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## Entrepreneurial Opportunity Recognition and Exploitation in the Academia: a Dynamic Process of Networking

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# Entrepreneurial Opportunity Recognition and Exploitation in the Academia: a Dynamic Process of Networking?

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## Abstract

*Academic Entrepreneurship has drawn large research interest over the last decade. However, few research focus on the processes behind entrepreneurial behavior in favor of more “linear” perspectives such as the individuals’ transformation from an academic to an entrepreneur measured by e.g. number of start-ups. This paper focuses on entrepreneurial opportunities, its nature and source, and speaks for the usefulness of a network perspective on academic entrepreneurship. Interdisciplinary literature is reviewed for research on the significance of networking to entrepreneurial behavior, or more precisely; network significance to opportunity recognition and exploitation among entrepreneurial academics. Entrepreneurial actions are viewed as non-isolated, non-deterministic, and dynamic co-creations through networks. Finally concluding remarks, hypotheses and research ideas are unashamedly presented in which the commercialization process may not be seen as a linear but dynamic process, the opportunity may be created or originate in new knowledge and in turn may be recognized by any member within the academic’s network and that encouragement and various resources necessary for entrepreneurial action may be added by yet others within the network.*

Keywords: *academic entrepreneurship, networks, opportunity recognition, innovation, co-creation*

JEL-codes: L26, O31, I23, I24

## Introduction

This study speculates on the influence social network may have to entrepreneurial behavior among academics in terms of opportunity recognition and exploitation. Prior research of entrepreneurship and innovation tend to circle around a person-centric perspective. This paper attempt to move away from e.g. the much simplified, rather linear e.g. individual transformation of an academic into an entrepreneur, thus from new knowledge creation to new venture (with or without elements of innovation) start-ups, and instead see entrepreneurship and innovation dependent on networks of various types of actors. Academic entrepreneurship is viewed as a process of non-isolated, non-deterministic, and dynamic co-creations through networks. This paper center innovation and entrepreneurship, discusses the nature and source of entrepreneurial opportunity, and look for evidence of network significance to entrepreneurial behavior among academics in existing literature. More precisely, interdisciplinary literature is reviewed to seek clues to support hypotheses on networking significance to opportunity recognition and

exploitation within academic entrepreneurship. Further, it discusses the nexus of innovation, entrepreneurship and networks and hypotheses are unashamedly presented. Finally, ideas for further research are suggested.

Moreover, it is a draft of a research idea striving to reincorporate innovation as central to entrepreneurship and to find out; i) what an *entrepreneurial opportunity* is and originate? ii) How networking influence entrepreneurial behavior among academics in terms of opportunity recognition and exploitation. It proposes an alternative, dynamic, network based view of academic entrepreneurship drawing perspectives from interdisciplinary theories.

This paper adopts a broad definition of academic entrepreneurship: academic entrepreneurship concerns entrepreneurial activities that introduce new knowledge to the economic system. From this more pervasive perspective it follows that AE may take place in various ways from e.g. patenting and consulting to collaborations with the industry. This wider approach may prove itself harder to operationalize in practice. However, as it is argued that the majority of entrepreneurial opportunities may evolve from tacit/intangible character, protected by patents or not is an argument strong enough to motivate this definition.

*Academic entrepreneurship* (AE) has in the 21<sup>st</sup> century drawn large research interest internationally (see e.g. Louise et al, 1989; Henrekson et al, 2000, Jones-Evans and Klofsten, 1999; Meyer, 2003; Shane 2000), nonetheless there is no consensus of the concepts *academic entrepreneurship* or the *academic entrepreneur*. Research is dominated by a somewhat narrow outlook of the concepts, such as “*business spun from the academia which holds intellectual property rights*” (Shane, 2000), producing a considerable amount of publications based on measurable outputs. Others define AE more widely e.g.; “*all commercialization activities outside of the normal university duties of basic research and teaching*” or “*the variety of ways in which academics take direct part in the commercialization of research*” (Henrekson et al, 2000) also incorporating activities such as; consulting, services, larger research projects, patenting, licensing, and businesses run as an occupation on the side (e.g. Jones-Evans and Klofsten, 2003).

Many researchers of AE investigate industry agency offices, technology-based entrepreneurs (Jones-Evans, 1995; Jones-Evans et al.1999), technology parks and incubators (Van Dierdonck and Debackere, 1990; Phan et al, 2005, spin-offs or spin-outs firms are even so widely studied (see e.g. Franklin, Wright and Locket, 2001, Nlemvo et al., 2002, O’Shea et al, 2008). Research on the organizational level; public support mechanisms (Meyer, 2003), university R&D diffusion (see e.g. Acs, Fitzroy and Smith, 1999) patenting and licensing of university inventions (see e.g. Mowery and Sampat, 2001; Mayer et al., 2003; Powers and McDougall, 2005), the entrepreneurial university (see e.g. Hoye and Pries, 2009). On the individual level, conditions and incentives for commercializing is of growing interest (see e.g. Henrekson and Rosenberg, 2000; Birley and Westhead, 1994; Davidsson and Honig, 2003; Mowery et al, 2001).

This scattered scientific approach to the research field constitutes pieces of a puzzle far from nearing a completion and despite long time interest in entrepreneurial behavior of academics, little is known about the *process* behind the recognition and exploitation of entrepreneurial opportunities. Entrepreneurship cannot be fully understood nor stimulated from more or less fixed models (see e.g; Dasgupta and David, 1994; Jong-Hak et al.,

2006; Chang et al, 2009) such as the triple-helix approach (see Etkowitz and Layersdorff, 2000). There is therefore a need to understand the underlying factors encouraging entrepreneurial behavior and there is a gap in the research of the significance networks has to entrepreneurial behavior among academics.

A social network perspective may provide a lens capable of analyzing entrepreneurial dynamics and the purpose of this conceptual paper is an attempt to contribute to this understanding. Few process-oriented studies have been conducted and only partial empirical evidence exists for a theory of network entrepreneurship in the academia. A few empirical studies has been identified and examined in this paper to assist in forming hypotheses. The objective of this paper goes beyond the person-centric orientation of the traditional literature of entrepreneurship and attempt to explore the significance of networking to opportunity recognition and exploitation. The first objective of this paper is to define, conceptualize and understand academic entrepreneurship. To develop my arguments, I first discuss the nexus of innovation and entrepreneurship and the usefulness of a social network perspective, then go on to a description of entrepreneurial opportunity and take support in theory to discuss the entrepreneurial process from an effectual, co-creative perspective.

### **The Nexus of Innovation and Entrepreneurship**

The academia produces new knowledge that through entrepreneurial activities transform into innovations in the market place. Academic entrepreneurship therefore naturally combines the perspectives of entrepreneurship and innovation. However, these strands of research are rarely *conceptually* intertwined.

Drucker (1985) defines entrepreneurship as an *act of innovation* in which resources are reinforced with new “wealth-producing capacity”. Similarly, Schumpeter (1936) states that; *entrepreneurship is innovation* by re-combinations of knowledge and that entrepreneurship are actions initiated by an “*entrepreneurial vision*” that by coming into conscious *awareness* transforms into a *resource* that may be used for these action. By Schumpeterian definition, entrepreneurship boundaries limit entrepreneurship to the moment the business owner “settles down to run her business”, as to where it “ends”.

Innovation promotes socioeconomic progress. To this most researchers are willing to agree. But what mechanisms commercialize science? The innovation model, in its simplest form, *the linear model of innovation*, was among the first to attempt to explain the relation of science and technology to the economy. The model suggests that innovation starts with basic research, may continue by applied R&D to complete with production and diffusion. Later, the model has been modified by e.g. the views of technology push" and "market pull" indicating the source of idea as research breakthroughs or ideas retrieved from the market respectively (Godin, 2006). Although criticized, the model has over the years been widely cited and has influenced a linear long lived conception of innovation (Mowery 1983, in Godin, 2006). The critique put forward are for example the assumption of a causal process based on scientific breakthroughs although most innovations on (firm) level are based on actual needs constructed by new combinations of existing knowledge in the market. Moreover, reconsiderations along the different stages (loops) of the innovation process are not presented in the model and that these are important as they can initiate new directions of the process, new innovations or even abandonment (Kline and Rosenberg, 1986). Godin (2006) argues;

“the long survival of the model despite regular criticisms is because of statistics. Having become entrenched with the help of statistical categories for counting resources and allocating money to science and technology and standardized under the auspices of the OECD and its methodological manuals the linear model functioned as a social fact. Rival models, because of their lack of statistical foundations, could not become substitutes easily.”

Similarly, Fagerberg et al (2005) stress the importance of openness to new ideas and solutions in the early phases of innovation based on the rational of basic characteristic of innovation; “every new innovation consists of a new combination of existing ideas, capabilities, skills, resources etc. It follows logically from this that the greater the variety of these factors within a given system, the greater the scope for them to be combined in different ways, producing new innovations which will be both more complex and more sophisticated”. They also points out the focus around the Bayh-Dole Act<sup>1</sup> to further narrow down the focus to deliverable outputs (such as number of patents etc.) based on “a poor understanding of the full spectrum of roles fulfilled by research universities in industrial economies, as well as a tendency to emphasize the output of university research that can be easily quantified”. In accordance, Bygrave (1993) reasons that innovating decision processes of an entrepreneur involves discontinuities that place it beyond quantitative models. Having that said and by adopting the Schumpeterian boundary of entrepreneurship; do one dare to question if it is really actions of entrepreneurship, or the outcome of these that are predominantly studied? Therefore I will argue for the usefulness of a social network perspective.

In relation to entrepreneurship, social networks may be seen as a significant as source of new knowledge (Johannisson (1990) and opportunities (Singh et al.1999, Burt, 1992) and provide access to opportunity various resources, the one that first comes to mind may perhaps be of the more obvious kind such as; capital, new employees, strategic alliance partners, service providers (e.g. lawyers, accountants, consultants) but also possibly more importantly to formal and informal intellectual resources, a supportive “people-based infrastructure” of e.g. information, market and technology assessments, lessons learned (Malerba, 2008). In addition, personality-based theories have fallen short in finding empirical evidence to support its arguments. For example, personal characteristics fulfilled may increase the ability to recognize entrepreneurial opportunity, however as an isolated characteristics is not enough to explain entrepreneurial activity. A social network perspective may be useful defining entrepreneurship as embedded in, facilitated and constrained by continuing and evolving social relations.

### **What are Entrepreneurial Opportunities?**

Shane and Venkataraman (2000) point to a gap in entrepreneurship research, the aspects of; “*the presence of lucrative opportunities*” and “*the presence of enterprising individuals*”. To Drucker (1985), change, in e.g.; industry and market structure, along with available science through “*human perception, mood and meaning*” is the general source of innovation. To Shane (2000) technological, political/regulatory or social/democratic changes are sources of opportunity. Entrepreneurship is at its core related to circumstance and opportunity (see e.g. Drucker, 1985; Shane and Venkataraman, 2000) therefore it is relevant to discuss what entrepreneurial opportunity is.

Wennekers and Thurik (1999) argue that opportunities can be either perceived or created, cited on the definition on entrepreneurship; “the manifest ability and willingness of individuals, on their own, in teams, within and outside organizations to perceive and create new economic opportunities.” McMullen et al. (2007) characterize schools of opportunities in categories in which the economic school the opportunity is described as *objective* and in society *existent*, while the “cultural-cognitive” school hold opportunity as *emergent and constructed* of “subjective, shared meaning of knowledge”. Moreover, that the “sociopolitical school describes the opportunity as *objective social network structures* though partly dependent on the individual entrepreneurs political and persuasive skills. Others (e.g. Venkataraman, 1997; Shane and Venkataraman, 2000) describe entrepreneurship as an activity that involves the *discovery, creation and exploitation* of opportunities with the aim to introduce novel goods, services or processes to the marketplace.

To Holcombe (2003) the imperfection of entrepreneurial activity will leave room for others to exploit the opportunities left out (“existent”) or created (“new”) by its fore comers. This suggests that entrepreneurial activity itself is an important source of opportunities. McMullen et al (2007) argue that “the nature and source of entrepreneurial opportunity are important issues for understanding how markets function and come into being” and if opportunities are created or existent awaiting discovery. Buenstorf (2007) reason from an evolutionary economic perspective that “entrepreneurial opportunities are mostly created by the activities of human agents ... and although individuals may deliberately create opportunities, these are often the unintended consequence of human activities motivated by other –‘non-economic’ – objectives”. Entrepreneurial opportunities being exogenous existent or created, the question is whether the entrepreneur herself or another agent creates the opportunity. Buenstorf (2007) separate the “opportunity to create the opportunity” from *the opportunity* in which the former may constitute a scientific breakthrough or regulatory change that forms the base for a new entrepreneurial opportunity to be created, discovered or exploited. Kirzner (1979), isolated the “entrepreneurial element” by contrasting routine behavior (optimization) to spontaneous acts and that these acts were triggered by something, “*alertness to hitherto undiscovered opportunities*” if you will. Kirzner (1973) quoted; “at any point in time, only some subset of the population will discover a given opportunity”. Similarly, Hayek (1948) states that “...all opportunities must not be obvious to everyone all of the time”. Correspondingly, knowledge is idiosyncratic in that knowledge diffused into society is absorbed through each individual’s personal experiences, prior knowledge and social relations. Through this process, opportunities are recognized by some, but not others (Acs, 2002). To Shane (2003) some individuals may have a better ability to recognize opportunities or due to their better access to information. To Kirzner (1973) information guide the entrepreneurial actions, for which asymmetric information cause various interpretations of opportunity. To Baker, Miner, and Eesley (2003) the individual differences in opportunity spotting is more a matter of the different characteristics of the networks the individual is embedded in.

Economic value, mobilization of resources and uncertainty affect the perceived opportunity. “Bringing to market activities and products related to new scientific knowledge and advanced technology means placing major relevance on the commercial organization of knowledge transfer. “ Meaning, the market needs to be considered; new knowledge transformed into workable business conceptions and designs, and requires an organization of bringing together resources.

## Social Networks

Social Network theory in summary form, the argument runs as follows. A person's network may be defined as constructed by all the people an individual knows (Barnes, 1972). Granovetter's (1973) theory of *strong and weak ties* divide a network into people a person may know well (strong ties) and less well e.g. acquaintances (weak ties). In relation to new knowledge the theory is based on reason that a person's access to new and unique information is more likely through weak ties than strong ties based on the logic of irregular interaction and in turn the weak ties' *embeddedness* in yet other networks. Thus, social networks are not fixed but constitute the social context and can be activated and used accordingly to different needs (Granovetter, 1985).

Existing research on entrepreneurship and networks look at the relationship between networks and e.g. creation of new firms (Johannisson and Ramirez-Passilas, 2001), resource acquisition (Birley, 1985; Aldrich and Zimmer, 1986), firm performance and survival especially in the early stages (Podolny et al., 1996) Reese and Aldrich, 1995). However, about the relationship between networks and entrepreneurial opportunity recognition and exploitation, in relation to academic entrepreneurs in particular, less is known.

Greve and Salaff (2003) point out that entrepreneurs have a systematic approach to network building that vary with the phases of establishing a business. The most time spent building networks and using the network contacts for discussing ideas is in the early phases. Entrepreneurs get support, knowledge and access to distribution channels through their social networks, and depending on the resources needed the entrepreneur will combine, organize and "activate" their social network accordingly. By positioning themselves in the social network entrepreneurs get fasten this process but also expand the opportunities made available through the social network (Granovetter, 1973, Burt, 1992). The relations of entrepreneurs tend to be predominantly informal but also formal or informal and be work or non-work related, extend over personal networks to organizations, institutions and so forth (Hansen, 1995).

Hills et al. (1997) found that entrepreneurs with extended networks identify more opportunities than their counterparts and made assumptions that the quality of the network contacts would influence abilities of e.g. alertness. Burt's (1992) "structural hole argument" builds on Granovetter's concept arguing that weak ties can "bridge" between networks (structural holes) and thereby "bridge" and expand the network connections open access to new knowledge and important inputs (Burt, 1992). The contacts within the social network that will lead to successful outcomes are key components and also constitute the individuals *social capital* and may grow over time by conscious actions of the entrepreneur.

## New Knowledge and Co-creation of Commercial Value

Reynolds (1991), point out that entrepreneurs embed their decisions in social structures. Also Schumpeter (1936) reasoned on the use of external actors for the innovation process. For example, he argued that the uncertainty of innovation could be reduced or even removed by asking customers what they want. Von Hippel (1988) similarly argues that user experience is the most important source of innovation, and not science itself.

To Sarasvathy (2001), in theory, the entrepreneurs' process may "start with three resources, which vary according to the individual/s in question: (a) who they are – their identity; (b) what they know – their knowledge base; and (c) whom they know – their social networks". Moreover, to Dew and Sarasvathy (2007) the entrepreneur act upon what they have and can afford to do;

"...this involves interacting and negotiating with potential stakeholders they already know or happen to meet. A key aspect of these initial interactions is that the entrepreneur may or may not start with some particular idea for an innovation, and either way the idea does not determine with which stakeholders he/she negotiates. Rather the inverse, in fact. The nature of the innovation is determined by which stakeholders self-select in to the venture by negotiating some kind of deal with the entrepreneur. This series of deals – together with other contingencies that occur along the way – determines which innovation actually comes to be. This self-selection process sets in motion a cycle of increasing resources available to the venture while at the same time imposing constraints on the innovation being developed by the venture".

No assumption of existing customers is made but stakeholders are incorporated (of which customers can be part of) as *co-creators* in the entrepreneurial (innovation) process. Stakeholders' inputs modify the innovation according to their information and resources and may turn its direction. Thus, the process may be *effectual*, in contrast to strictly *causal*. Sarasvathy et al, (2003) emphasis on the *value*; "if values are shared, then goals can be flexible and attempts to satisfy consensual preferences can manifest as various actions". In effectual reasoning the entrepreneurial process involves imagination, for the creativity involved in the idea generation process but also for the matching of possible stakeholders. The forming of the idea as well as the direction of the development of the same is subject to the stakeholders input. The rational is that the process and its goal is not determined neither random. The stakeholders are intentional, all with an outlook on the new knowledge as commercially viable and therefore willing to invest, whatever resource. Possible impacts of the innovation once successfully commercialized are continuously reconsidered along the way (Sarasvathy et al, 2003). Dew et al. (2004) argues similarly of "*Knightian uncertainty*" that occurs with the dispersion of knowledge over people, places and time. Given that people know different things in combination with uncertainty relates to different people having different expectations. "Uncertainty both creates the opportunity and the necessity for expectations, and the dispersion of knowledge makes it inevitable that those expectations will be heterogenous". Individuals therefore imagining possible outcomes leading to different expectations and an alternative value of resources. Moreover, expectations are constantly being modified as the result of past actions and "as the future starts to unfold in unexpected ways the agents modify their expectations for further action. This heterogeneity is vital to the decision to create a structure for action. "Network theoretic analysis of expectations... confirms the criticality of the dispersion of knowledge to expectation formation by pointing out how information channeling through social networks effects the expectation formation by economic agents"(Bikhchandani et al. 1992 in Dew et al. 1992). Moreover, it is argued that "when a very high uncertainty is attached to an opportunity, then only one individual sees value in it; very often, there is some attribute the individual possesses – prior knowledge, a particular network of connections, or a very specific asset – that leads her to exercise judgments" (Dew et al. 1992). Much in line with the rational of *living labs*, a



new structure of open innovation theory in which various actors not only shorten the time to market through the shared interest of stakeholders but through user-group involvement in real-life settings that improve and fit the innovation (Folstad, 2008).

Similarly, to Koppl et al. (2010) innovations may not have customers, but even if obtained, feedback is from existing and not emerging firms; *“as the entrepreneurial phase is in the making...”* They conclude that uncertainty on the demand and supply side must be addressed concurrently (all stakeholders) displaying a less linear entrepreneurial process in which *“the entrepreneur discover an opportunity, produces a product, and then adapts the product to consumer feedback.”* Moreover, they propose;

*“...entrepreneurial efforts are likely to be contingent on an adequate consideration of the desires of all stakeholders, not just consumers. Just like designers often had to configure representations of imaginary users for whom to design their products, entrepreneurs are likely to have to engage in a similar process for each and every stakeholder group.”*

I hypothesize:

1. *“A commercial value of new knowledge may within the network be recognized by another network member than the academic herself and though the consensus for commercial value the entrepreneurial process is carried forward by the network member’s co-creation of the opportunity.*
2. *When visions (imagination) of the possible uses are shared, it may initiate commitment and action and thus an entrepreneurial opportunity is created.*

## **Research on Networks and Academics**

The following section present empirical evidence from previous research on networks and academics.

### **Industry Collaborations**

Research has shown that at the organizational level, traditions in academia to collaborate with industry in research increase the likelihood of commercial viability of their research (Jong, 2006, Feldman and Desrochers 2004). Some scientific disciplines may be more able to naturally adjust themselves to the encouraged entrepreneurial behaviors (*“the universities third mission”*). For example, there might within certain disciplines such as engineering, be tradition of e.g. shared methodologies or research areas (Hakala and Yliyoki, 2001).

Lissoni (2010) investigated academic inventors as *“brokers”* and found that relationships with co-inventors from industry are less likely to be maintained over time than those with co-inventors from academia; that they are also less likely to go beyond contacts for information exchanges. Moreover, academic inventors tend to have a central network position that may be explained by the academic being between homogenous groups of co-inventors (all from either industry or the academia) while to a lesser degree academic inventor’s span over both, but when they do, those relational ties appear to be stronger with both. Moreover, the evidence point to that academic inventors involved in few patents tend to maintain relations for research or funding purposes while those with more

patenting activities tend to use relations for more strategic reasons. Lissoni concludes that the social contacts through industry collaboration may be part of the reward, seen as an invention incentive by improved reputation and career in- and outside the university.

Balconi, Breschi and Lissoni (2002, in Malerba 2008) found that the academics relational management with industry contact often is part of a strategy to e.g. set up new research groups, facilities or methods or give interesting research ideas. That is; "... many more academic entrepreneurs are looking, at each point of time, for "new combinations" within the realm of basic research than one can believe by assessing only the spin-off creation or the patenting rate of universities". Birley (1985) argues that "whilst most the institutions are prepared to solve specific problems, they are not in the business of diagnosis or counseling, thus the entrepreneur seek efficiency in his social network. Christensen and Peterson (1990) hold correspondingly that social settings around a person's network may significantly influence the generation of new ideas.

An empirical study by D'Este et al. (2010) investigating what factors shape the capacity of academic researchers to identify and exploit entrepreneurial opportunities, concludes that collaboration with industry and the awareness and ability to exploit commercial opportunities are correlated and likely to be self-reinforcing. Thus, "the higher the level of industry interaction, the more likely it is that academic researchers will recognize the potential applications of their research and the better will be their understanding of market conditions and business processes." Moreover, "the stronger the taste for commercial opportunities and the higher the level of entrepreneurial skills among academic researchers, the greater will be their inclination to search for funding from industry and strengthen linkages with business." Further, that "past collaborations with industry show a positive and significant impact only for the case of 'opportunity exploitation', while there is no statistically significant impact in the case of 'opportunity identification'." (D'Este et al. 2010)

### **Networks and Scientific Excellence**

Etzkowitz (1989) showed that transfer of knowledge to the industry predominately derive from successful scientists. Although the working place allows networking and build up a large common mass of knowledge (Nahapiet and Ghoshal, 1998), it is of the same kind, conceptualized by Burt (1992) as *redundant*. Drawing from research results from D'Este et al (2010) *research network* has a negative effect on the probability of university researchers engaging in opportunity identification but a positive effect on opportunity exploitation. This goes in line with Burt's (1992) reasoning of weak ties (here: outside the workplace) that provide more "new information" than strong ties (here: colleagues) that move in the same circles. Moreover, the research findings indicate a significant impact of scientific excellence on the likelihood of recognizing an entrepreneurial opportunity but the proposed impact of scientific excellence on the exploitation of entrepreneurial opportunities no significance were found. They conclude that "the higher the scientific excellence of the academic researcher, the more likely it is that he/she will identify commercial opportunities arising from his/her research". However, it does not necessarily favor the decision to act. Similarly, in line results are presented by Wetter and Wennberg (2007) whom mapped out what effects individuals with an academic degree has had on economic development and job creation in Sweden during, 1990-2002 and what factors that may influence one's entrepreneurial behavior (here defined as (any) business start-up). Among the results they found indications on that the likelihood of a

person starting a business increase with the level (higher) of education the person has, however decreases for persons with a PhD degree.

Similarly, also others (see Shane and Venkataraman, 2000, and Uzzi, 1997), point out the significance of prior and “excellence” knowledge to opportunity recognition. The *raison d’être* being that new knowledge is combined with “old”, processed and absorbed with a greater understanding outcome than if prior knowledge would not exist. They reason that depending on the *mass* and *content* of prior knowledge new and different opportunities will be recognized. Cohen and Levinthal (1990) concurrently speculate on the logic that a higher education normally would mean a wider knowledge span to be put in use for new combinations and opportunities.

Extensive cross-institutional collaboration networks (Rafols, 2008; Bammer, 2008) established by a researchers does not give evidence of increased likelihood of opportunity exploitation. However, the research indicates that the ability to embrace a broader range of disciplinary fields in research, thus integrating knowledge activities and find associations between research expertise and industrial usefulness, increase the likelihood of exploitation. D’Este et al. (2010), reason that “identification of entrepreneurial opportunities is more likely among academic researchers with a wide cross-institutional research collaboration network.”

Based on the above I hypothesize,

*Network of academic “excellences” may be redundant in nature, constituted of strong ties in favor of deepening the scientific progress but with the downside of limiting entrepreneurial opportunities and commercial perspectives.*

Sanders in McMullen et al. (2007) Propose an entrepreneurial opportunity to new goods and services;

*“...the opportunity for a new product can be broken down into constituting bits of knowledge and by definition only emerges when all of its knowledge-components exist. Only when an entrepreneur (firm or person) has the vision to bring together all pieces of required and helpful knowledge and combine them with the financial, material and human resources needed to develop the idea into a product. The latter activity is mostly profit driven but presupposes that the knowledge, finance, and resources are available. And even then history shows that it is the market and a considerable share of luck that determines which innovations succeed and which fail.”*

Much in line with the concluding remarks of D’Este et al (2010);

*“while scientific excellence of research and prior entrepreneurial experience shape opportunity identification; it is the capacity of combining multiple bodies of knowledge and the experience in collaboration with users that most distinctively shape opportunity exploitation”.*

“A great deal of knowledge created at universities is tacit and uncodifiable, and the dissemination of such knowledge requires direct interpersonal contact” (Allen, 1984).

Powell et al (1996) “when the knowledge base of an industry is both complex and expanding and the sources of expertise are widely dispersed, the locus of innovation will be found in networks of learning, rather than in individual firms”

Allen did refer to the movement of university staff for the sake of knowledge diffusion, but nonetheless the statement holds interesting clues that can be brought to light by another quote. Shane (1997) interviewed MIT spin-off founders and investors in the search for qualitative evidence of the significance of industry relations and funding to the formation of spinoffs. The evidence showed that the relation provides increased credibility when seeking other funding but also a confirmation of a strategic use of relations. One investor explained his readiness to invest;

“(The founder) described something that quite frankly I didn’t understand. You know there were two lasers. You bounce them off a point on the wafer. You measure the acoustical wave disturbance. You run it through some device, and presto you have a measurement. So being polite, I said something along the lines of, “Well that’s really great but does it have any commercial significance? And this is one of the key parts about MIT being different than other places. He said, “Well the work is funded by Intel and IBM.”

### Informal links

Besides the formal networks between the e.g. the university and surrounding industry, research has shown that also informal links can facilitate future collaborations (Ponomariov and Boardman, 2008). Wong (2001) stress the need for universities to better leverage on informal networks (alumni, angel investors and industry partners) to facilitate commercialization and exemplifies with Tsinghua University in China that through alumni has successfully founded ventures through its science park using the university’s technology and IP and point out similar experiences in Korea. Moreover, Wong argues that commercialization would be facilitated through expanded and deepened informal interactions between university faculty, students and industry.

### Hypotheses

It can be assumed that the successes of the entrepreneurial actions are dependent on the various and total inputs of the actors involved in the process. These actors are in the network context of the academic, placed in the formal and informal web of actors. Based on the examination of academic entrepreneurship as distributed across agents, I hypothesize;

“The larger the diversity in the structure (strong and weak ties, formal, informal) of the academics network, (compared to academics with predominantly strong ties, e.g. limited to research colleagues in the same field) the more likely it will be

that academic researchers will (a) identify and (b) exploit entrepreneurial opportunities.

“The network itself is a source of opportunity (new combinations of knowledge form new knowledge and opportunity) and creates an encouraging environment leading to entrepreneurial action”.

## **Conclusion**

The process of the idea commercialized on the market may not be seen as a linear process, in which the academic owns the idea (identification of the commercial viable science) and becomes the entrepreneur by starting a company but rather as a dynamic process in which the origin of the idea may come from outside, identified by members within the network of the academic and the appreciation of its commercial value, and the necessary resources (intellectual capital, entrepreneurial experience, re-innovation processes etc.) is added by yet others within the network. The presented concepts describes academic entrepreneurial actions as non-isolated, non-deterministic, and dynamic co-creating through networks.

The network structure in terms of redundancy, strong and weak ties is likely to influence the possibility of opportunity recognition. Each network is a unique set of social capital and the combined social capital of the network is likely to influence the direction of the entrepreneurial process and creation of entrepreneurial opportunity

Taking the arguments of Bauendorf (2007) “entrepreneurial opportunities are mostly created by the activities of human agents...” in relation to the scientist that on at least at the level of basic research strive to create new knowledge for the purpose of contributing to the knowledge mass and that new knowledge through social networks are recognized as commercially viable. This new knowledge may be alternated to fit the market.

The arguments of structural holes (Burt) support the idea of a co-created process as the social capital of another (added) network may identify new uses for new knowledge that were not recognized within the first network. Thus, others see potential in the new knowledge, and the various stakeholders commit and help formulate a concept/use and committed resources make the pursuit of the commercial value possible, thus an opportunity is created. The development of the commercial concept and use form the new knowledge in the possible direction given the resources available and drawing on Sarasvathy’s hypothesis that each entrepreneur act on the basis of what they can afford to invest (lose) and that this facilitates or constrains the outcome.

## **Research idea**

In the literature, only a few studies (quantitative or qualitative) on the networks of academic entrepreneurs have been done.

Social network analysis is suitable tool for studying networks of individuals in terms of generators of new knowledge and entrepreneurial opportunity and exploitation.

The objective is to produce innovative techniques and datasets to allow a quantitative assessment of 1) the size and structure characteristics of social networks to which academic entrepreneurs belong to, and 2) back track the source of opportunity recognition and initiative to exploitation. In particular, two networks are in focus, the “professional” network, in which you recognize e.g. colleagues but were initiated through the institution of the university and second, the “personal” network where the intention and interest of driving those relationships are initiated from the individual. “Strong ties” may prove significant to the process of new knowledge creation and opportunity recognition while “weak ties” may prove significant to the opportunity creation and exploitation of that new knowledge.

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