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Corporate Governance, Roles, and Future Directions: New Venture Creation of Autonomous and Dependent Entrepreneurial Scientists

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Abstract - A conflict in scientific entrepreneurship has arisenover the propriety of scientific advancements, businessgovernance, and the resulting commercialization of scientific innovations. Some research indicates that the commercialization activities display asymmetric convergence because industry appears to have a more influential role in the exploitation of these innovations. Yet, the research does not differentiate the types of commercialization activities and assumes that all forays into scientific entrepreneurship are comparable. This research aims to explore these contentions and differentiate two groups of scientific entrepreneurs based on their lived experience. This research indicates that, while the essence of the experience is the same, these groups of scientific entrepreneurs have different experiences based on their roles and the conflicts related thereto, witness varying control issues over the fate and delivery of their innovation due to the influences of investor relations, and exhibit differing visions for the future based on their experience. This research provides evidence and advances the theory that scientific entrepreneurs need to be segregated by the influence of their investor relationships because of the differences these relationships impose on their lived experience.

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I. Introduction

The mental image of white-smocked scientists experimenting in stuffy laboratories in pursuit of academic knowledge has become obsolete. Their image once inspired Maslow (1954) to consign their studies to that of identifying, "... impulses to beauty, symmetry, and possibly to simplicity, completion, and order…" (p. 2). Marx believed that their contribution was greater. He remarked that the future of capitalism resides in science because the production of industry depends on it. (1845, trans. 1947). In the modern day, advancement of knowledge while concomitantly participating in the conversion of new knowledge into a commercialization activity , A scientist today is, "the person who can make contributions to marketable products" (Krimsky a period. 2004, p. 1). This is a significant departure from its antecedent stereotype

The new image is mired in the socio-economic realities of the modern day. The context of merely advancing the body of scientific knowledge has now been enjoined with the dynamic economic environment as well as the motivations of the contemporary government-industrial complex that seeks innovation, technological advancement, and profits. For the scientist, these realities require, "…a shift in orientation from purely academic pursuits to entrepreneurial activity" (Etzkowitz, Webster, & Healey, 1998, p. 13). This suggests a contamination, of sorts, to the theoretically untainted academic motivations of early scientific discoveries.

Many academic scientists, specifically those interested in the pursuit of scientific knowledge and advancements, decry this enjoinment. The concept of "pure" science has historically meant that ties with industry were outside of the scientific norm (Etzkowitz, Webster, & Healey, 1998). With the advancements in high-profit potential industries such as polymer science, biotechnology, and nanotechnology, industry has sought to exploit these technological advancements for economic gain. Yet, many scientists believe as Krimsky (2004, p. x) does that, scientists must remain, "…free and independent investigators… (They) have the responsibility to their discipline and to the public to pursue the best science." It is with this rich and complex debate that the exploration of the lived experience of scientific entrepreneurs begins.

II. Background

Some scientists elect to change their career path and engage in entrepreneurial endeavors to promote their innovation, exploit their intellectual capital, or address a need in the marketplace. In so doing, the scientific entrepreneur recognizes a transformative change in their role and realizes a shift in perspective via a planned attempt to revolutionize their lifeworld. These perspectives are demonstrated in the various conflicts of governance and control, disparities in the commercialization of the innovation, and issues related to the future direction of their venture. The extant literature seems to imply that all scientists-turned-entrepreneurs share similar experiences in the new venture creation experience. No attempt has been made

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to differentiate autonomous scientific entrepreneurs (those with primary controlling interest in the venture) and dependent scientific entrepreneurs (those with limited control over the commercialization of their ventures). This differentiation is mired in the interrelationships between the entrepreneur and investor and between entrepreneur and the economic realities of the business world.

A growing body of research suggests the modern socio-economic reality coupled with the intervention of government and industry lure scientific entrepreneurs toward profits that can contaminate the purity of their work (Etzkowitz, Webster, & Healey, 1998). This research explores this view in the context of the lived experience of scientific entrepreneurs that autonomously create their own new ventures versus those that do so under the influence of outside investors. The aim is to discover how these pressures are understood to be significant for autonomous scientific ventures versus more financially dependent scientific ventures. This research evaluates the commercialization experience to explore how scientific entrepreneurs appreciate the realities of role conflict, business governance, and direction of the fate of the innovation which are the primary indices affecting scientific commercialization.

The reflective appraisal of their experience is intended to answer the research question – How does the scientist-turned-entrepreneur perceive the lifeworld changes brought about by the new venture creation experience in terms of role conflicts, corporate governance, and their vision for the future? A better understanding of the scientific entrepreneur's experience is needed information to advance the discourse and address the primary issues of scientific commercialization. This research aims to explore the phenomenon of the scientist-turned-entrepreneur by differentiating the commercialization experience of autonomous scientific entrepreneurs in contrast to those that experienced the new venture creation process through investor-led vehicles.

III. Theoretical Review

The research attempts to differentiate the entrepreneurial scientist has had its share of difficulties because of the disparities between academic scientists and those scientists desiring commercial endeavors. Scientists that deliver, "…commercial outcomes tend to be rather different than those who are accustomed to producing academic ones" (Ambos, Makela, Birkinshaw, and D'Este, 2008, p. 1424). Many attempts to classify their behaviors, traits, and their commercialization activities have come under scrutiny by researchers aspiring to understand the scientific new venture creation process.

a) Attempts To Differentiate Scientific Entrepreneurs

The unique alternatives available to the university scientist inhibited much of the research into scientific entrepreneurship. These alternatives included fellowships, scholarships, grants, and endowments that were designed to keep the scientist at the university (Samsom, 1990). These alternatives provided a significant filtering mechanism in exporting innovations beyond the walls of the university (Danielson, 1960) and hindered the transmission of scientific discoveries to industry (Bell & McNamara, 1991; Litvak & Maule, 1973). These scientists were able to receive many of the benefits while avoiding some of the difficulties inherent in an external entrepreneurial venture.

Later, social science researchers, sought to differentiate scientific entrepreneurs from other types of entrepreneurs. Samsom (1990) confirmed that scientists have fundamental cultural and behavioral differences that influence the new venture creation process. Likewise, Bell and McNamara (1991) suggested that scientist-lead entrepreneurial ventures outside of the university setting usually involve management insufficiency, monetary problems, and technology flaws in getting a product to market. Commercialization of scientific entrepreneurial endeavors usually include a potential decrease in innovation (Cotgrove & Box, 1970; Kenney, 1986; Etzkowitz, Webster, & Healey, 1998), ineffectual business management (Ahn, 2008), inability to grow (Kenney, 1986), and collaboration inefficiencies (Niemi, 1993). These researchers suggest that there are specific business related problems that influence scientific endeavors and affect their ability to sustain start-up activities.

However, the socio-economic conditions of the contemporary era are believed to expedite some of the commercialization activities. Scientific entrepreneurs have advantages over other entrepreneurs. "They are closer to the future than the rest of us. That proximity to the cutting edge gives them the opportunity to start businesses based on science that are truly breakthrough in nature" (Gaebler Ventures, 2009). Whether they have an advantage or not, the salient aspect of their experience is that exploitation of scientific discoveries by industry in the modern day poses unique difficulties for the scientist but may also provide certain benefits. Researchers then focused their collective attention on the commercialization activities.

b) The Scientist In Commercialization Activities

Scientists view commercialization activities different from other entrepreneurs. Scientific entrepreneurs initially consider the aspects of business education, management expertise, accounting, and

training to be of secondary importance and behave accordingly (Litvak & Maule, 1973; Sindermann, 1982). Moreover, organizational design in scientist-lead organizations is less reflective of progressive practices than other executive-lead organizations (Moss-Kanter, 1989). Venture financing, marketing, and planning, are also less developed than in the typical organization (Litvak & Maule, 1973). Issues that were initially considered secondary, are seen as increasingly important including allocation of resources, accounting, and management expertise (Samsom, 1990). Given this, exploration of the post-product introduction, while minimally researched, suggests that these scientific entrepreneurs begin to recognize all functions as important to the success and vitality of the new venture creation process.

The commercialization process imparts a new perspective for the scientist. The role of the scientist changes as does the duties and responsibilities for the survival and success of the new venture. The existing research confirms the requirement for the continued involvement of the scientist (Zucker, 1998; Stuart & Ding, 2006; Phillips & Zuckerman, 2001). The scientist and the innovation cannot be divorced, at least initially, as easily as might occur in other forms of entrepreneurship. The scientist frequently embodies the product, not unlike a brand provides meaning, and cannot easily be changed.

Beyond a mere involvement, Zucker (1998) suggested that scientists must maintain a key role in both the development of the technology as well as the commercialization of the venture. To some in academic circles, this represents a loss to the scientific community. Yet, Zucker (1998) disagrees. Scientists publish more, an indicator of their continued scientific success, during the creation of their entrepreneurial venture than before or after (Zucker, 1998). This begets other discoveries thereby advancing knowledge and permitting further entrepreneurial venture creation.

The importance of these functions is demonstrated in contemporary society where a further emphasis is placed on the importance of the development of sustainable businesses that foster advancement. The role of scientific innovation and the ventures that arise from it imbricates the very fabric of society based on the importance of scientific advancement, social improvement, and the demand for improved goods and services (Vinck, 2010). Because of this, the myriad of issues that surround the industry-government-university interaction have gained increasing importance to foster growth and satiate the needs of a more knowledge-based society (Etzkowitz, 2008). This has lead to shift in the consideration of, not of how much knowledge can be gained but rather, how much money can be made (Molle & Djarova, 2009). The demands of contemporary society and the influence this wields are at odds with the Mertonian scientific norms that were an integral part of the historic scientific culture.

c) *Exporting Science To Industry*

Collaboration between science and industry is a necessity because of the relationship between fundamental discoveries and product development, production, and marketing. (Greenberg, 2007). Nevertheless, this collaboration, at times, is not without its costs. Scientists go through a transition period where their expectations about science are revised to meet company needs, or, if unable to return to academia; they are fated to the disillusionment of role incompatibility (Cotgrove Box 1970). This role incongruity is rooted in the disparity between their scientific culture and that of the competitive marketplace.

The competitive marketplace deposits other strains on the scientist. Discoveries develop slowly where value is thought to be low and if value high, competing opportunities can lead to appropriation (Zucker, Darby & Armstrong, 2002). The corporate world that stresses profits is therefore pitted against the scientific motivation for knowledge-creation and information building. This creates angst because contemporary science is complex and is often, "financed by, a society that worships money and profits and celebrates personal wealth "(Greenberg, 2007, p. 5).

Exporting science to industry requires the involvement of both parties. However, this equation is not balanced. Kleinman and Vallas (2001) refer to this as asymmetrical convergence because industry appears to have a more influential role in the equation. "It is said today that the scientist who can turn ideas into profits are the ones that are contributing to a better world" (Krimsky, 2004, p. 2).The unidirectional nature of this statement speaks volumes about what is considered important in exporting scientific discoveries to industry in the modern day.

This suggests that autonomy and control over the research and commercialization process is a battleground for those desirous of engaging in a new scientific endeavor. Packer and Webster (1996, p. 427) note that this creates disharmony because, "scientists must exist between or in two distinct social worlds to manage the rewards that academic and patent cultures carry." Beyond these cultural discrepancies, the direction and furtherance of the research oftentimes are a cause for unease to the scientist. "Concerns over autonomy and control as innovations transition from academia to industry pose a significant threat to academic research" (Kleinman & Vallas, 2004). This implies that the scientist will frequently be embroiled in conflicts about the fate and transport of their new venture because of the requisite issues associated with creating a profitable new venture.

The norms of the scientist in the new venture creation process are challenged by the necessary business-related tasks that comprise any entrepreneurial action. Capitalization occurs by securing intellectual property, restructuring research groups, and establishing a corporate vehicle to maximize return (Etzkowitz, Webster, & Healey, 1998). This aspect is typically foreign to the scientist. The corporate vehicles these scientists must choose too can be a source of conflict. A choice must be made between contract or consulting ventures, technology asset firms, and product-oriented companies (Stankiewicz, 1998). Inherent in the efficient operation of these vehicles are business, not scientific, norms at least as Merton (1942) envisioned. Mitroff (1974) demonstrated that scientific research and work practices are influenced by business-related normative systems and these systems, "…not only do not conform to the Mertonian norms but also are point for point contrary to them" (p. 594). Therefore, many entrepreneurial scientists decide, sometimes unwittingly, to enter a lifeworld that is not their own.

IV. Opportunity, Rationale, and Design

The seminal literature forms the understanding of scientific entrepreneurship in the modern day. Missing is the meaning the experience imparts to entrepreneurial scientists with regard to corporate governance, conflicts, control, and future directions of scientific innovation. An opportunity exists to explore the lived experience of autonomous entrepreneurial endeavors versus those endeavors dependent on outside sources of capital to better understand the scientific entrepreneur's view of the new venture commercialization process in terms of these issues.

a) Opportunity Statement

The existing peer-reviewed literature presents little exploratory data about the relevant aspects of the commercialization experience from the perspective of the scientific entrepreneur. Further, the data that does exist implies the commercialization activities impart a subservient relationship of the science to financial interests. These financial interests might be brought about by outside investors or evolve from the monetary needs of the entrepreneur. The lived experience of the scientist that initiates and sustains the venture is also not represented as a subset of the seminal literature. There is an unrealized potential and a gap in the literature in this regard.

The research questions is - How does the scientist-turned-entrepreneur perceive the lifeworld changes brought about by the new venture creation experience in terms of role conflict, corporate governance, and vision for the future? The development of this research posited other sub-questions. What is the difference in the lived experience of autonomous and dependent scientists-turned-entrepreneurs? How do these entrepreneurs perceive the role of conflicts, firm governance, and future fate of the innovation? How does the experience shape their beliefs and visions of the future? Answering these questions contributes to the existing body of knowledge and expresses the reflexive lived experience in a qualitative postmodernist perspective from the view of the scientist-turned-entrepreneur.

b) Rationale

The purpose of this research is to understand the perceptions of autonomous and dependent scientific entrepreneurs based on their understanding of role conflicts, business governance, and visions for the future. Using a lived experience study of successful scientific entrepreneurs, both autonomous and dependent, their reflexive understanding of the new venture creation process is exposed. The knowledge claims of the existing literature is given meaning in today's context because of the entrepreneur's lived experience (Creswell, 2007). This means that the lived experience of these scientific entrepreneurs is considered given their real world experiences and placed into a historic and ethnologic construct. This research is designed to explore their lived experiences, assess what the implications might be for other entrepreneurs and for future research, and provide insight into the phenomena surrounding the scientific entrepreneur's agency in the new venture creation process.

The meaning of the experience that these entrepreneurial scientists endure is at least partially based on the interrelationships inherent in the new venture whether as an autonomous or dependent scientific entrepreneur. Understanding this meaning is necessary for researchers to understand because the scientific entrepreneur a) runs the risk of divorcing themselves from the very cultural roles that heretofore sustained them, b) at risk is the very concept of ethical transparency, and c) the suggestion inherent in these concerns is the belief that the exportation of scientific discovery to industry in the modern day imparts some problems to be solved. Moreover, the continued assumption that autonomous and dependent scientific entrepreneurs have the same experience must be challenged because of the importance to academic pursuits, technological advancement, and social improvement. The differences in the lived experience of these ventures deserve study because of the academic interest in entrepreneurship, importance of industry driving scientific development, and the social insistence on new technological advancements. Given the importance placed on scientific and entrepreneurial

activities in the U. S. and abroad and the dismal success rates in entrepreneurial ventures documented by Headd (*2002*), a lived experience study is vital to the understanding of the experience of these individuals..

This research incorporates qualitative inquiry to explore the phenomenon of scientific entrepreneurs in the new venture creation process. Phenomenology is a research perspective that is suited to the research question. Likewise, phenomenology is an appropriate platform for exploring the understanding of manifold aspects of a phenomenon (Creswell, 2007). Husserl (1948) suggested that researchers not seek quantitative descriptions but rather return to the meaning of the phenomenon to humans. The human experience is the true reality in the context of the human mind. Therefore, this research seeks the essence of the experience from the perspective of those successful scientific entrepreneurs that have endured it. Patterns, trends, or themes, emerged using inductive reasoning in the data collection and analysis.

c) *Research Question, Design, And Context*

Interviews of successful, for-profit scientists that started a new venture were conducted to evaluate the retrospective assessment of events they deemed important in the success of their ventures. The research sought to gain a thorough understanding of issues related to role conflicts, corporate governance, and vision for the future. The study population was segregated between autonomous scientific entrepreneurs and dependent scientific entrepreneurs. .

Purposeful sampling was used for selection of participants. A sample size of 40 was used where half were autonomous ventures and half were dependent. This sample size is appropriate for this study given the research methodology. Sample size is not as ratio-dependent as in quantitative assessments so the percentage of the population used is less crucial (Creswell, 2007). The participants were all successful scientific entrepreneurs in the Midwestern United States, were still in the same science-related business they founded, had operated their businesses profitably for, at least, the last ten years, and were unfamiliar with the researcher before the interview. Figure 1 presents the participant group relative to their corporate vehicle and longevity.

Entrepreneurial Discipline	Vehicle	Controlling Interest	Longevity
Industrial Hygiene Consulting (2)	LLC's	Owner/CEO	12-14 years
Industrial Hygiene Consulting (2)	C-Corp	Angel Investors	11-15 years
Polymer Science Ventures (2)	LLC/S-Corp	Owner/CEO	10-11 years
Polymer Science Ventures (2)	C-Corp	Venture Capital	11-12 years
Geologic Consulting (3)	LLC/S-Corp	Owner/CEO	10-12 years
Geologic Consulting (3)	C-Corp	Angel Investors	11-15 years
Laboratory/Chemistry (3)	LLC/Partnership	Owner/CEO	12-14 years
Laboratory/Chemistry (3)	C-Corp	Investment Firm	13-19 years
Biologic Consulting/Research (2)	S-Corp's	Owner/CEO	12-14 years
Biologic Consulting/Research (2)	C-Corp	Venture Capital	10-11 years
Environmental Science (3)	LLC/S-Corp	Owner/CEO	
Environmental Science (3)	C-Corp	Venture Capital	
Engineering Firms (3)	LLC/Partnership	Owner/CEO	18-22 years
Engineering Firms (3)	C-Corp	Investment Firms	14-16 years
Botany/Horticulture Consulting (1)	LLC/S-Corp	Owner/CEO	10 years
Botany/Horticulture Consulting (1)	C-Corp	Angel Investors	17 years
Health Physics Consulting (1)	LLC/S-Corp	Owner/CEO	12 years
Health Physics Consulting (1)	C-Corp	Venture Capital	16 years

Figure 1: The Participant Group

The firms each accumulate between $800,000 and $25 million in annual revenue and provide work for 10 to 250 employees. The firms operating as Subchapter S Corporations were larger where the initial Liability Corporations were, in all cases smaller firms where the initial investment was possible by the owner or where investment did not include ceding control as represented by voting share. The firms operating as Subchapter C Corporations were larger where the initial investment exceeded $1 million and control of the venture was shared or exceeded by financial interests such as angel investors, investment firms, or venture capital firms.

A prequalification questionnaire was completed by each scientific entrepreneur to determine that the participant could answer the research question in a

meaningful manner. Interviews capture a multitude of views about a theme in a manifold social perspective (Kvale, 1996). A series of discursive one-on-one interviews were performed to generate rich and detailed data. The objective of interviewing these individuals was to explicate emergent themes representative of their understanding of business governance, control, and direction of the venture.

Emergent themes are a grouping of perspectives that relate across the expressed dialogue of the collective and are consistent among the participant group. The interviews of 40 participants presented themes via the analysis of over 150 pages and 5,500 transcribed lines of text. The data was classified, coded, and analyzed using NVivo™ software. Certain elements represent pervasive themes that emerged from the research although other elements expressed were given equal weight. Irrespective of the persistence, themes are presented so that an inclusionary representation of the experience can be understood.

Researcher bias was minimized using triangulation. Triangulation exposes missing themes and confirms thematic representations. Triangulation is, "… used to show that independent measures agree or, at least, do not contradict each other" (Miles & Huberman, 1994, p. 266). The themes presented in this section were checked using peer review or, according to Denzin (1978), researcher triangulation. After application of pseudonyms to assure confidentiality, a colleague, who was not involved with the data acquisition or a part of the data set, evaluated the thematic representations to consider alternative meanings or additional themes. This research sought, "…convergence among multiple and different sources of information to form themes or categories in a study" (Creswell & Miller, 2000, p. 126). This assists with data validity and credible data reduction.

V. Data Presentation

Six categorical themes are resident in the lived experience that comprises the scientist's conception of the new venture creation process with regard to role conflict, corporate governance, and the future direction of their ventures. These themes were relatively pervasive across the two groups. Little consistency exists between the autonomous firms and the dependent firms with regard to corporate governance and role conflicts. The prospects for the future of their firms varied based upon the interests of each entrepreneur.

Theme 1: Perceptions of deficient business/managerial expertise.

The first theme resident in the data is a realization of the difficulties associated with the new venture creation process. This theme was omnipresent among the participants. The difference resides in the different types of problems that surfaced.

In the autonomous scientist group, various statements describing the business and management related problems and challenges of establishing a viable new entity indicate this reality. Most of these statements include issues related to personnel management or financial matters such as stories of inadequate cash flow, deficient human resource decisions, ineffective political savvy, and various other real world conundrums. Statements like, "The personnel problems were frequent…" or "Cash flow was killing us," indicate this theme. For one, the problems were more intimate.

> The employees in my firm were looking to me to guide this company. At times, I felt wholly unprepared to do so. Many times in those early years, we were hemorrhaging money. The income was not enough. I spent more time with my accountant than I did with my projects, some weeks.

This resulted in a personal appraisal that oftentimes led to an acknowledgement of their lack of preparedness, lack of business adroitness, or the many mistakes made in the business or managerial aspects of running a business.

The dependent ventures were not without similar concerns. The only seeming difference in the incidence of this theme is the description of which business area the problem surfaced. For the dependent businesses, many of the entrepreneurs faced problems related to personnel, finance, organizational development and the like, but they had others to rely on. This is shown in statements like, "We were young and growing so our investors were very important to us" or "Our Board was very patient with explaining the basic HR functions to me." One participant was more candid about the experience.

> The organization needed my leadership in so many areas I did not know where to begin. This was far afield from my education. My Board was insistent that I hire an administrator. Even though I was reticent, I did. Turns out, it was a great decision.

In both the autonomous endeavors and the dependent endeavors, business and management problems surfaced often. The scientist's incapacity to manage these issues became tangible in the consequences and penalties caused by their lack of experience. It was not their surprise at this aspect of the new venture creation process that most perplexed the participants, it was the latent realization of the importance of these aspects and the resulting damage their ignorance caused.

Theme 2: Need for the scientist's involvement.

The second theme resident in the data is a realization that the scientist was an integral part of the new venture creation process. Most believed this was a foregone conclusion. For the autonomous ventures, this

reality was represented in the burdens of the start-up. For the dependent ventures, this generated conflicts within the organization.

One participant from the autonomous group put it most succinctly. "I am the business." She went on to state that clients, financial institutions, and the firm's employees believed she personified the venture. This caused consternation because, as she stated, "We are really a producer of (a specific resin) that also does research. The process is pretty clear-cut." She was flattered that others found her to be so indispensable but she believed their description of firm dependency was unfounded. Another participant disagreed.

> My employees can try to do this without me and I encourage that. But, not a day has gone by where I am not called on to make both scientific and management decisions. Some of this is because I am the boss. A lot of it is because there is an art to research and it is not all cut-and-dry.

The above implies that the scientist, both because of their role as principal and because of their education, experience, and knowledge is vitally important to the business. Whether they believed the perceptions of others or not, their role as a scientist and principle is necessary for the venture.

The dependent group mostly echoed the comments of the autonomous group. Most scientists, at least initially believed their innovation framed the establishment of their organization. One remarked, "In the early days, I was involved in the construction of this business. I sat in on most board meetings and made important decisions." He later stated that this waned, as the product became more of a commodity. "I retreated to my lab and I am pretty happy looking for new things to research." He later admitted that he liked his involvement with the early establishment of his business. One participant suggested a much more disheartening perspective on this issue.

> At times, I felt like a show pony. I was trudged out to every social club, trade show, and high society gala they could make me go to. It was boring and belittling. I was the lead developer and chief operating officer, and I was expected to be a carnival barker.

This perspective, though not to the same extent, was persistent across much of the dependent group. Five suggested that they, "… are still involved with some of the business-related aspects of the venture and still feel instrumental in its development." The need for the scientist to be involved was vital, at least initially, but in the view of the participants, seemed to fade over time. Most of the scientists in the dependent group stated that their involvement in the day-to-day operations of the business was less than they initially expected.

Theme 3 : Role ambiguity

The third theme resident in the data is the desire to seek an understanding and undertake the necessary actions in their position with the company. This theme was suggested by a broad array of participant viewpoints. Though the theme was persistent, the underlying cause varied between the groups.

Most of the autonomous group initially believed they understood the role they had chosen as an entrepreneur though it was not often a positive perception. The understanding became realized in various stories of emotional angst and anxiety. This was evident in statements like, "I stared out the window and wondered what I had gotten myself into" or "We were down to 20-grand and I was getting nervous." One proffered another perspective.

> I was finally steering my own ship. I had developed a service, found a partner, bought some equipment, and I was out on my own. I grew into the role. Sure, I had problems but I managed. I liked being both the CEO and chief physist.

Most of this group underestimated the toll that this new role would extract. Many stories related the amount of time and effort they expended in being both the lead scientist as well as the owner. Yet all stated they understood and accepted the roles they had chosen Conflict over role ambiguity was present in the dependent group. Most of the discussion evolved to expose some level of disenfranchisement for the scientist. For half, this required extended meetings and, in some, written descriptions of what the company expected from them. Most detailed various stores of misunderstandings between what they thought their role would be in the new venture.One participant's statement reflects most of the group.

> My initial conception was that I was a valuable member of the team. I was involved in development of getting the innovation into a sellable product. I was also involved with the marketing and delivery. Once this was complete, I found I was later less involved.

Often this caused consternation for the entrepreneurs. "Later, I was expected to go back to the lab to find something else." Other statements like, "I was only as good as my last invention" demonstrate the thought that the scientist became more involved in the production of new developments verses being aligned with their former innovation. One participant stated his relevant view on other issues of role ambiguity.

> I think most of the change in my role was because of my lack of experience. The management team decided I would be better used elsewhere. I did not like this but they had the ear of the Board and that meant a lot. They focused on making money. I was relegated to other areas of the operations.

Most of these scientific entrepreneurs detailed instances of being, "pushed to the back burner" in the business because of the need for the business to become and sustain profitability. This caused dismay for the entrepreneurs. The disparity between their preconceptions and the reality of advancing the business were at odds with their initial conceptions. This often caused discontent for the entrepreneur.

Theme 4 : Vindication, growth and empowerment.

The fourth theme resident in the data is the reflection that the scientist had achieved personal growth through the process in spite of the viewpoints of others. In many, this was demonstrated as vindication that their efforts resulted in a business that was built upon their ideas. In others, it was demonstrated in the revelation of enhanced abilities in the management aspects of running a business. This theme was pervasive, though the underlying cause varied between the groups.

In the autonomous group, the demonstration of this theme was readily apparent. Many entrepreneurs detailed instances of growth and development caused by their accomplishments in creating a successful entity. Many went on to express how they felt their decision to engage in the new venture creation process exonerated their decisions among their family, friends, coworkers, and former peers. In the words of one participant, "I did not receive much support so when the positive results of my work became evident, I knew I had been right and they had been wrong." This led many to the belief that they were better able to handle the myriad of decisions and actions necessary to sustain their entities. One put it in this perspective.

> As I look back, I can see that all of the mistakes I made forged my development as a businessperson. I learned to adapt and make solid judgments. I began to look at all my decisions based on the business, not just the science.

The dependent entrepreneurs echoed similar commentary. They suggested many of the same perspectives as the autonomous group.

> In my case, I was intimately involved in the business plan. I made decisions on financial requirements, marketing decisions, regulatory requirements, and most other aspects of the business. Later, my role changed but I can still see my handiwork in the success of this firm. I knew it would work and I was right.

Many went on to discuss how the development of their business changed them.

> Before, I was just a person in the lab. When I discerned this opportunity, I built it on the science. Later, the success of the firm needed to be based on business. Others suggested I needed to change. I worked very hard to understand that, in all its aspects. That's probably why I'm still involved and have the backing of the Board.

These individuals later suggested that the process fulfilled their intentions and this led to satisfaction. Statements like, "I've grown through the process" and "I have become more well-rounded as a person" demonstrate their logic, though not all of the entrepreneurs believe this came without an alteration in their initial conception.

> The firm is more profit-focused than I think it needs to be. Innovation comes in many forms and not all need to be based on which products or services produce the most profit. We actually pass-up on many ideas because they will not generate enough profit. This, I think is a problem. I'm working to remedy this internally.

This rationale is not atypical among this group. The constant focus on how much money a product or service will generate versus the contribution to the public good with less money generation is a persistent cause of concern for this group. The focus on profitability still does not sit well with many of the dependent entrepreneurs.

Theme 5 : Feelings of obsolescence, disinterest and the desire for change.

The groups discussed their personal appraisal of the changes brought about by their creation of a successful entity in a variety of contexts. Once the business was believed to be self-sustaining, the entrepreneurs constructed a mental determination of other possible intentional changes in their lifework. In some, this was based on their success, in others, the basis was a need to alter their situation due to discontent.

The autonomous group detailed their future in light of their success. In all cases, this was framed against their fulfillment by the new venture creation process. Many statements detail this as shown in a thoroughly representative statement of one entrepreneur.

> I need to do something else and the business has given me latitude to do that. I have the ability to go off in any direction I so choose. I am starting a new division and I have more time to commit to it since the structure is in place to keep this business going.

Most of these entrepreneurs went on to detail elaborate plans for personal and professional

expansions to their business, changes in their personal desires for new endeavors, and enhancements for differing visions for the future. Most of this was based on the perception that they had outgrown their role and believed there was something more for them to do.

The dependent group also demonstrated this theme. However, in most cases, dissatisfaction framed their motivation to encounter new or differing realities. This is demonstrated by one participant who stated,

> I can see that my importance here has passed. This place can run without me. I need to build on my new abilities and I believe I could do this again, in a better way, and on my own terms. In the next five years, I will be a different person again.

Others suggested motivations based on the perception of their existing position. "Returning to just the science is not enough. I am now intrigued with the business aspects too. I saw what these people (investors) did. I can do it too." Others stated that once the science became a business, they became less interested. "I got to the point that I believe this is commodity, you know, like selling oranges or something. I need to get that mental stimulation for the science back." In the case of these entrepreneurs, the conception that the business appropriated the science, became untenable to the scientist though some used this as leverage to expand into other endeavors that were obviously laden with business implications.

Theme 6 : Transcendence to other endeavors.

The sixth theme inherent in the data suggests a mental or literal decision to excel beyond this initial foray into entrepreneurship once the entrepreneur achieved success. A central theme of this part of the dialogue is transcendence beyond the status quo. Specific discourse shows this expression in the autonomous group.

> I now aspire to new things. Then, I just did stuff. I took up a business and did not fully realize that it would shape my desire for knowledge, my outlook on future interests, or my passions, but it does.

Other fleeting statements also show this perspective. "I now desire new knowledge" or "I continue to expand who I am" show this perspective. In this, the entrepreneurs presented data that inferred that the experience made them believe that other ventures are achievable. Virtually all of the autonomous scientists-turned-entrepreneurs indicated that they would diversify their current business or progress into other, sometimes more elaborate, undertakings.

Most telling is the representation that each scientist-turned-entrepreneur would relive the experience again, either figuratively or literally. An interesting point that was consistent among the autonomous entrepreneurs was the context of a similar autonomous entity. None of these entrepreneurs suggested seeking outside sources of financing, partners, or other controlling interests.

The dependent group of entrepreneurial scientists stated similar interests. Though, the framing of their new conceptions was different. The framing was that of re-gaining control over the fate and transport of their endeavor. One scientist embarked into a discussion as to why he thinks this way.

> I think (the new venture creation process) makes you a mentally healthier person. You know, Jefferson never really conceived the U. S. to be a culture of laborers. He wrote about selling your trade to another man in exchange for goods and services. Working for 'the man' was not in his conception for most of us. I agree with Jefferson in this regard. This makes you a healthy person, knowledgeable, and well rounded. It also makes you want to do it all over again.

In much of the discourse with the dependent entrepreneurs, the discussion was laced with undertones of more independence and control.

> I know I am not where I need to be. I envisioned a business where the science was of paramount concern. This is not that venture. I need to revisit my situation and get back to where I thought I was going. You know, a research firm where science drives the end result.

Some of these entrepreneurs were nondescript as to their desires for the future. Transitional phrases like, "I will start another venture…," "I want to expand my business into…," or "I would like to do it again…," reflect this sentiment. Several of the entrepreneurs suggest business transcendence while others state that they will pursue undertakings of a completely different nature. Oftentimes this includes personal expansion into other areas of interest, which require longer-term goals. The satisfaction of this experience appears to lead to a desire for more.

The six themes resident in this study provide insight into the lived experiences of the scientific entrepreneur with regard to corporate governance, conflicts in the commercialization of the innovation, and prospects for the future. Each participant presented a unique experience that differed in the undertaking and attainment of a successful entity. Nonetheless, common themes emerged through analysis of the data. These common themes assisted with an understanding of 'how' the scientific entrepreneurs experienced 'what' they experienced. An acknowledgement of these themes allows researchers to look beneath the textural descriptions and themes to garner a deeper meaning about the phenomenon (Patton, 2002).

VI. Synthesis of the Themes

Themes are presented to facilitate understanding of the data and these thematic representations can be synthesized. Theme synthesis is consistent with Husserl's (1931) concept of phenomenological reduction by consolidation. This consolidation involves an abstraction of the lived experience because this structural portrayal of the emergent themes resides outside of the individual experiences presented in the data (Patton, 2002). Theme synthesis gives rise to specific meanings about the experience of commercializing scientific ventures.

First, most suggested that they have experienced a multitude of issues related to corporate governance. This is readily apparent in theme one, perceptions of deficient business/managerial expertise, because while the autonomous scientific entrepreneur maintains control over the venture, they are less prepared for the rigor of the experience and less knowledgeable about the entrepreneurial process. This is also evident in the dependent group. While this group presents fewer opportunities for management inefficacy by the scientist, the investor group contributed various hardships in corporate governance. The issues related to corporate governance are also presented in theme two, the need for the scientist's involvement. The need for the scientist to be involved was vital. In the autonomous group, this was necessary to manage both the science-related and business-related tasks. This suggests the scientist's role in corporate governance is more complete for the autonomous venture but is also more fraught with hardships due to ineffectual business-related capacities. For the dependent group, the scientists' involvement was necessary, at least initially, though their necessity seemed to wane as the business evolved. This suggests the scientist's role in corporate governance was initially important but subsided as the business became more successful owing to the involvement of the investor groups.

Second, the commercialization efforts generated role conflicts for the scientists. The expressions of conflict were pervasive across the group in theme three, role ambiguity. In the autonomous group, this is evidenced in an on-going and outward display of conflicts whereby the scientist must constantly shift between business manager and lead scientist to handle the myriad of problems that arise. In the dependent group, role ambiguity is more intimate. In this, the scientist's role changes from the preliminarily incessant involvement in most every decision to being relegated to narrower roles once the business becomes self-sustaining. The effects of the commercialization effort too can be seen in theme four, vindication, empowerment and growth. Overcoming their problems, adjusting to cultural norms, and securing an approving perception by others were seen as critical to the experience of the autonomous entrepreneur. The dependent entrepreneurs suggest their preconceptions about the validity and viability of the business were correct and this suggested the commercialization effort was fulfilling, even though their involvement changed over time. Both suggest the experience identified heretofore unrecognized abilities in understanding and assimilating business-related concerns, pride in their achievements, and value in the commercialization process. This is important because the experience demonstrates the growth of the entrepreneur and elevation in self-confidence leading to empowerment because of the successful commercialization experience.

Third, all detailed their prospects for the future based on the attainment of their successful entity. This is readily apparent in theme five, feelings of obsolescence, disinterest and the need for change. In the autonomous group, this theme took on an affirmative character where the relevance of their history formed the basis for future entrepreneurial ventures of a similar nature. In the dependent group, this theme was also apparent but was framed by obsolesce and irrelevance to the future of the venture. These entrepreneurs admitted that the experience had led to an enhancement of their self-belief such that they have a new perception of what is important and how much work is necessary to attain a successful new venture. Likewise, prospects for the future were presented in theme six, transcendence to other ventures. In the autonomous group, this was presented in statements suggesting exuberance at the thought of recreating similar ventures. The dependent group also displayed this perspective though the context was framed in the desire to regain autonomy and control over the fate of the innovation or direction of a new undertaking. This means the phenomenon brought about the desire for further growth, elaboration of self-directedness, and aspiration to transcend to higher levels of undertaking. Figure 2 presents the meanings, which lead to the exposure of the essence of the experience.

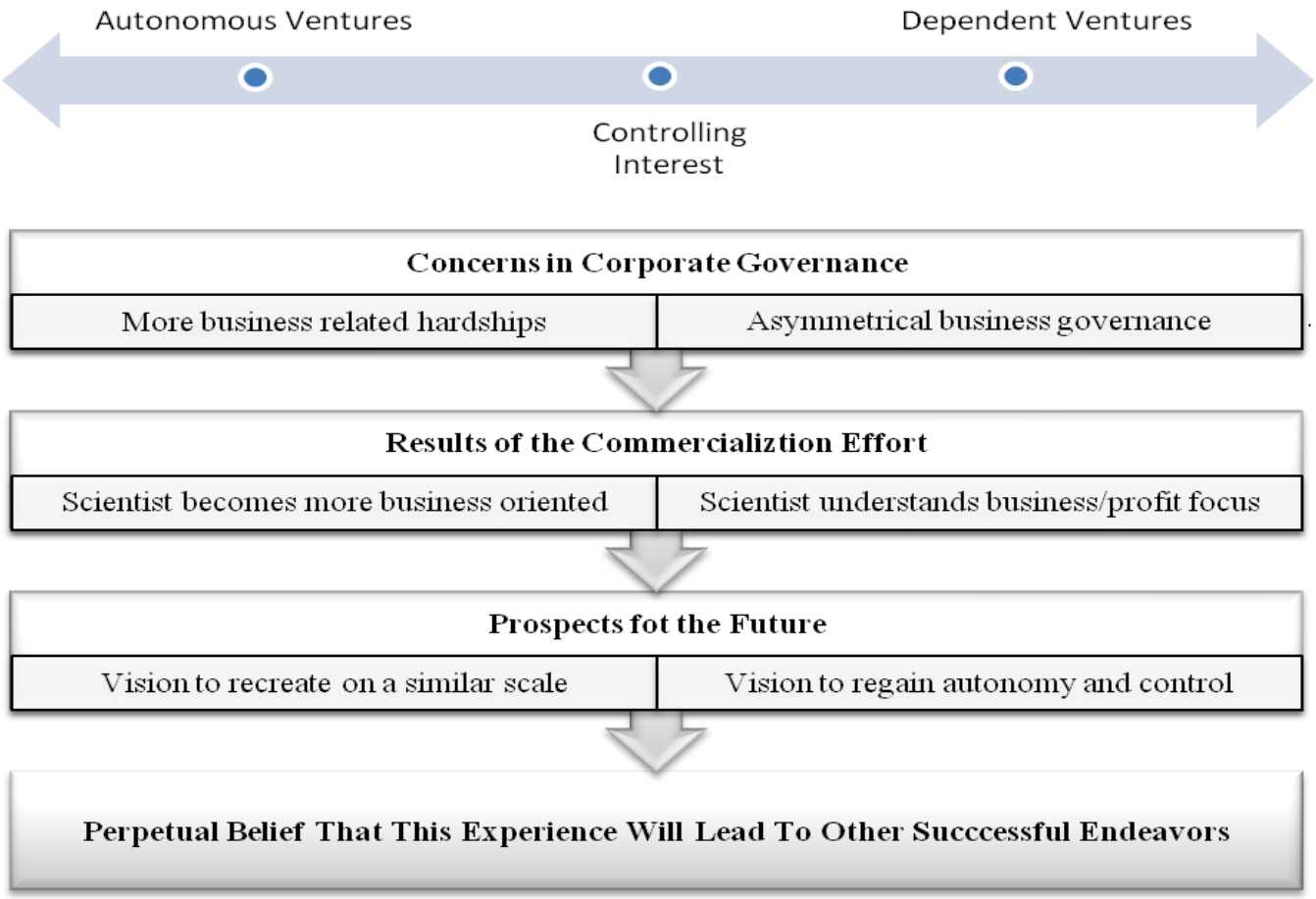

Figure 2 : Meaning and Essence of the Experience

The meanings inherent in the above suggest that the experience, whether through an autonomous venture or a dependent venture share many of the same meanings though expressed through different thematic representations. This leads to, and allows, for a mental distillation of the experience. This distillation is the essence where the experience is "…simply there" according Husserl (1964, p. 9). This essence is inherent in the experience, is present for all successful scientific entrepreneurs of this research, and requires no further elucidation.

VII. The Essence of the Experience

The experience is realized in the concerns over corporate governance where the autonomous scientific entrepreneurs display more business related hardships and the dependent scientific entrepreneurs more asymmetrical business governance. Governance presents itself in varying gradations of satisfaction for the autonomous entrepreneurs and dissatisfaction for the dependent entrepreneurs. The experience is also realized in the conflicts that that the process causes.

Successful resolution and placation of these conflicts evolve from experiencing the multitude of perplexities that form their lifeworld in the initial stages of the process and serves to form their decision to engage in the process again, sometimes with different objectives. This leads to a conceptualization that the process can be replicated and that further accomplishments are possible across a broader spectrum of endeavors. In the autonomous group, this is typically on a similar scale. In the dependent group, the dissatisfaction with the experience precipitates the notion that other outcomes are preferred. In all cases, an affirmation of self-value, enhancement of personal and professional growth, and movement toward self-actualization, advances feelings of empowerment and transformation. Thus, the essence of the experience is a perpetual belief that further entrepreneurial endeavors can lead to similar successful outcomes.

VIII. Implications

The aim of this work is to differentiate the lived experience of autonomous scientific entrepreneurs from those dependent on other controlling interests. This research shows many of those differences in the commercialization process even thought the essence is the same. The rationale for this differentiation is based upon the extant literature and the findings of this research. The implications of that differentiation are significant.

First, it is apparent that the role of the scientist

changes consistent with the findings of Zucker (1998), Stuart and Ding (2006), Samsom (1990), and Phillips and Zuckerman (2001). In both groups, a noticeable difference is readily apparent where the role of the scientist in the new venture creation process is ensconced in the necessary business-related tasks that comprise most entrepreneurial ventures. Interestingly, the concept of a loss of scientific norms was virtually absent in the autonomous group in deference to Mitroff (1974). These scientists did not suggest any form of disparity with scientific norms nor did they suggest their work practices were influenced by business-related normative systems. This was apparent in the dependent group and these scientists, found themselves entering unwittingly into a lifeworld that seemed foreign. Over time, the autonomous group became more business focused while retaining much of their utilization as a scientist. In the dependent group, the scientist either adapted to a new business-oriented role or was resigned to other, often less pleasing, roles in the organization consistent with Cotgrove and Box (1970). This might be a rationale as to why scientists publish more during the undertaking due to being pushed to the back-burner by management, consistent with Zucker (1998).

Second, it is apparent that the commercialization process is different consistent with the findings and rationale of Litvak and Maule (1973), Sindermann, (1982), and Moss-Kanter, (1989). Yet, this is more revealing for the business, not necessarily for scientist. In the autonomous group, commercialization was imbedded in the morass of business related problems associated with the scientist-turned-entrepreneur's inefficacies of starting, managing, and sustaining a business. In the dependent group, this notion is enmeshed in the conflicts of business governance.

Third, competitive market pressures for profitability brought about conflicts for the scientific entrepreneur. Entrepreneurs of both groups turned ideas into profits consistent with Krimsky (2004). Inconsistencies were found with the autonomous entrepreneurs in the discourse of Zucker, Darby and Armstrong (2002) where innovation development was predicated on value. These entrepreneurs developed their innovations, most often, with limited consideration of value. The dependent group though was consistent with Zucker, Darby and Armstrong (2002) where innovations developed slowly where value is thought to be low and faster if the value was high. Also consistent with their proposition was the concern over appropriation where competing opportunities were high (Zucker, Darby & Armstrong, 2002). The corporate world that stresses profits is therefore pitted against the scientific motivation for knowledge-creation and information building. Further, the dependent group clearly demonstrated Kleinman and Vallas' (2001) concept of asymmetrical convergence where investment forces appear to have a more influential role in the business. In the autonomous group, this influence was left to market pressures.

Fourth, the relationship between fundamental discoveries and product development, production, and market acceptance was crucial to the entrepreneur's success in both cases, consistent with Greenberg (2007). However Greenberg's contention that the scientist revises their expectation about the science because of business realities needs to be revisited because it was not suggested in the discourse of the of the autonomous entrepreneur. In this group, it is better termed as an addition versus a revision. For the dependent group, Cotgrove and Box's (1970) contention that this collaboration, at times, resulted in a transition period where their expectations about science were revised to meet company needs, or, if unable to do so, they were fated to the disillusionment of role incompatibility is seen to be consistent. This was not referenced in the discussions with the autonomous entrepreneurs because this role incongruity seemed irrelevant to their scientific culture because operating in a competitive marketplace is a role they accepted.

Finally, the concept of autonomy and control provided an eclectic experience for these entrepreneurs. As could be expected, this theme was subdued for the autonomous entrepreneurs. In fact, at times consternation was evident because of the singular nature of this aspect of the new venture creation process. However, for the dependent entrepreneurs autonomy and control over the research and commercialization process became a battleground because of the dissonance in the expectations of entering a competitive marketplace, working with vested interests, and having to share control over the fate of their venture or innovation. Beyond this discrepancy, the direction and furtherance of the research were notable causes for unease to the scientist as evidenced in the scientists' concern over the value and perception of their innovation consistent with the thoughts of Kleinman and Vallas (2004).

The theory advanced is that investor led scientific entrepreneurial endeavors are different than those led by autonomous entrepreneurial endeavors and should be treated differently. This is because not all scientists engaging in scientific entrepreneurial endeavors share the same experience and resultant outcomes for the future. Further, while the scientist undergoes a role change, this is accepted by the autonomous scientific entrepreneurs as a part of the reality of the life world they have chosen as opposed to the dependent scientific entrepreneurs where this reality is thrust upon them by others. Though success leads to empowerment in both groups, the governance and control over the venture imparts different meaning to the experience. The consequences of the experience

suggest different modes of undertaking future endeavors. The modality of the new undertaking for autonomous entrepreneurs is shown to exhibit the same freedom and control is different for dependent scientific entrepreneurs that seek to erect new ventures that will afford them more control and freedom.

IX. Conclusion

This research provides insight into the differences in the new venture creation experience of autonomous scientific entrepreneurs and dependent scientific entrepreneurs. The focus of this research is to explore the differences in the way these entrepreneurs understand the considerations of governance and control, disparities in the commercialization of the innovation, and issues related their future direction. The aim of this research allows for the differentiation of these scientific entrepreneurs based on their lived experience. This study identified many associations with the existing scientific entrepreneurship literature that addresses the current debate about these endeavors in light of the socio-economic pressures for profitability, intervention of government and industry, and the experience these individuals endure in the new venture creation process. Likewise, this study revealed some discrepancies between this research and the research of others so as to suggest avenues for future research into scientific entrepreneurship.

X. Assumptions and Limitations

The study is limited to successful scientific entrepreneurs that have founded their own autonomous business entities as defined in this work. The chronologic time limits the research to the same socio-economic climate. For this reason, it should not be assumed that all scientific entrepreneurs behave similarly at other times or in other environments.

Qualitative assessments using the phenomenological perspective have assumptions that influence the study. The researcher has a role in the interpretation and consolidation of the data generated from the interviews of the participants. Therefore, the researcher's ability to effectively interpret the data can affect any phenomenological study. In addition, this research assumes that the participants candidly and honestly discussed their experiences in a forthright manner. Further, generalizing the data beyond the sample population is discouraged. The information presented is intended to illustrate the views of this participant group only.

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