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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 social network perspective on academic entrepreneurship. Inter-disciplinary literature is reviewed for research on the significance of social network to entrepreneurial behavior of academics, or more precisely; social networks significance to opportunity recognition, evaluation and exploitation among entrepreneurial academics. Academic entrepreneurial actions are viewed as non-isolated, non-deterministic, and dynamic co-creations through social networks. Finally concluding remarks, hypotheses and research ideas are 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 social network and that encouragement and various resources necessary for entrepreneurial action may be added by yet others within the network.

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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 social network perspective on academic entrepreneurship. Inter-disciplinary literature is reviewed for research on the significance of social network to entrepreneurial behavior of academics, or more precisely; social networks significance to opportunity recognition, evaluation and exploitation among entrepreneurial academics. Academic entrepreneurial actions are viewed as non-isolated, non-deterministic, and dynamic co-creations through social networks. Finally concluding remarks, hypotheses and research ideas are 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 social network and that encouragement and various resources necessary for entrepreneurial action may be added by yet others within the network.

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# 1. Introduction

This paper considers the influence social network may have on entrepreneurial behavior among academics in terms of opportunity recognition, evaluation and exploitation. Prior research of entrepreneurship and innovation has tended to evaluate a person-centric perspective. This paper attempt to move away from the much simplified, rather linear perspective of the transformation of an academic into an entrepreneur, and instead explore to what extent academic entrepreneurship and innovation depend on social networks. Academic entrepreneurship (AE) is viewed as a process of non-isolated, non-deterministic, and dynamic co-creations through social networks. This paper center academic innovation and entrepreneurship, discusses the nature and source of entrepreneurial opportunities, and search for evidence of the significance of social networks for entrepreneurial behavior among academics in existing literature. More precisely, interdisciplinary literature is reviewed to seek clues to support hypotheses on the significance of social networks to opportunity recognition, evaluation and exploitation within AE. Finally, ideas for further research are suggested.

Research on academic entrepreneurship naturally intertwines theories of innovation and entrepreneurship and this paper strive to find out; i) what an *entrepreneurial opportunity* is and where it originates ii) how social networking influence entrepreneurial behavior among academics in terms of opportunity recognition, evaluation and exploitation. It proposes a dynamic, social network based view of AE drawing perspectives from interdisciplinary theories.

Academic entrepreneurship has in the 21<sup>st</sup> century drawn large research interest internationally (see e.g. Henrekson *et al*, 2000, Jones-Evans and Klofsten, 1999; Meyer, 2003; Shane 2003), 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). This paper adopts a broad definition in which AE may take place in various ways from e.g. consulting to collaboration with the industry.

Many researchers of AE investigate industry agency offices, technology-based entrepreneurs (see e.g. Jones-Evans, 1995; Jones-Evans *et al.*, 1999), technology parks and incubators (see e.g. 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 Lockett, 2001, Nlemvo *et al.*, 2002, O'Shea *et al.*, 2008). Research on the organizational level; public support mechanisms (see e.g. 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; 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. Birley and Westhead, 1994; Henrekson and Rosenberg, 2000; Mowery and Sampat, 2001; Davidsson and Honig, 2003).

Despite long time interest in entrepreneurial behavior of academics, little is known about the *process* behind the recognition, evaluation and exploitation of entrepreneurial opportunities. Entrepreneurship cannot be fully understood nor stimulated from more or less precencieved models (see e.g; Dasgupta and David, 1994; Jong-Hak *et al.*, 2006; Chang *et al.*, 2009) such as the triple-helix approach (see e.g. Etkowitz, 1989). There is therefore a need to understand the underlying factors encouraging entrepreneurial behavior among academics and only a few studies has been conducted on the significance social networks has to entrepreneurial behavior among academics(see e.g. Déstet *et al.*, 2010; Wetter and Wennberg, 2007). Aldrich and Zimmer (1986) point to a research gap in understanding entrepreneurial behavior from a social network perspective, embeddedness in specific.

A social network perspective provide a lens capable of analyzing entrepreneurial dynamics, to identify patterns and roles of actors affecting the entrepreneurial process among academic entrepreneurs. The purpose of this paper is to contribute to this understanding. Few process-oriented studies have been conducted and only partial empirical evidence exists for a theory of social network on academic entrepreneurship. A few empirical studies has been identified and examined in this paper to assist in forming hypotheses. This paper goes beyond the person-centric orientation of the traditional literature of entrepreneurship and attempt to explore opportunity recognition, evaluation and exploitation from a social network perspective. To develop my arguments, I first discuss the nexus of innovation and entrepreneurship and the usefulness of a social network perspective, then I go on to a description of entrepreneurial opportunities and take support in interdisciplinary theories to discuss the entrepreneurial process from an effectual, "co-creative" social network perspective.

## **2. The nexus of innovation and entrepreneurship**

The academia produces new knowledge that through entrepreneurial activities may transform into innovations in the market place. Academic entrepreneurship therefore naturally combines and conceptually intertwines the perspectives of entrepreneurship and innovation.

Drucker (1985) defines entrepreneurship as an *act of innovation* in which resources are reinforced with new “wealth-producing capacity”. Similarly, Schumpeter (1936) define entrepreneurship as 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 actions. By Schumpeterian definition, entrepreneurship boundaries limit entrepreneurship to the moment the business owner “settles down to run her business”, as to where entrepreneurship “ends”.

The majority of innovations promote 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 attempts 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 long lived linear conception of innovation (Mowery 1983, in Godin, 2006). The critique put forward is for example the assumption of a causal process based on scientific breakthroughs although most innovations (on firm level) are incremental and constructed by new combinations of existing knowledge. Moreover, by assuming a linear process, the much reconsiderations in the innovation process is not properly considered, and that these are important as they can initiate new directions of the process, lead to new innovations or on the contrary abandonment (Kline and Rosenberg, 1986). Godin (2006:6) 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.* (2005:274) 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 point out the focus around the Bayh-Dole Act<sup>1</sup> to further narrow down the focus on measurable 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 (1989) reason that innovation decision processes of an entrepreneur involves discontinuities that may 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

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<sup>1</sup> A legal act of 1980 shifting the intellectual property rights of inventions derived from the university’s (federal government-funded) research from the individual researcher to the university.

actions of entrepreneurship, or the outcome of these that are predominantly studied?

In relation to entrepreneurship, social networks may be seen as a source of; new knowledge (Johannisson, 1990) opportunities (Hills *et al.*, 1997; Burt, 1992) and various resources. The one that may first come to mind is perhaps the obvious such as; capital, new employees, strategic alliance partners, service providers (e.g. lawyers, accountants, consultants) but also, possibly more importantly; formal and informal intellectual resources, a supportive “people-based infrastructure” of e.g. information, market and technology assessments, lessons learned etc. (Balconi *et al.* 2004). In addition, personality-based theories have fallen short in finding empirical evidence to support its arguments (see Aldrich & Zimmer, 1986). For example, one can easily argue that even is a person portray characteristics considered important for entrepreneurial activity to take place, it is not enough to explain entrepreneurial activity. A social network perspective may be useful by defining entrepreneurship as embedded in, facilitated and constrained by social relations. In the coming sections I will therefore build up arguments for the usefulness of a social network perspective to better understand the underlying processes of entrepreneurial behavior.

### 3. What are entrepreneurial opportunities?

This section discusses on an interdisciplinary theory base what an entrepreneurial opportunity is and from where it originates with the purpose to later on put it into the perspective of academic entrepreneurship.

Shane and Venkataraman (2000), point to a gap in entrepreneurship research; the lack of aspects of what they call “*the presence of lucrative opportunities and 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 (2003), 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. They define entrepreneurship as the ability and willingness of individuals by themselves or in teams to inside or outside the organization 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. 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 forerunners. 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 significant to the understanding of market creation and function, and to understand if opportunities are created or existent. Buenstorf (2007) reason from an evolutionary economic perspective in which entrepreneurial opportunities mostly are created by the activities of other agents and may be intentional, but often unintended consequence of these 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.

Moreover, 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 previously undiscovered opportunities. Kirzner (1973) and similarly, Hayek (1948) argue that at any point in time only some people will discover a given opportunity. 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). Certain individuals may have a better ability to recognize opportunities or due to their better access to information argued by Shane (2003). To Kirzner (1973) information guide the entrepreneurial actions, for which asymmetric information cause various interpretations of opportunity. Baker *et al.* (2003) point out that the individual differences in opportunity recognition are more a matter of the different characteristics of the social networks the individual is embedded in. Moreover, that economic value, mobilization of resources and uncertainty affect the perceived opportunity. To bring activities and products related to new scientific knowledge and advanced technology to market increases the significance of the commercial organization of the 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.

## 4. Social networks

Acting on an entrepreneurial opportunity, the commercialization of research demands access to necessary resources, both financial and other like well-developed commercial networks (know-who), management expertise (know-how) (Mustar, 1997), and external mentors (Radosevitch, 1995). Social networks can be activated and used accordingly to different needs (Granovetter, 1985). This section introduces the concepts and basic rational of social network theory to later lead up to the arguments for and the usefulness of a social network perspective on academic entrepreneurship research.



Social networks are emergent, self-organizing and complex set of actors, e.g. individuals or organizations, and the links, referred to as *ties*, between them (Wellman, 1988). Social network analysis is a methodological approach to identify patterns, dynamics and roles, such as socially influence, within the social network. It is the properties of the relations between the actors rather than the actors themselves that are studied (Wasserman & Faust, 1994). The level of analysis may be the large unit of whole societies, to organizations, groups, and the smallest unit the individual, also referred to as an “ego-network” (Jones & Volpe, 2011).

A person’s social 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 social 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 of social network is based on the rational 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. Embeddedness can be referred to as the nature of social behavior defined by how an action is constrained or facilitated by the social context (Granovetter, 1983). Moreover, people we know well tend to move in the same circle and the information is somewhat overlapped with what we already know (Granovetter, 2005). Since weak ties are people whom in turn know people outside our own network and the information received tend to be more often new and original (Granovetter, 1983). Moreover, strong ties form close groups, referred to as a *clique*, and these are linked to each other by weak ties. From a macro level perspective it can be argued that these weak ties direct the level of information diffusion in social networks of larger scale. Granovetter (1983) exemplifies with scientific fields in which ideas and information diffuses more efficiently through weak ties.

Existing research on entrepreneurship with a social network perspective examine the relationship between social networks and e.g. creation of new firms, resource acquisition (Birley, 1985; Aldrich and Zimmer, 1986), firm performance and survival, especially in the early stages (e.g. Reese and Aldrich, 1995). Less is known about the relationship between social networks and entrepreneurial opportunity recognition, evaluation and exploitation, in relation to academic entrepreneurs in particular.

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 early in the entrepreneurial process. Moreover, entrepreneurs may 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 not only facilitate 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, work or non-work related and extends over personal social networks to organizations, institutions and so forth (Hansen, 1995).

Hills *et al.* (1997) found that entrepreneurs with extended social 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" build on Granovetter's argument that weak ties can "bridge" between networks (structural holes) and thereby expand network connections through open access to new knowledge and important inputs. People in the position bridging between networks can enjoy strategic benefits as they may be the sole path through which information or other resources can flow. As Granovetter (2005) express it, the "social marginal" may be the best venue for innovation as it may provide freedom from routines, the institution and the "consensus" of best practice. The contacts within the social network that will lead to successful outcomes are key components and constitute the individuals *social capital* and may grow over time by conscious actions of the entrepreneur.

## 5. New knowledge and co-creation of commercial value

This section draws from interdisciplinary literature to display the entrepreneurial process as non-isolated but a process involving many actors.

Reynolds (1991) point out that the entrepreneur insert their decisions in social structures. Also Schumpeter (1936) argued for 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 an 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 (2007:276) based on this, entrepreneurial opportunities are created, and 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 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 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 heterogeneous” (Dew et al., 2004:667). Individuals may therefore imagine possible outcomes leading to different expectations and 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. 2004). Additionally, 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. 1992:672).

To Koppl *et al.* (2010:130) 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 the supply side must be addressed concurrently 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, p, 130;

“...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 him/herself and though a shared evaluation of a commercial value the entrepreneurial process is carried forward by the network member’s co-creation of the opportunity.*
2. *When visions of the possible uses are shared, it may initiate commitment and action and thus an entrepreneurial opportunity is created.*

## 6. Research on networks and academics

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

### 6.1 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 by policies encouraged entrepreneurial behaviors, also called “the universities third mission”. For example, there might within certain disciplines such as engineering, be tradition of e.g. with industry shared methodologies or research areas (Hakala and Ylijoki, 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 the 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. In addition, 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 *et al.* (2004) found that the academic’s management of relations to industry contacts often is strategic, e.g. to set up new research groups, facilities or methods or give interesting research ideas. Moreover, that at each point of time, many academic entrepreneurs are searching for *new combinations* within basic research, that what can be perceived by e.g. evaluating only the spin-off creations or the patenting rates of universities. Birley (1985) argues that “whilst most the institutions are prepared to solve specific problems but not in the business advisory, thus the academic entrepreneur seeks efficiency in his social network. Christensen and Peterson (1990) argue correspondingly that the social setting 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 are 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” (D'Este *et al.*, 2010:5). Likewise, “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.” More, 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.* 2010:7).

## 6.2 Networks and scientific excellence

Etzkowitz (1989) showed that transfer of knowledge to the industry predominately derive from 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 on 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. D'Este *et al* (2010) conclude that the higher the scientific excellence (of the academic researcher), the more likely it is that this person will identify commercial opportunities arising from their own 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 factors may influence entrepreneurial behavior (here defined as (any) business start-up). Among the results they found indications that the likelihood of a person starting a business increase with their level (higher) of education, however decreases for persons with a PhD degree.

In the same way also others (see Shane and Venkataraman, 2000, and Uzzi,

1997), point out the significance of prior knowledge and “excellence” to opportunity recognition. The *raison d’être* being that new knowledge is combined with “old”, processed and absorbed with a greater understanding than if prior knowledge would not exist. Thus, 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 wider knowledge to be put in use for new combinations and opportunities. Also, research on social networks of extensive cross-institutional collaboration has not shown evidence of increased likelihood of opportunity exploitation by the academics (Rafols, 2008; Bammer, 2008). However, indicating that the ability to embrace a broader range of disciplinary fields in research, thus integrating knowledge activities and finding 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 social network of cross-institutional research collaboration.

Based on the above I hypothesize,

*The networks 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.* (2007:18) propose a definition on 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 (improvement) is an opportunity being developed 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) that scientific excellence of research and prior entrepreneurial experience shape opportunity identification, and the capacity of combining multiple bulks of knowledge and experience of user collaboration that shape opportunity exploitation. Also others point out the dynamics of relations involved, that a great deal of university produced knowledge is tacit and codified, and the diffusion of such knowledge requires direct interpersonal contact (Allen, 1984). Likewise, 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 personal social relations to the industry for funding of spinoffs. He showed that relations provide increased credibility when seeking additional funding but he also indicated 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.’ ”

Besides the formal networks between e.g. the university and surrounding industry, research has shown that also informal links can facilitate future collaborations (Ponomariov and Boardman, 2008).

It may be assumed that the successes of the entrepreneurial actions are dependent on the variation and the total of what the actors involved bring into the process. These actors are in the social network context of the academic, placed in the formal and informal connections of actors. Based on the 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 social network itself is a source of opportunity (new combinations of knowledge, form new knowledge and opportunity) and creates an encouraging environment of committed stakeholders leading to entrepreneurial action”.*

## **7. Research Ideas and the usefulness of a Social Network Perspective**

In the literature, only a few studies (quantitative or qualitative) on the social networks of academic entrepreneurs (academics directly involved in commercialization of research) have been done. Social network analysis is a suitable tool for studying social networks of academics in terms of the generation and diffusion of new knowledge, entrepreneurial opportunity and exploitation. This perspective would through social network analysis reveal the significance different types of actors, in their roles have to the academic entrepreneurial process.

The objective of a possible future research is to test the presented hypotheses and allow for assessment of; 1) the size and structure characteristics of social networks to which academic entrepreneurs belong. 2) back-track the source of opportunity evaluation, recognition and exploitation. In particular, two networks are in focus, a “work-related” social network, in which e.g. colleagues are recognized, and second; the “private” social network. “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.

## **8. Conclusion**

The process of research results commercialized on the market may not be seen as a linear process, in which the academic owns the new knowledge (identification of the commercial viable science) and becomes the entrepreneur by starting a company but rather as a dynamic process. A process in which the origin of the “idea” may come from the outside, identified by members within the social network of the academic entrepreneur and the appreciation of its commercial value, the necessary resources (intellectual capital, entrepreneurial experience, re-innovation processes etc.) may be added by yet others within that social network.

The presented concepts describe academic entrepreneurial actions as non-isolated, non-deterministic, and dynamic co-creations through social networks. The social network structure in terms of redundancy, strong and weak ties, is likely to influence the possibility of opportunity recognition. Each social network has a unique set of combined social capital that is likely to influence the direction of the entrepreneurial process and creation of entrepreneurial opportunity.

The academic that 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, 1992) support the idea of a “co-created” process (actions of committed stakeholders) as the social capital of another (added) social network may identify new uses for new knowledge that were not recognized within the “first” social network. Also, a person in a connecting position between networks create good conditions for innovation. Moreover, others see potential in the new knowledge, and the various committed stakeholders drive the process to formulate concepts/uses and engage resources to pursue the commercial quest, thus an opportunity is created. The development of the commercial concept is directed given the resources available, drawing on Sarasvathy’s hypothesis that each entrepreneur act on the basis of what they can afford to and that this facilitates or constrains the outcome.



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