licenses were sanctioned in favour of 454 startup corporations that specifically catered to academic research.
- Noted academic varsities like MIT, Stanford and Cambridge, are recognised across globe for their spin off potential and creation of new ventures. Evidence suggests that these academic institutions have research centric academic culture and strong commercialisation outlook. The synergetic relationship of research outlook and culture has created innovation clusters that act as feeder for innovative organisations. These academic varsities thus can synonymously being called as enterprising institutions with strong commercialisation essence. (Powers. J & McDougall. P, 2005)
- A maiden step towards academic entrepreneurship was the introduction of Bayh–Dole Act in 1980 (Mowery, D., & Sampat, B. 2005). To increase academic entrepreneurship and licensing, emphasis was placed on incentivising the academic research. With this bold step academia underwent renaissance and moved from being stagnant pool of knowledge to research and treaded the entrepreneurial path of commercialisation. Academic research started flowing from academic labs to corporate houses and finally to the marketplace, thereby necessitating academia to rethink the academic deliverables in terms of marketability proposition.

  In light of these academic changes, academic stakeholders witnessed a paradigm shift in terms of their role and value addition. Being pure knowledge creators was the history and entrepreneurial mindsets and resultant behaviour was the critical success factor for enterprising institutions.
- Rethinking academic entrepreneurship gained momentum with the emergence of concepts like ‘‘entrepreneurial university’’ (Etzkowitz, H. 1998). Academia was considered as a driver of nation’s economic state and as a tool for regional growth. Linking academic output with economic development increased the scope of academic entrepreneurial agenda and necessitated the need of having diversified academic portfolio ranging from teaching to research and innovation. This phenomenon was termed as ‘‘second academic revolution,’’ (Powers. J & McDougall. P., 2005) wherein teaching to research was replaced by research to market and academia was considered a developmental tool within the hands of policymakers.
- Pioneering Academia’s second revolution the path breakers were: The University of Waterloo (UW), The University of Toronto (U of T) and The Ohio State University (OSU) (Bathelt, H., & Spigel. B., 2011). These institutions created symbiotic relationship between the regional entrepreneurial quests and academic research capacities. The resultant was the creation of spinoffs and ventures, wherein it is

pertinent to mention that the academic mission and agendas were crafted by regional industry experts thereby initiating a customised form of industry-academia interface.

- A case to reflect upon in field of academic entrepreneurship is the University of Toronto that is revered as one of the pure research varsity with strong commercialisation outlook. Catering to the socio economic profile of Toronto, the university aggressively involves in creation of innovation clusters wherein industry and academic partners engage in creation of innovation products and services fuelled by strong public private partnership. It is pertinent to mention that in 2008, the region had more than 56 public research organizations, and 44 private biotechnology firms, including many start-up firms (Bathelt, H., & Spigel, B., 2011), and the role of university in shaping these start-ups was pivotal. Hence, creation of specialised research centres at academic level that caters to the industrial needs of region spurs the enterprising momentum of academia by creating strong interfaces via spinoffs and licensing.
- At other end internal and external governance provisions shapes the academic entrepreneurship and the resultant research. Ohio State University is evidence in the matter as state aggressively funds the research endeavours of university but the resultant entrepreneurial outcome is in the form of licensing patents to the firms rather than creation of spinoffs (Bathelt, H., & Spigel, B., 2011).. Hence it can be implied that academic entrepreneurship as a practice varies across institutions in terms of outcomes ranging from patents to spinoffs. A close look into the matter reveals that this behaviour is partially because of internal technology transfer office mechanisms and in broader sense because of the Bayh-Dole Act, which restricts academia to patent research, but mandates it.

Navigating across the history of academic entrepreneurship, the above instances suggest that academia across globe are challenging the embedded traditional roles of teaching and research and are evolving in terms of academic deliverables and practice. Growing knowledge intensive economic models coupled with increasing industrialisation has compelled academia to carve a niche for them by creating high end innovative research deliverables. Academia as knowledge creators practiced a push phenomenon of delivering products and services with little or negligible market orientation thereby necessitating industry to have their in house research labs.

Academic labs were mandated by course curricula, but the status quo was revolutionised by the pioneers (MIT, Cambridge) wherein academic labs were connected by the entrepreneurial pathways leading to market. With this orientation academia across globe were recognised as the engines of national innovation system in general and regional development in particular.

Traversing from lab to market, academic entrepreneurship witnessed great divide in terms of practice and market acceptability, wherein entrepreneurial ecosystems were considered as the predictor of entrepreneurial success in academic settings. However, disparity in economic models and rate of industrialisation exists across globe, thereby compelling researchers to rethink that do we need to create entrepreneurial habitat first thereby generating ecosystem at more mature levels of academic entrepreneurship or simply benchmark the practices of enterprising academia. The subsequent discussion will attempt to solve the anomaly as to what extent academic entrepreneurship is a context ridden subject and do we need to talk of ecosystem first or focus to create entrepreneurial habitat for creating holistic ecosystem (entrepreneurial quadrilateral).

2. WHY ENTREPRENEURIAL HABITAT AND NOT AN ECOSYSTEM

Mapping the innovation pyramid, the baseline comprise of technological innovation system, followed by sectoral innovation, regional innovation system and national innovation system (Wright. M., 2014). There are divergent pathways followed by academic to contribute to the

top level of innovation pyramid. In this direction, enterprising academic institutions initially build upon the Academic Capital that is an aggregate of various forms of capital (Edvinsson & Malone, 1997) in order to create pool of innovations that can contribute to the different slices of innovation pyramid ranging from sectoral needs to national innovation needs. Entrepreneurial outcomes at academia are significantly a function of academic capital. The nature and type of academic capital determines the composition of innovation that university yields. Academic Capital is a function of different forms of capital stated as:

AC= f (Ic, Fc, Sc, Hc, Rc, Oc, INc, Pc) (Edvinsson & Malone, 1997).

(***Ic****-Intellectual Capital,* ***Fc****-Financial Capital,* ***Sc****-Structural Capital,* ***Hc****-Human Capital,* ***Rc****- Relational Capital,* ***Oc****-Organisational Capital,* ***INc****-Innovation Capital &* ***Pc****-Process Capital*)

The optimum combination of all the above said competencies determines the academic market value. The stated equation although being linear has a deep inferential dilemma to address. Every academic setup possesses different forms and different combinations of capital. To the opposite end every industrial set up has different academic needs. An academia with strong structural capital may complement an industrial partner with strong need for research infrastructure. An academic setup possessing strong human capital will be looked upon by consultancy firms. Thus, academia in order to cater to industry and innovation pyramid need to develop internal habitats that are entrepreneurially rich for targeting specific industrial setups. A mature level of entrepreneurial habitat has potential to interact with other academic habitats for increasing the market value of research outcomes via collaborations and mobility of researchers (Brennenraedts, R. et.al. 2006).

Intersection of various academic habitats under operant conditions i.e. the context creates spin off opportunities and paves the way for creating entrepreneurial ecosystems. Tailored interventions taking into consideration the kind of academic capital need to be developed so that sustainable industry-academia interfaces can be created.

Further, the argument leads to the understanding that mature habitat spins off the creation of ecosystems but entrepreneurial context being sensitive as per different academic settings, need to create a balance between innovation, entrepreneurship policies and firm types. Quantifying this argument the industrial perspective for academia can be evaluated by looking at parameters against which the overall ranking of academic institutions is done internationally. Times Higher Education Asia University Rankings (2014) indicates that the criterion for ranking of academic institutes includes consideration for five performance indicators. These performance indicators act as yardstick for evaluating academic entrepreneurial capacity and are listed below as:

- Teaching (No. of Doctorates)
- International Outlook (Collaborations, Consultancy and Researcher Mobility)
- Industry Income (Inventions, Patents, Spinoffs and Consultancy)
- Research (Volume/Income/Reputation)
- Citations (Times Higher Education Asia University Ranking, 2014)

Holding an Asian perspective on the subject matter academia that were considered as stagnant pool of knowledge need to behave in fluid manner as core academic product that is research and citations are now looked upon as tool for creating academic income . A sense of urgency prevails across academia in terms of bringing the industrial outlook in their research deliverables i.e., patents, Spinoffs, Inventions and Consultancy. Urgency has to be catered by spurring enterprising across academia by exploiting different forms of capital, creating

sustainable entrepreneurial habitats, developing cross academia ecosystems, and serving to the broader part of innovation pyramid.

Extending the discourse, engaging of academic stakeholders is pivotal as they have the potential to conceive entrepreneurial ideas that transform into tangible products via academic entrepreneurial routes comprising of capital, suitable environment and market intervention.

It is critical to understand that debate surrounding national innovation systems (Wright. M., 2014) mushroomed in 1980's and research on innovation ecosystem spurred in last five years only, thereby creating a void between academia-industry relationships. Further discussion is warranted to diagnose the gap emergent from the quantum jump of academic from teaching and research to entrepreneurial ecosystems, ignoring the intermediate role of entrepreneurial habitats.

3. LITERATURE MAPPING

Academia across globe is engaging in entrepreneurial activities in order to create financial resources for carrying research, and in this direction commercialization of academic research output is the most prominent form of gaining financial support (Wood, M. S. 2009). As such, the role of academia has become bimodal, on one hand academia need to cater the teaching agenda and on other the commercialization. These roles necessitate academia to foster creation of entrepreneurial infrastructure that spurs market orientation within the academia.

Glassman, A.M et.al (2003) expressly defines academic entrepreneurship as the exploitation and exploration of opportunity with the academic settings. Exploitation pertains to identification of the opportunity and exploration specifies the extent to which the opportunity has commercialization potential. Thus academic entrepreneurship may be defined as a response to market need when exploration is stressed upon and exploitation means stretching academic research potential.

Further, Bathelt, H., & Spigel, B. (2011) while elaborating on the entrepreneurial role of academia, considers academic entrepreneurial outcomes directly proportional to the economic development. This means that academic entrepreneurship is a significant contributor to the regional economic growth. Academia is central in creating industry-academia clusters that nurture start-up creation, spinoffs and technological clusters for adjoining industrial setups. The authors also reflect upon the differential entrepreneurial contribution of academia to industry, wherein spin off creation is a looked upon an outcome of academic research thereby ignoring the contribution of academia in creating regional entrepreneurial ecosystems for holistic growth that comprise society at large and community in specific.

Bienkowska. D & Klofsten. M., (2012) while extending their view on academic entrepreneurship highlights that The role of knowledge workers in creating entrepreneurial habitats is pivotal as they contribute in moving academia from entrepreneurship to entrepreneurial and finally to enterprising. The entrepreneurial mindsets supported by strong transdisciplinary collaborations with apt research infrastructure results in creating mindsets with high levels of innovation quotient which serve as basic ingredient for academic entrepreneurship.

Further, considering the diverse array of academic structures, academic entrepreneurship has created disparate commercialization results (Pilegaard, M. et.al. 2010) with academia pioneering in natural and technical sciences have outnumbered academia with humanities and social sciences as core product. The commercialization results in form of academia-industry interfaces (collaborations, spinoffs, start ups) are inclined more towards natural and technical sciences. Henceforth, academia cannot pursue standardized form of entrepreneurship, as different academia operates under different environments and need preferential treatment in terms of commercialization. This means that academia across globe is not comparable as the operating environments differ, academic stakeholders differ, and interactions between academic actors and commercialization infrastructure differ. It becomes imperative to diagnose the academic setups that operate as habitat for entrepreneurial motives and big enterprising academia that act as ecosystems.

Pilegaard, M. et.al. (2010), on defining academic entrepreneurship points out the dominance of defining academic entrepreneurship as a function of spin offs, startups , licensing, patenting and consulting, whereas defining academic entrepreneurship in terms of individual-individual collaborations, individual-environment interactions and individual-environment-innovation interactions has been paid little attention. The study has put forth that academic entrepreneurship doesn't operate in silos, it is context ridden, woven in the interplay between individuals (entrepreneur), processes (entrepreneurship) and mindsets (entrepreneurial), that finally leads to enterprising.

Lacetera. N. (2009) in her paper titled "Academic Entrepreneurship" corroborates academic entrepreneurship as a tool for producing research with strong social and economic potential. The paper highlights the importance of entrepreneurial choice that differentiates academic researcher from corporate researcher. As an academic researcher, the academic entrepreneurship has two fold benefits for researcher i.e. investment potential and consumption benefit. Investment in terms of undertaking industrial projects with strong commercialization potential and consumption benefits in terms of revenues and peer recognition (novelty). In contrast the corporate researcher pursues research only with high investment potential keeping in background the exit option, once the investment commercialization potential fades away.

This implies that entrepreneurial choice is a key predictor in differentiating academic research and corporate research. Academic research with entrepreneurial motive central to it has strong institutionalization potential that paves way for development of research infrastructure in a sustainable manner. On the other hand corporate entrepreneurship is a volatile feature that lacks institutionalization vision.

Klofsten.M & Evans.D., (2000) quoting commercialization capacity as a predictor of academic entrepreneurship, talks of the various academic strategies carved intentionally to create entrepreneurial habitats for spurring research. Quoting the academic entrepreneurship evidences from Sweden and Ireland the demographic composition alongwith previous entrepreneurial experience, work experience and university environment are strong predictors of academic entrepreneurship.

Mars. M & Aguilar. C., (2010) defining academic entrepreneurship synonymous to corporatization of academia reflects the implications of academic entrepreneurship on the state. Academia due to adoption of transformational role, from teaching to enterprising have become more dynamic, leading to incorporation of entrepreneurship as an academic agenda. This has also supported the innovation needs of state, thereby minimizing the reliance of academia on state funding. Thus academic scientists have become fund creators in addition to carrying the basic duties of teaching and research. Further, Mars. M & Aguilar. C (2010), while researching academic entrepreneurship presented a diverse perspective, by connecting entrepreurial motives of academia with self reliance and accountability. Academia engage in entrepreneurial endeavors not necessarily for profit making or commercialization but self reliance wherein being pure learning institutions, the societal needs can be catered with no profit motive, hence keeping the academic novel spirit alive.

Connecting the argument with suitable evidence, Etzkowitz (2002) narrates entrepreneurship as a determinant of transformation of MIT, based on tripartite interactions among industry, state and academia. The tripartite structure at MIT has created an entrepreneurial ecosystem that nurtures entrepreneurship across different academic disciplines and processes, thereby catering the regional innovation needs and adding to the national knowledge repository.

Yusof. M et.al., (2012), presented academic entrepreneurship as a description of three organizational interventions; organizational creation, organizational innovation and organizational renewal. Organizational creation refers to the core product of academia ranging from technical to basic sciences. The academic creation is a function of academic specialisation. Varied academic specialisations create different bundles of research output,

thereby determining the current and potential commercialization prospect of the academic output.

Rethinking academic entrepreneurship calls for bringing in renewal (Brennan & McGowan, 2006) across institutional setups. Mass strategies need to be replaced by tailored one coupled by incorporation of capacities that foster creativity and innovation not only at strategic level but at basic teaching level, that add value to the academic stakeholders. An entrepreneurial curriculum at bottom line can generate windows of entrepreneurial insight and entrepreneurial vision at the strategic level can build habitats for insight-strategy synchronization thereby cutting across academic stagnation and reviving the academic competitiveness.

Wright, M. (2014) in paper titled "Academic Entrepreneurship, technology transfer and society: where next?" presents the saturation of academic entrepreneurship in terms of technology transfer and spin outs. The novel impact of academic entrepreneurship on society remains an unexplored area. It has also been highlighted that academic disparity in terms of entrepreneurial capacity exists, as context, academic actors and governance structures varies and also makes society-academia connect critical to understand. Academic entrepreneurship as per the author is subject to different contexts i.e. temporal context (from academic idea generation to commercialisation), institutional context (governance models, academic vision and strategy formulation), social context (implications of academic deliverables on the society) and spatial context (geographic proximity of academia vis a vie industry).

All the contextual epistemology with regard to academic entrepreneurship points out that academia entrepreneurship cannot be a mass practice as institutions vary across dimensions. Extending the views, it is inferred that academia in developed and highly industrialised economies behave as an ecosystem whereas in a growing set up and developing economies, the struggle is to create an amicable environment for academic entrepreneurship.

Synthesising literature and past evidences with regard to academic entrepreneurship, it can be drawn that academic role is getting challenged across various fronts as academia is looked upon a delivery tool to nation's innovation system. The convergence in form of challenge being experienced across globe is explicitly mentioned in the preceding discourse, but anomaly is that solution to this challenge is a divergent one as context is a moderating variable and a determinant of magnitude of academic entrepreneurship. So academic entrepreneurship ecosystems can be prevalent in one state of reference but creating an entrepreneurial habitat can be a daunting task in another set of frame. This calls for diagnosing various predictors of academic entrepreneurship in varied setups and creating tailored strategies, connecting various academic stakeholders so that academia act as an innovation and research feeder to industry in particular and nation in general. The subsequent section aims to address these anomalies via various propositions, so that a conceptual framework in terms of academic quadrilateral can be designed under suitable entrepreneurial conditions (habitat).

4. THE CONCEPTUAL MODEL AND PROPOSITIONS

Rethinking academic entrepreneurship in light of context that is entrepreneurial habitat is the focal area of paper. To validate the connect of context with academic entrepreneurship, propositions have been attempted to clear the understanding so that generalized observations can be drawn, and future scope of research in this direction can be highlighted. The propositions will lay foundation for creating academic entrepreneurship quadrilateral that

connects, people, process, mindsets and outcomes by acknowledging the sensitive aspect of context. The underlying propositions in this direction states that:

P_1: Context is a predictor of level of academic entrepreneurship

P_2: Entrepreneurial habitats create entrepreneurial ecosystems that cater to top of entrepreneurial pyramid.

P_3: Academic entrepreneurship is a sustainable feeder to industrial breakthroughs thereby paving the way for creation of entrepreneurial clusters

In support of **Proposition 1**, Haeussler. C & Colyvas. J., (2011), in their survey of more than 20,000 German and UK academicians revealed that individual attributes, tangible and intangible organisational resources, values and reputation are key predictors of academic entrepreneurship. In an academic setup, entrepreneurial outcome in form of spin off, patent or licensing is determined by the level of individual orientation towards entrepreneurship and the kind of social recognition that is associated with the research being undertaken. The social recognition is subject to context specifications. Certain contexts value academic research as novel contribution, wherein others recognise commercialisation potential of academic research as a contribution.

Academic setups that comprise economic security and personal advantage linked to entrepreneurial endeavours best engage academic scientists. Commercialisation is looked upon by scientists as an economic payoff but the academic value system determines the reputational advantage of engaging into commercialisation process.

Abreu. M & Grinevich.V., (2013) in their work connects context with academic entrepreneurship, by enlarging the scope of academic entrepreneurship. It is not only spinouts and licensing that defines entrepreneurship but any academic policy that connects community with academia can be called as entrepreneurship. Any entrepreneurial opportunity undertaken at academic level that involves risk and rewards in form of societal benefits are part of academic entrepreneurship. There are academic varsities that specialise in community outreach and don't have labs to do so, as only intangibles cater this community-academia connect. Academic specialisations in humanities and arts sideline the importance of TTO's, not necessarily because they are not enterprising but because, the academic deliverables target different community partners that do not include industry. The data are complemented using institution-level information on financial and logistical support for entrepreneurial activities.

Kweik (2008) corroborate that context shapes the institutional change and change in turn determines the quantum of academic entrepreneurship. The pace at which academia undergoes change can take three forms incremental, radical and accidental. Academia following incremental course of change execute entrepreneurial activities in a planned manner, keeping in consideration the broader environment and industry response. Academic identity cannot be diluted for commercialisation hunger, thereby indicating context as a strong variable moderating the impact of change on academic enterprising.

Radical change challenges the context and spurs entrepreneurship by bringing plethora of change in policy making, governance structures, leadership, decision making and stakeholder selection. Accidental Change is a matter of choice when key industry clients are involved or a resultant of uncontrolled external (market) influence, the interface environment. Henceforth, change that is context driven, predicts quantum as well as nature of academic entrepreneurship. Academia that creates change interventions with response to growing entrepreneurial needs of market refers to 'academic revolution'.

Drawing European perspective of context as predictor of academic entrepreneurship, Hannon. P. D. (2013) identified leadership, governance, organisational capacity, people involvement, Commercialisation rewards, Curriculum, Industry-academia interface quality, entrepreneurial pathways as the key predictors of academic entrepreneurship. The presence and interplay of all these factors determine the quality of entrepreneurial habitat that nurtures the budding entrepreneurial insights at academic level. An entrepreneurial habitat comprising the above

said variables have potential to create entrepreneurial mindsets that in turn build institutional capacities and deliver innovations as a routine output, thereby enhancing the effectiveness of academic entrepreneurship.

The composition of entrepreneurial habitat may remain similar across academia buy , academia need to create divergent pathways and strategies as the context intervenes in contingent forms thereby necessitating academia the create habitats that cater specific industrial needs thereby negating the generic nature of academic entrepreneurship. How universities create the pathways and strategies for successfully travelling this journey are contingent on many factors.

Mapping the perception of more than 1,126 PhD students at Linkoping University, Sweden Bienkowska. D & Klofsten, M. (2012) infers that network building capacity is a key predictor of academic entrepreneurship. Network building at academic level refers to mobility of researchers across industry and the collaborations that foster because of mobilisation. The response of students confirmed that more mobilisation leads to better industry-academia engagement, wherein industry perspective can be brought by researchers via firsthand experience. Experiential based learning creates entrepreneurial capacities that are market oriented, thereby increasing the propensity of commercialisation. Further, contextual variables such as culture, organisational structure, partner suitability, core academic research, academic vision determines the ease of networking.

Klofsten.M & Evans.D (2000) quoting the entrepreneurial instances of Sweden and Ireland, points out the growing incompatibility in academic research and commercial success of that research. Academia for being successful in market place need not to act as research bank whose deliverables are outsourced by industry but an entrepreneurial habitat where innovations are carved under industry-academia supervision. The direct involvement of industry in initiation stages of research brings in industry perspective at earlier stages rather than at later stages of innovation diffusion. The paper explicitly confirms that for creating sustainable habitats predictors of academic entrepreneurship such as gender, age, entrepreneurial experience, work experience and academic environment on the entrepreneurship activities are critical.

Conforming to the proposition that context impacts entrepreneurship Yusof.M et. al., (2012) highlights that various variables of academic environment i.e. Control systems, organizational culture, human resource management systems and entrepreneurial leadership behaviour are key predictors of academic entrepreneurship. Culture as a context has profound impact on the organisational members as how they perceive academic entrepreneurship, whether a source of academic income or an institution that strives to contribute to the innovation pyramid at its highest level.

D'Este. P. et.al., (2010) on defining entrepreneurial capacity highlights that entrepreneurial experience creates mentoring possibilities for budding entrepreneurs. This involves cognitive integration of present academic entrepreneurs with future entrepreneurs, so that entrepreneurial pathways are tailored as per industry and academia requirements. Entrepreneurial experience is a strong predictor of creation of entrepreneurial habitats as expert knowledge inputs get embedded in the habitat creation, thereby making habitat more innovative and industry centric.

Presenting a comparative perspective of context with reference to highly industrialised economies (HEI's) vis a vie newly industrialised economies (NIE's), Wong.P et. al., (2007) confirms that bureaucratic organisational structures, low research base coupled with lesser number of inventions and lower demand of industry for academic deliverables weaken the tripartite relationship among state, academia and industry. So, urgency rests on the academia of NIE's to be entrepreneurial so that they act as drivers of national economy, thereby compensation for the less favourable conditions for a structured tripartite arrangement. Hence, Academia is developing part of world need to restructure, reengineer organisational

structures, policies so that entrepreneurial culture can be developed and industrial needs can be tapped.

O'Shea, R., (2004) work on academic entrepreneurship is heavily based on the study of entrepreneurial activities at MIT supported by a cross national study of more than four European universities, identified Leadership, industry-academia interface quality, funding portfolio of academia, entrepreneurial culture that values change but keep academic value system undiluted as strong predictors of academic entrepreneurship. Leadership here refers to the extent to which top academic scientists possess competency to align commercial goals with overall academic goals. Interface quality refers to win win situations for industry and academia, negating the scope of hostility. Diversified funding spurs entrepreneurships as risk mitigation is critical for sustain entrepreneurial moves.

P_2: Entrepreneurial habitats create entrepreneurial ecosystems that cater to top of entrepreneurial pyramid.

Study of Rasmussen. E., (2011) suggests that academic entrepreneurship has been evaluated as a linear relationship between independent and dependent variables, wherein antecedents to academic entrepreneurship have been tested across different academic setups. The academic entrepreneurship is a complex phenomenon, that take long and complex developmental paths for creating innovate product and these paths leads to change in composition of academic teams, resource configuration depending upon the degree of complexity. Thus, every academia behave a specialized habitat seeking to nurture specific set of academic research, as engaged academicians (scientists) are embedded in academic context that act as facilitator as well as constraint in the entrepreneurial process.

Fini. R & Grimaldi. R (2017) while extending views on academic entrepreneurship highlights that industry role is pivotal in creating entrepreneurial culture for developing a conducive habitat for entrepreneurship. This can be done by building academic infrastructure in close vicinity of industry so that the content of research transfer remains intact. This helps in building entrepreneurial habitat with market intervention, thereby increasing the propensity of habitat creating ecosystem. It is pertinent to understand that ecosystem differs from habitat in terms of interplay between tangible and intangibles. Habitat at very basic level creates specialised slices of academic research which on combination with institutional infrastructure (expertise, funding, collaborations, and human capital) develops broader ecosystem, although the core product (research) remains habitat centric.

Further, Fini. R & Grimaldi. R (2017), extending the process approach of academic entrepreneurship, explains that entrepreneurial habitats are drivers of entrepreneurial intentions. Intentions translate into ideas and habitats provide pathways for development of these ideas into tangible research outcomes. Certain academic habitats create ideas, which because of non availability of complementary academic resources lack transition from intangible form to research deliverables. Thus, habitats need to integrate with other academic habitats that provide necessary infrastructure for entrepreneurship and commercialization. Hence, the integration of academia-academia habitats create an ecosystem that is easy for market players to tap in, because of varied choice (in terms of innovation) offered by ecosystems.

Kim, Y. et.al., (2012) conceptualised the impact of tripartite state-industry-academia relationship on industry acceleration. It was found that industry R&D and state relationship contributed to deceleration of firm growth whereas the academia and industry connect created mushrooming of regional firm. The regions with dense entrepreneurial climate created symbiotic relationship between industry-academia and state, suggesting that academic research capacity significantly impacted the regional industry growth and also supported state to generate additional funding for entrepreneurial endeavours.

Feigenbaum. E & Brunner. D (2002) in their book titled "The Japanese Entrepreneur: Making the Desert Bloom defines habitat as a set of conditions where entrepreneurial ideas blossom, develop and get transferred into marketable research, thereby shaping the economic

landscape of the region. Academia as an entrepreneurial habitat comprise of idea generators i.e. entrepreneurs, industry experts, funders, financial institutions and government bodies. An optimum combination of these resources yields an environment that supports entrepreneurship. Other habitat conditions include organisational culture, entrepreneurial attitude, academic vision, notably these habitat conditions act as context under which entrepreneurship is pursued.

Harmonious and balanced interactions amongst all these variables create a mature habitat environment and ideal atmosphere for start-up creation and innovation delivery, the noted instances are firms as Intel, Oracle, SUN, Cisco, Microsoft, Yahoo, E-Bay, Chiron and Genentech. These corporations are evidence of maturity of entrepreneurial habitats in USA in the time period of 1980-1990.

Contrasting this entrepreneurial maturity effect with Asia, Miller, W. F. (2000) talking of Japan, explains that Japanese entrepreneurial habitat has not resulted in creation of highly innovative firms, reasons being the lack of synchronisation of entrepreneurial variables (organisational culture, academic vision, attitudes, entrepreneurs, industry experts, funders, financial institutions and government bodies) that resulted into immature habitats.

Thus it can be drawn that academia across globe are struggling in creating the habitat conditions for enterprising academic varsities but habitat maturity is debatable issue at entrepreneurial variables and the interplay among them varies across academic landscape. So academia need to think habitat first and ecosystem latter for minimising the translation of habitat deficiencies into broader ecosystem.

P_3: Academic entrepreneurship is a sustainable feeder to industrial breakthroughs thereby paving the way for creation of entrepreneurial clusters

Examining this proposition calls for revisiting history of academic entrepreneurship, wherein evidences of academic entrepreneurship signify that academia is a contributor to the research needs of industry and national innovation system.

Carlsson. B (2002) quoting the instances on Sweden and Ohio, narrates that both the economies comprise of biomedical and polymer based industry clusters. The academic entrepreneurship in Ohio is greater in comparison with Sweden, reason being the paths of technology transfer, collaborative mechanisms, density of industry-academia networking, in industry support for carrying academic research act as key differentiator. The industrial clusters in Ohio are more advanced than in Sweden, because academia constantly feeds industrial research needs. The academic entrepreneurial climate in Ohio is more mature as funding, networking, policy making and governance academic drive the academic research which is abysmal in case of Sweden.

Marquesa. J et.al, (2006) study on University of Coimbra, Portugal talks of the triple helix arrangement among industry-academia and state that created strong communication based industries in the region and hybrid form of organisations grew in the academic vicinity. As a response to the growth of communication clusters because of active participation of University of Coimbra, the Portugese government formulated 'Integrated Program for the Support of Innovation PROINOV', in order to strengthen the social networks and resultant economic payoffs across academia and industry, which in turn strengthened that national innovation identity of Portugal in European Union.

Wong. P et. al., (2007) confirms the rise of National University of Singapore (NUS) from a pure research institution to a commercial hum wherein industry and academia works in parallel to each other. This University is actively engaging in commercialisation projects involving technology commercialization, spin-offs, and foreign researcher's mobility and creating culture that embraces entrepreneurship. The reflections of entrepreneurial culture are evident in the curriculum, selection of faculty, academic mission, as entrepreneurial outlook is one of the parameter for evaluation the university stakeholder's involvement in making NUS an entrepreneurial University. .

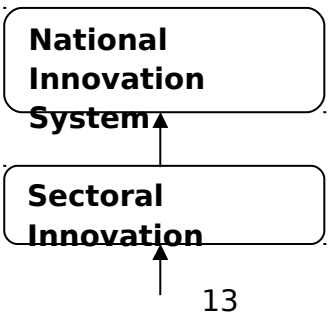
Sidhu. R et.al., (2011) on conforming academia as sustainable feeder to industry highlights the evolving academic structures of Singapore that works on the principle of academia-academia alliances. The Global Schoolhouse policy of Singapore that supports academic collaborations for fostering research and innovations is one of the turning points of Singaporean academic history, as academia is engaged in creating knowledge hubs that is feeding ground for regional industry.

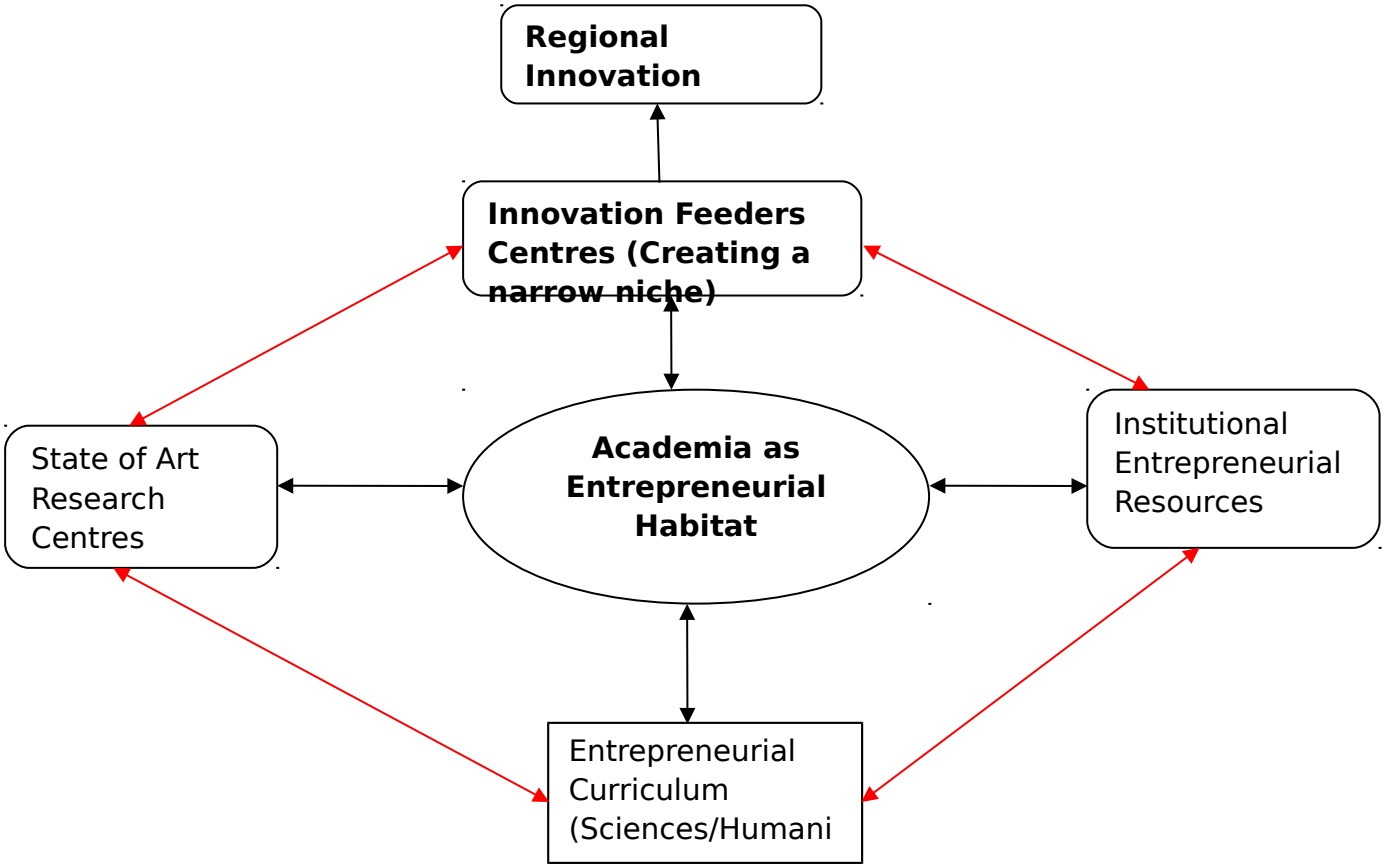
Questioning the self sustainability of academia, "The Entrepreneurial University: From Concept to Action", EULP Programme (2013) prepared by Coyle. P et.al, (2013) suggests that academia in pursuit of being self sustainable need to exhibit entrepreneurial response to the growing innovation needs of society. Academia that was considered as warehouse of knowledge, isolated from market place, need to rethink their essence in terms of being contributors rather than knowledge keepers. Today academia is evaluated against no. of parameters that primarily involve contribution to regional employability, research impact on national innovation system; community engagement, social mobility and teaching. All these parameters cannot be met by relying on state, so markets that were untested research grounds, need to be engaged so that they visualise academia as innovation hubs rather than static knowledge houses.

A report titled "Higher Education, Innovation & Entrepreneurship in Focus (2013) highlights America's quest of academic entrepreneurship, wherein most of the higher education institutions have designed the academic processes that value commercialisation, enterprising and innovation. These three fundamental value propositions are reflected in the prominent academic varsities of America namely University of Akron and University of Wyoming. It is pertinent to mention that these academic institutions don't feed industries bur are key in creating national innovation ecosystems.

Contemporary to America's academic entrepreneurship, Massachusetts Institute of Technology (MIT) presents a classical case of being considered as the creator of Greater Boston entrepreneurship ecosystem. Moreover it is dominantly seen that academia in above mentioned cases are continuously in touch with the state for policy making and at times also provide entrepreneurial wisdom to state for creating sensitive academic policies that nurture commercialisation motive of academia.

4.1 ACADEMIC ENTREPRENEURSHIP QUADRILATERAL- A CONCEPTUAL MODEL





Considering academic entrepreneurship at World's top enterprising academic institutes that comprise of Aalto University (Finland), University of Auckland (New Zealand), University of Cambridge (UK), Imperial College London (UK), University of Michigan (US), MIT (US), University of Oxford (UK), Stanford University (US), Technion (Israel), UC San Diego (US) (Graham. R., 2014), it has been found that academic entrepreneurship is a function of internal as well as external variables. Internal involve institutional factors and external involve state and regional innovation quest. Taking into consideration the discussion of preceding sections while comparing US and European academic entrepreneurship with Asian perspective on enterprising, it can be deducted that for creating academic entrepreneurial habitats, Institutional Entrepreneurial Resources that comprise of Research infrastructure, Human Capital and Networking capacity need to be exploited. On other hand the Entrepreneurial Curriculum that focuses on developing niche entrepreneurial ideas amongst young students need to be created that cater academic specialisation of varsity. This means that science centric entrepreneurship curriculum should focus on creation of TTO's and incubation centres thereby increasing academic economic sense. On other hand humanities and social sciences led entrepreneurship curriculum should create community engagement opportunities thereby spurring social entrepreneurship. So, tailored interventions should replace massification of entrepreneurial curriculum. The interplay between institutional resources and student stakeholder group will create state of art research centres at academic level that involve optimum ratio of experts and material.

Narrowing down the scope of academic deliverables, the enterprising academia needs to strive for creating innovation feeder centres with multiple research orientations. Orientations vary from commercialisation to community connect. These feeder centres can work closely with state funded research labs for creating research clusters involving community, industry, state and academia, thereby paving the way for creation of sustainable habitats that not only connects with stakeholders with a commercial motive but also builds active social inclusion environment. This aspect differentiates purpose of academia as formal education which is basic purpose of academia gets replaced with lifelong learning agenda and is reflected by the

connect (Entrepreneur-Individual, Entrepreneurship-Process, Entrepreneurial-Attitudes, Skills and Behaviour, Entrepreneurial Ecosystem-Role of Society). The focal area is that entrepreneurial habitats are more localised, as per regional needs and thus possesses better potential to connect with society.

Catering to the bottom of innovation pyramid, academic innovation feeder centres as they reach their mature levels will exhibit spill over potential and will create regional innovation centres with strong potential to connect with industry. Following the entrepreneurial pursuit, practicing this connect need to gain mass acceptability as more academia need to engage as per the model so that a national innovation system feeded by academia can be developed.

The model variables have potential to strengthen the innovation pyramid at the bottom level which creates a balance between novel academic pursuits and commercialisation needs, thereby shaping academia in a holistic manner. The need is to identify core academic potential, create infrastructure, align young entrepreneurial minds with institutional enterprising vision and create habitats that bubble with entrepreneurial solutions to societal needs.

5. CONCLUSION & FUTURE RESEARCH

Revisiting a vast body of literature, it becomes evident that academic entrepreneurship emerges from intention, enters into process, creates mindsets and attitudes that are entrepreneurial and finally creates entrepreneurship as a key academic resource. Academic entrepreneurship across globe is common academic priority for meeting the burgeoning innovation needs of economy; but pathways for creating sustainable entrepreneurial habitats are different. This difference is because of context that moderates the relationship among various stakeholders. Context necessitates academia to introspect into their indigenous entrepreneurial habitats and create specialised research hubs that serve bottom of innovation pyramid. It is time to rethink academia and its entrepreneurial motives as per the regional/local needs of economy. The contemporary European and US models of academic entrepreneurship cannot be replicated in Asian scenario, as academia is continuously moving from standardised models of governance to tailored one.

The future research implications involve research on creating performance indicators for different academic entrepreneurial habitats so that entrepreneurial orientations can be mapped. Moreover, the entrepreneurial habitats that consider industry-academia collaboration as important ingredient for commercialisation need to leverage academia-academia collaborations that will act as a point of intersection between science led entrepreneurship and community driven entrepreneurship.

6. REFERENCES

Abreu, M., & Grinevich, V. (2013). The nature of academic entrepreneurship in the UK: Widening the focus on entrepreneurial activities. *Research Policy*, *42*(2), 408-422

Association of University Technology Managers (2010) *AUTM U.S. Licensing Survey: FY 2010*.AUTM, Northbrook, IL.

Bathelt, H., & Spigel, B. (2011). University spin-offs, entrepreneurial environment and start-up policy: the cases of Waterloo and Toronto (Ontario) and Columbus (Ohio). *International Journal of Knowledge-Based Development*, *2*(2), 202-219.

Bienkowska, D., & Klofsten, M. (2012). Creating entrepreneurial networks: academic entrepreneurship, mobility and collaboration during PhD education. *Higher Education*, *64*(2), 207-222.

Brennan, M. C., & McGowan, P. (2006). Academic entrepreneurship: An exploratory case study. *International Journal of Entrepreneurial Behavior & Research*, *12*(3), 144-164.

Brennenraedts, R., Bekkers, R., & Verspagen, B. (2006). The different channels of university-industry knowledge transfer: Empirical evidence from Biomedical Engineering. *Eindhoven: Eindhoven Centre for Innovation Studies, The Netherlands*.

Carlsson, B. (2002). Institutions, entrepreneurship, and growth: Biomedicine and polymers in Sweden and Ohio. *Small Business Economics*, *19*(2), 105-121.

Coyle, P., Gibb, A., & Haskins, G. (2013). The Entrepreneurial University: from concept to action. *National Centre for Entrepreneurship in Education (NCEE)*, 2-58.

D'Este, P., Mahdi, S., & Neely, A. (2010). Academic entrepreneurship: What are the factors shaping the capacity of academic researchers to identify and exploit entrepreneurial opportunities. *Danish Research Unit for Industrial Dynamics Working Paper No. 10*, *5*.

Edvinsson, L., & Malone, M. S. (1997). Intellectual Capital: Realizing Your Company\'s True Value by Finding Its Hidden Brainpower.

Etzkowitz, H. (1998). The norms of entrepreneurial science: cognitive effects of the new university–industry linkages. *Research policy*, *27*(8), 823-833.

Etzkowitz, H. (2002). Incubation of incubators: innovation as a triple helix of university-industry-government networks. *Science and Public Policy*, *29*(2), 115-128.

Feigenbaum, E. A., & Brunner, D. J. (2002). The Japanese entrepreneur: Making the desert bloom. *unpublished monograph, Stanford University*.

Fini, R., & Grimaldi, R. (2017). A Multicountry, Process-Based Approach to Academic Entrepreneurship. In *THE WORLD SCIENTIFIC REFERENCE ON ENTREPRENEURSHIP: Volume 4: Process Approach to Academic Entrepreneurship—Evidence from the Globe* (pp. 1-17).

Glassman, A. M., Moore, R. W., Rossy, G. L., Neupert, K., Napier, N. K., Jones, D. E., & Harvey, M. (2003). Academic entrepreneurship: Views on balancing the Acropolis and the Agora. *Journal of Management Inquiry*, *12*(4), 353-374.

Graham, R. (2014). Creating university-based entrepreneurial ecosystems: evidence from emerging world leaders. *Massachusetts Institute of Technology*.

Haussler, C., & Colyvas, J. A. (2011). Breaking the ivory tower: Academic entrepreneurship in the life sciences in UK and Germany. *Research Policy*, *40*(1), 41-54.

Hannon, P. D. (2013). Why is the entrepreneurial university important?. *Journal of Innovation Management*, *1*(2), 10-17.

Kim, Y., Kim, W., & Yang, T. (2012). The effect of the triple helix system and habitat on regional entrepreneurship: Empirical evidence from the US. *Research Policy*, *41*(1), 154-166.

Klofsten, M., & Jones-Evans, D. (2000). Comparing academic entrepreneurship in Europe–the case of Sweden and Ireland. *Small Business Economics*, *14*(4), 299-309.

Kwiek, M. (2008). Academic entrepreneurship vs. changing governance and institutional management structures at European universities. *Policy futures in Education*, *6*(6), 757-770.

Lacetera, N. (2009).Academic entrepreneurship. *Managerial and Decision Economics*, *30*(7), 443-464.

Mars, M. M., & Rios-Aguilar, C. (2010). Academic entrepreneurship (re) defined: significance and implications for the scholarship of higher education. *Higher Education*, *59*(4), 441-460.

Marques, J. P. C., Caraça, J. M., & Diz, H. (2006). How can university–industry–government interactions change the innovation scenario in Portugal?—the case of the University of Coimbra. *Technovation*, *26*(4), 534-542.

Miller, W. F. (2000). The 'Habitat' for Entrepreneurship. *Silicon Valley Networks Project*.

Mowery, D., & Sampat, B. (2005). The Bayh-Dole act of 1980 and university-industry technology transfer: a model for other OECD governments?. *Essays in honor of Edwin Mansfield*, 233-245.

O'Shea, R., Allen, T. J., O'Gorman, C., & Roche, F. (2004). Universities and technology transfer: A review of academic entrepreneurship literature. *Irish Journal of Management*, *25*(2), 11.

Pilegaard, M., Moroz, P. W., & Neergaard, H. (2010). An auto-ethnographic perspective on academic entrepreneurship: Implications for research in the social sciences and humanities. *The Academy of Management Perspectives*, *24*(1), 46-61

Powers, J. B., & McDougall, P. P. (2005). University start-up formation and technology licensing with firms that go public: a resource-based view of academic entrepreneurship. *Journal of business venturing*, *20*(3), 291-311

Rasmussen, E. (2011). Understanding academic entrepreneurship: Exploring the emergence of university spin-off ventures using process theories. *International Small Business Journal*, *29*(5), 448-471.

Sidhu, R., Ho, K. C., & Yeoh, B. (2011). Emerging education hubs: The case of Singapore. *Higher Education*, *61*(1), 23-40.

Wong, P. K., Ho, Y. P., & Singh, A. (2007). Towards an "entrepreneurial university" model to support knowledge-based economic development: the case of the National University of Singapore. *World Development*, *35*(6), 941-958.

Wright, M. (2014). Academic entrepreneurship, technology transfer and society: where next?. *The journal of technology transfer*, *39*(3), 322-334.

Wood, M. S. (2009). Does one size fit all? The multiple organizational forms leading to successful academic entrepreneurship. *Entrepreneurship Theory and Practice*, *33*(4), 929-947.

Yusof, M., Siddiq, M. S., & Nor, L. M. (2012). Internal factors of academic entrepreneurship: The case of four Malaysian Public Research Universities

WEBSITES

THE world university rankings (http://www.timeshighereducation.co.uk/world university rankings/2010-2011/analysis.html)

http://www.clemson.edu/cecas/departments/automotiveengineering/documents/cuicardeptofcommerce2013.pdf