ACADEMIC ENTREPRENEURSHIP IN THE LIFE SCIENCES

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ABSTRACT

The increasing pressure to generate income from commercializing research is impacting universities and researchers. The way scientists participate in this process needs more investigation. While scientists and entrepreneurs often share similar characteristics (such as: internal locus of control; curiosity and creativity) they can differ significantly with respect to the core of any entrepreneurial function; namely, the intent to profit. Understanding researchers’ perceptions about their role in the process of commercialization provides an interesting framework for analyzing entrepreneurship as a process.

Analyzing the responses to 25 interviewees from Australian universities (19 researchers, and 6 technology transfer officers) we conclude that the researcher’s self-perceived roles concerning an entrepreneurial intention can be classified into five main phases: non-entrepreneurial, semi-entrepreneurial, pre-entrepreneurial, entrepreneurial and post-entrepreneurial. Further, within each of these phases there are a number of different categories of roles. For example, within the non-entrepreneurial phase a researcher might be: “unaware” of the potential to commercialize his/her research; or might be opposed to commercialization (“antipreneur”); or might accept the commercialization of his/her research but not want to be involved (“uninvolved”). The aggregated results that emerge from an understanding of all the possible categories that potentially can exist across the five phases in the entrepreneurial process provides a more comprehensive map of the entrepreneurial mindset of life science academics than currently exists.

INTRODUCTION

The increasing pressure to generate income from commercializing research is impacting universities and researchers. After the cold war several authors established theoretical models that incorporated the benefits of public research to the private sector (Etzkowitz and Leydesdorff 1997). This led to the enactment of new laws and regulations allowing universities to own the intellectual property created from public funds (for example, the Bayh-Dole Act in the USA and similar laws around the world, Mowery and Sampat 2001). This “academic capitalism” phenomenon (Slaughter and Rhoades 2004) has spurned considerable research in areas such as: the impact of laws and regulations on intellectual property; the technology transfer process; and the university as an institutional entrepreneur.

In the case of academic entrepreneurship, two distinctive areas have been studied: licensing research discoveries to industry (Etzkowitz and Leydesdorff 2000; Godin and Gingras 2000) and university spin-outs (Wright et al. 2006). While most studies investigating academic entrepreneurs appear to consider the technology transfer officer (TTO) as the entrepreneur, there have been a small number of studies that have focused on the researcher as the founder or co-founder of a spin-out. However, in the case of academic entrepreneurship, entrepreneurial activity is not limited to spin-outs as there are a variety of other options available to profit from research, including: providing consulting services; licensing; and joint venturing. This complexity provides a fertile ground for the further exploration of entrepreneurship theory. We seek to contribute to the field by providing an integrated overview of the perceptions of university life science researchers concerning their role in the process of commercializing research discoveries.
LITERATURE REVIEW

Defining the entrepreneurial process

The definition of entrepreneurship and the entrepreneurial process lacks consensus amongst scholars. Amit et al. (1993) summarize nine theories that explain entrepreneurship research, whilst Tripathi (1985) explores the evolution of the concept through time. Jointly these authors investigate over fifty different concepts without reaching an agreement. Schumpeter (1939) defined the entrepreneur as an individual who takes action to disrupt markets. He considered the entrepreneur as the prime mover in economic development. As a consequence, differences between entrepreneurs and non-entrepreneurs have been extensively investigated.

Some authors argue that entrepreneurs possess certain characteristics that distinguish them from non-entrepreneurs; for example, personality traits and behaviors (Baron 2000; Rauch and Frese 2007). Traits that have been associated with entrepreneurs include: a high need for achievement, tolerance to risk, and an internal locus of control. However, as these characteristics are measured after the individual has undertaken the entrepreneurial act of starting a new venture; it is difficult to determine if these characteristics are the causes or consequences of entrepreneurial activity. In an attempt to shed some light on this issue a number of authors have examined the pre-entrepreneurial activity of nascent entrepreneurs (Davidsson and Honig 2003). Researchers have also evaluated behavioral characteristics (Gartner 1988) or cognitive processes (Shaver and Scott 1991) to better understand why an individual takes the action to start a new venture. Entrepreneurial behavior, measured in terms of business creation and success, has been found to be highly correlated with the following individual traits: need for achievement; generalized self-efficacy; innovativeness; stress tolerance; need for autonomy; and a proactive personality (Rauch and Frese 2007). Lumpkin and Dess (1996) introduced the concept of Entrepreneurial Orientation based on five dimensions that have been found to be useful in characterizing key entrepreneurial processes: autonomy, innovativeness, risk taking, proactiveness, and competitive aggressiveness. Finally, research has also highlighted the importance to new firm creation of factors external to the individual, such as social networks (Ardichvili et al. 2003).

The researcher entrepreneur

University support for scientists and their research has been undergoing significant changes. Kezar and Lester (2009) identified the following changes that are challenging academic leadership within universities: the rise in part-time and non-tenure-track faculty; the increasing pressure to publish and teach more courses and to adopt new technologies and pedagogies; increasing standards for tenure and promotion; the ascension of academic capitalism; and the heavy service roles for women and people of different races. Coccia and Rolfo (2008) show that public policies in Italy are reinforcing the production of applied research instead of basic research. Similarly, Hackett (1990) noted that many scientists were working from grant to grant generating short term research projects. Hackett (1990) questioned the impact of this pressure on researchers who were required to generate up to 75 percent of their salaries and research costs from grants. Ylijoki (2003) reports that short-term contracts in the academic world have forced academics to embrace the values of a market-orientation; together with their traditional academic values. Boardman and Corley (2008) describe the relationship between a university and its researchers as equivalent to a loose confederation, where researchers act as small business owners and the university as an institutional banker.

However, the available literature provides little understanding with respect to: the role that researchers perceive they have (or would like to assume) with respect to commercializing their research; the impact of the researcher’s perceived role on the outcomes of the process of commercialization; or the evolution in the perceptions researchers have of their role. Siegel et al. (2001) note that the success of technology transfer depends on the participation of faculty, yet this topic is not covered in any of the studies they refer to. Jensen and Thursby (2001) also report that some 71 per cent of inventions licensed by their sample universities required the cooperation of the researcher/inventor if they were to be successfully commercialized. Shane and Ulrich (2004) reviewed the work published in Management Science (since its inception in 1954) on the topics of technological innovation, product development, and entrepreneurship and noted that only five out of the 250 articles considered the role of the individual
researcher. As noted by Jain, George & Maltarich (2009, p.292) “Missing from much of this conversation is a deeper understanding of the involvement of a key actor – the university scientist”.

The balance between understanding the commercial world and adhering to traditional academic values seems conflicting (Samson and Gurdon 1993; Stuart and Ding 2006), although Van Looy et al. (2006; 2004) reported that commercial and scientific activities reinforced each other. Nicolau and Birley (2003a; 2003b) found that researchers were more likely to stay in academia and not move out to a spinout when their social networks ties were weak and redundant. Petkewich (2009) highlighted the beneficial impact that researchers’ commercialization efforts had on their students; however, Slaughter et al. (2002) questioned the use of students as laborers who did not benefit from the commercial applications they helped to create.

Prodan and Drnovsek (2010) introduced the concept of academic-entrepreneurial intentions which is impacted by a variety of attributes such as the researcher’s: entrepreneurial self-efficacy; personal networks; perceived role models; number of years in academe; patents; and type of research. Whether the researcher is attracted to (pushed) or forced into (pulled) behaving entrepreneurially needs more investigation. The value of the researcher as the creator of knowledge is critical to the university and, by extension, to the possibility of embedding this knowledge into a commercial application. There is, however, a clash between intent and rewards. Academics are evaluated on the quality of their teaching, research and image (Shapiro 2009) and not on the revenues generated from research. Research quality is evaluated by peers who decide if the results should be published, presented at conferences, and funded by the state. Some authors question the capacity of the individual to play the role of both an academic and an entrepreneur (Cooper 2007; Hinkson 2002). It has also been suggested that the scientific community (including those who decide on the allocation of public funding) is biased to supporting the researcher, not the research (Hackett 1990; Nixon 2001) and as a result of the potential bias inherent in this pecking order process some researchers might be favored over others (Rauch and Frese 2007). Hoye and Pries (2009) note that those researchers with significantly higher levels of publishing and patenting are also disproportionately more likely to be reported as nascent entrepreneurs.

Studies examining the impact of the involvement of academic researchers with the private sector show mixed results. Bercovitz and Feldman (2008) indicate that the histories and traditions of scientists, as well as university policies, shape the process of knowledge transfer to industry. Jong (2008) considered strong industry ties were the driving force in the expansion of molecular biology in the 1980s and 1990s, and the absence of industry ties as an explanation for failures in the 1950s and 1960s. However, Jones (2000) exposed conflicts of interest arising from close ties between the researcher and industry and van Rijnsoever (2008) observed that interactions with industry do not improve the researcher’s career; whereas interaction with other researchers does. Campbell and Slaughter (1999) highlighted tensions in the struggle for control between faculty and administrators with regards to intellectual property and disclosure.

It should also be noted that the entrepreneurial role researchers can play varies substantially. In the case of spin-outs, Nicolau and Birley (2003b) established three business models defined by the researcher’s relationship with the firm. First, is the “orthodox” spinout, where the researcher leaves academia to take an entrepreneurial role. Second, is the “hybrid” spinout, where the researcher takes a part time (or advisory position) in the spin-out. Third, is the “technology” spinout, where the researcher is not involved in running or managing the spin-out. In the USA, most researchers seem to adopt the “hybrid” spinout approach; navigating between their primary role as an academic and their secondary role as a commercializer (Jain et al. 2009). Public policies might also impact the decision of the researcher regarding their relationship with a spin-out. The Small Business Innovation Research (SBIR) program in the USA, for example, funds university spinouts (USOs) provided the researcher participates in the day to day operations of the firm (Toole and Czarnitzki 2007).

The participation of the researcher in entrepreneurial activities needs to be evaluated prior to defining the path taken, whether it is by grant seeking, consulting, licensing or spinouts, or by some other means. This concept expands the two main modes of exploitation defined by Shane and Venkatamaran (2000), namely: the creation of new firms; and the sale of opportunities to existing firms.

**METHODOLOGY**

To gain additional background information, the first stage of this research project involved discussions with six technology transfer officers (TTOs). Based on these discussions we developed a number of
selection criteria (outlined below) to use in identifying the university life science researchers (subjects) to be interviewed. The subjects interviewed were (or had been) tenured, or tenure track, professors working at an Australian university in the life science area. Interestingly, three researchers declined to be interviewed because of their opposition to the commercialization of research.

Our selection criteria included:
1. Researchers with no interest in participating in the commercialization process;
2. Researchers that had participated, or were participating, in a commercial initiative via licensing or a spinout and held positions in both academia and a private firm;
3. Researchers who had tried to commercialize their research but had failed and subsequently returned to academia full-time; and
4. Former researchers that had left academia to pursue commercial interests related to their research.

The interviews consisted of a series of three open-ended questions concerning the views of the individuals on the following issues:
1. Commercialization of university research.
2. The role of the researcher in the commercialization process.
3. Factors external to the researcher that impact the process of commercialization.

In conducting the interviews, plenty of time was made available for elaboration and exploration of any issues raised by the interviewees. For each question we were evaluating a series of concepts and asked for clarification on specific topics. Interviewees were also asked to provide details concerning their: gender, age decade, job title, number of patents, licensing deals and spinoffs, and number of publications. Interviews took place between March and September in 2010.

**RESULTS**

To date 19 subjects have been interviewed. As presented in Table 1, 15 researchers were male and four were female. The youngest interviewee was in his 30s and the oldest in his 60s. The time spent in a full-time academic post ranged from 7 to 44 years. The number of publications varied greatly, from 25 to over 500. The number of patents, spinoffs and licenses also varied widely. These variables are accepted as an indication of the intent to commercialize the results of research and are used traditionally as metrics for commercialization. We did not evaluate other metrics such as revenues, employment, profits or return on investment (ROI) generated from licensing or spinoff activities.
DISCUSSION

Our analysis of responses indicated that the concept of entrepreneurship is more clearly defined by using an action-based approach (such as taking action to generate income from research) instead of the traditional focus on the individual (such as his/her traits and behaviors) or a process-based approach (focused on systems and relationships). We believe our approach is more aligned with Gartner’s (1988, p.64) view that “the entrepreneur is not a fixed state of existence, rather entrepreneurship is a role that individuals undertake to create organizations”. Our approach shifts the view of the entrepreneur from being a person who behaves in a certain way to being a person who, under certain circumstances, takes certain actions. By focusing on actions we gain a deeper appreciation of the researcher’s self-perceived roles allowing for a wider investigation that is both situational and versatile, and more in line with the wide range of researchers we encountered.

Scientists can select, and play, different roles in different situations, thereby exhibiting different behaviors. These perceived inconsistencies could be explained by the different self-assumed roles, which are related not only to the individual, but also to specific projects and external factors (such as the scientist’s working environment). In this sense we can make the analogy with a plant disease that requires a combination of three different factors to exist: the plant, the pathogen, and the appropriate environmental conditions. The relationship between scientists and entrepreneurial activity, likewise, seems marked by a combination of factors and can change over time and with changing circumstances. Furthermore, our observations indicate that scientists can (either concurrently or over time) assume different roles with respect to commercializing research discoveries.

Table 1: Demographic Information

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* Nascent
An analysis of the responses we received indicates that the researcher’s self-perceived roles concerning an entrepreneurial intention can be classified into five main phases: non-entrepreneurial, semi-entrepreneurial, pre-entrepreneurial, entrepreneurial and post-entrepreneurial. The decision concerning the role the individual wants to play is used to allocate them to a certain phase and the decision about how that role is played is used to place them in particular categories within each phase. We consider that a complete view of these different phases and categories is required to provide a comprehensive map of the entrepreneurial mindset of life science researchers.

Each category is defined by the individual’s self-perceived role concerning a particular project together with other environmental factors. It is likely that individual, project and environmental variables trigger a decision in the researcher as to which role he/she will play. Individual variables include age, values, education, personality traits, behaviors, education, and so forth. Project variables include the type of research being undertaken and the capacity to commercialize this particular research results. Environmental variables include such as: operational capacity; funding options; legal and tax implications; and cultural acceptance of entrepreneurial activities.

The five phases and 16 categories into which life science researchers could be classified, based on our investigation, are presented in Figure 1. The top row of Figure 1 presents the five phases with a varying number of categories identified under each phase.

Figure 1. Key Entrepreneurial Phases Incorporating Various Stages

As noted previously, a researcher could simultaneously be in a number of different phases/categories with respect to different projects. For example, a researcher might be classified as “nascent” with respect to one project while, at the same time, being classified as “unaware” of the commercialization potential of a second project.

The non-entrepreneurial phase:

This phase has three categories whereby the scientist can be considered as either: “unaware” of the commercial possibilities for his/her research; or directly opposed to research commercialization (“antipreneur”); or might accept the commercialization of his/her research provided it does not require any involvement on his/her part (“uninvolved”).
The “unaware” category is where all researchers are assumed to be when they commence their academic careers. All of our interviewees acknowledged their lack of interest in entrepreneurial activities until they became aware of the possibilities. Academic scientists tend not to view themselves as entrepreneurs and, as noted in the following comment by one of our interviewees, efforts to commercialize research can be perceived as a negative in the early stages of an academic’s career because it distracts from researching and publishing:

“For the academic it is a distraction from his or her career (it doesn’t promote it), there is the prospect of status but it is not recognized through commercialization. You become a professor if you publish.”

Usually it is the TTO, an industry partner or an acquaintance who creates awareness in the researcher by making an observation about a potential commercial application. Although we did not specifically ask about the event that triggered awareness, responses from interviewees gave us the impression that it was not likely that their awareness came from a colleague within the research community.

For the “antipreneur”, commercialization of research is a negative, as indicated in the following email response from a subject that declined to be interviewed:

“the researcher has no role in commercialization… It might surprise you to know that scientists strive to find out how the world works and this has NOTHING to do with commercialization.”

One of the subjects interviewed had failed as an entrepreneur and had returned to academia. He declared himself against the commercialization of research, stating that it was a risky proposition that had caused him to lose many years of research and had made it difficult for him to get back into academia and to receive further research funds.

An “uninvolved” researcher might claim that a type of research is not conducive to industrial applications or that the goal of his professional life is to publish and disseminate knowledge and that he or she has no intention of getting distracted with activities that are outside of the traditional academic roles. A lack of interest in the process of commercialization might stem from a lack of understanding as indicated in the following comment:

“We don’t do it because scientists are not trained in entrepreneurship; instead they look at other directions.”

As soon as the researcher decides to become involved he or she moves to either the semi-entrepreneur or pre-entrepreneur phase depending the level of involvement being contemplated.

The semi-entrepreneurial phase:

Consistent with the views of Schumpeter (1947) and Shane and Venkatamaran (2000), we believe that entrepreneurship should not be limited to the act of creating a new venture but should include other endeavors that facilitate the creation of wealth from research activities. “Many a would-be entrepreneur of today does not found a firm, not because he could not do so, but simply because he prefers the other method” (Schumpeter 1947, p.151). Yet for many scholars, entrepreneurship refers only to the creation of a new organization (Gartner 1988; Lumpkin and Dess 1996). Consistent with the views of Schumpeter (1947) and Shane and Venkatamaran (2000), we believe that entrepreneurship should not be limited to the act of creating a new venture but should include other endeavors that facilitate the creation of wealth from research activities. However, we acknowledge that creating a new venture requires a much firmer commitment and a greater level of risk-taking and, therefore, we introduce the semi-entrepreneur phase, which requires a lower level of commitment compared to the pre-entrepreneur phase.

Semi-entrepreneurs prefer to focus their energy and time on developing research, yet they recognize the value of private enterprise in economic development and enjoy interacting with the commercial world, providing value to industry. They exhibited respect for commercial partners and acknowledged the distinct differences between the world of academe and the world of commerce.
entrepreneurs do not want to become entrepreneurs; if they did they would move to the pre-entrepreneurial phase.

We identify three categories within the semi-entrepreneurial phase: advisor; research funds seeker; and delegator. Our literature review indicated that some researchers are involved in commercial activities as advisors. Some of our subjects indicated that they had indeed participated as advisors but our questions did not specifically address this activity.

A research fund seeker wants to better understand industry needs in order to create research that is useful and generates further research funds. Their level of engagement with industry is more intimate than the non-entrepreneur and they enjoy the interaction, as indicated in the following comment by one of our interviewees:

"Building up a trustful relationship and not ripping them off is important. Industry has been burnt and has stopped funding."

On the contrary, delegators prefer not to be directly involved with industry (although they may work closely with TTOs) as indicated by the following comment,

"... it is not something I want to do full time, I mean getting into only commercial things … because you become very constrained in what you do."

**The pre-entrepreneurial phase:**

Once the scientist has accepted the possibility of starting a new venture he/she will gather the necessary information to decide if it is viable to start a new venture. Sometimes this decision is related to the financial and operational support they receive. At this time the researcher enters what we refer to as the pre-entrepreneurial phase. These researchers will follow Ajzen’s (1991) theory of planned behavior, exhibiting an intention to found or co-found a new venture. Some of these researchers will seek knowledge about the commercialization process, the market, and business standards, thereby being categorized as “nascent”. Other researchers will manifest an intention to pursue a startup but will not seek the appropriate information. One of the TTOs we interviewed suggested that such researchers often thought of themselves as King Midas, we prefer the concept of “dreamer”. Dreamers do not recognize the value of commercial skills.

Krueger (2000) related intent and self-efficacy to propensity to act, indicating that perceptions of feasibility and desirability impact entrepreneurial actions. At the nascent stage, researchers build up their capacity to take action as indicated by the following comment:

"I need to educate myself about the process, confidentiality issues… what you disclose … what we can and can’t present."

This increase in self-efficacy leads to an increased likelihood of new venture formation, if the conditions are appropriate. Dreamers on the other hand do not build the necessary self-efficacy to commercialize their research discoveries.

**The entrepreneurial phase:**

The entrepreneurial phase is marked by the scientist’s participation as founder or co-founder in a startup. The categories we identify in the entrepreneurial phase include: novice, dual, oscillator, serial and harvester. We consider a novice researcher to be someone still in the process of understanding the business world, their role and their expected rewards. The novice is driven by excitement and self-reflections about the public/private good dilemma. This is also the magic stage, where there is a world of possibilities. As indicated in the following comment, for some researchers the formation of a company is seen as a means of generating funds for future research but this has the ability to create a conflict of interest:

"I was aware of the academic tension and my compromise to both parties, so I became an investigator for a research program at the company then, towards the end of 2008, I became
the CSO and I am very careful about it. I have a clear disclaimer in all of my publications
(shows me the disclaimer). Some other researchers don’t.”

Self-reflection, however, can also mark a transition into other, more stable, categories. At some stage, researchers realize that commercialization is harder than expected and, as a result, reorganize their expectations into more realistic goals. Once they move beyond the novice classification the researchers appear more comfortable with the very different roles they are playing; as both researchers and co-founders. Most of our subjects were involved in dual careers; that is, they combine their academic role with a role in the commercial world. We categorize these researchers as “dual”. For researchers in this category the scientific and commercial worlds co-exist and the researchers believe they can be successful both as entrepreneurs and scientists. As can be seen from the following comment, in many cases these researchers feel the need to re-affirm the public good/private good dilemma that prevents other scientists from taking action to become entrepreneurs:

“I didn’t want the funds, but I wanted to find a solution to the problem.”

They also gain an appreciation for commercial skills and efforts, as can be seen from the following comment:

“I’ve got a lot respect for others that have commercialization skill sets. We received funds and they did a good due diligence on us, but we didn’t do a due diligence back, and we learned.”

Some researchers jump from one startup to another, without having a clear commitment, goal or exit strategy for the new ventures they create. We categorize these researchers as “oscillators”. Sometimes creating a new startup is driven by a desire to take advantage of a funding mechanism, particularly where public policies favor starting new ventures rather than growing existing ventures. Oscillators do not close a previous venture prior to starting the new venture and, therefore, they are unable to fully commit to either venture, their behavior appears opportunistic.

Other researchers have exited from more than one new venture placing them in the category of “serial” entrepreneur. These individuals have a sense of practicality that is unique; they balance business with academic life. Serial entrepreneurs we interviewed have had at least one successful and one failed spinout. As indicated by the following comment, they also seem to understand the interdependency between the many stakeholders in the new venture startup process:

“A lot of VCs have been burned because researchers stop working on the technology.”

In contrast to oscillators, serial entrepreneurs feel in control and accountable for the outcomes of the new ventures they found. They also terminate their relationship with a prior venture before establishing a new venture. Serial entrepreneurs tend to use more effectuation, while oscillators tend to use more causation and exercise less internal locus of control.

Finally, there are a few researchers who make the transition from initiating a startup to successfully growing the venture and leaving the world of academe as researchers. These researchers are categorized as “harvesters”. Unlike “oscillators”, “duals” and “serials”, “harvesters” focus on growing their venture. Harvesters take accountability to an extreme and have a systematic way of evaluating data for continuous improvement, as can be seen from the following comment:

“It’s the journey, and it never stops. It is the whole process not the milestones.”

As can be seen from the following comment, harvesters can establish clear goals and systematically evaluate the performance of their ventures:

“The market has to be huge, but accessible. We need to bring in world-class people and ask ourselves: are we the best people to do this? We need to look at the risk and rewards. Is this doable in my lifetime? And after you tick all of the boxes, you still need to do robust financials (ROI, NPV, pick your own poison). You’ve got to love it, but it has to pay the rent.”
Regardless of their profit seeking intent, the following comment indicates that the impact on the life of patients and the local economy seems to be pivotal to all those researchers in our sample that were in the entrepreneurial phase:

“You don’t set out to make money but to make a contribution.”

The post-entrepreneurial phase:
Finally, we considered it important to think about the post-entrepreneurial phase, although to date we have not interviewed many subjects in this phase. However, a number of our interviewees referred to individuals in this post-entrepreneurial phase as role models. The influence of such researchers who had tried and either failed or succeeded as entrepreneurs was evident.

One “failed” entrepreneur we interviewed had returned to academia and had become an “antipreneur”. A second interviewee had exited from the venture he founded and had subsequently invested as an angel “investor” in a number of startups. During the course of our investigation this individual took up the role of a CEO in a spin-out, thereby moving from the post-entrepreneur phase back to the entrepreneur phase and into the category of a “serial” entrepreneur.

Thus far we have not been able to secure an interview with a post-entrepreneur who has completely “retired”.

CONCLUSIONS, LIMITATIONS AND FUTURE RESEARCH

Our findings suggest that understanding researchers’ perceptions about their role as entrepreneurs (and potential entrepreneurs) provides an interesting framework for analyzing entrepreneurship as a process that considers not only the person but also the project and various environmental factors. As a result, an individual might choose to take different roles at the same time for different projects, or might shift from one role to another.

It should be noted that the map of entrepreneurial phases and categories presented in this paper is based on a limited number of observations, which limits the generalizability of our findings. A larger more in-depth study might be useful in better defining the entrepreneurial process within academic institutions.

We expect to continue developing a deeper understanding of the various categories within the entrepreneurial phases we identify and the relationships between those phases and the categories within them. As noted by Gartner (1988), who is the entrepreneur is the wrong question; we need to better understand the process of entrepreneurship and the actions taken by entrepreneurs.

BIBLIOGRAPHY


Jones, L. M. (2000). *The commercialization of academic science: Conflict of interest for the faculty consultant*, University of Minnesota.


