Power of Entrepreneurial Firms

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ABSTRACT

Innovating entrepreneurial firms may address their need for resources by partnering with established firms or swimming with sharks. Their resources and futures are uncertain, but with their belief in that future, they see themselves not as minnows but as future whales. Established firms partner with them because they too see that future value; therefore, entrepreneurial firms may not be as low powered as they have been portrayed. Through a longitudinal field study of the partnerships of three entrepreneurial firms, I examined how and when entrepreneurial firms developing novel technology innovations with uncertain resources gain relative power over established firm partners? I found that the firms gained power through three mechanisms rooted in the uncertainties inherent in entrepreneurship. First, they gained speculative power when other firms believed not only in their future value creation but also that in that future the entrepreneurial firms will control critically needed resources. Second, established firm partners lost relative power when entrepreneurial firms were willing to trade performance targets for alternatives to dependence by changing their strategies and resource usage. Third, with failure as their most likely outcome, the entrepreneurial firms identified thresholds after which they were willing to cease operations and exit, ending the established firm’s opportunity to participate in the future innovation and shifting the relative power between them.

Keywords: entrepreneurial firms, power, resource-dependence, uncertainty

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INTRODUCTION

Entrepreneurial firms need more resources than they have (Jacobides & Winter, 2007). One way that they address that need is to partner with established firms to gain financial and non-financial resources as well as legitimacy, market knowledge, and network connections (Alvarez & Barney, 2001; Pahnke, Katila, & Eisenhardt, 2015; Rindova, Yeow, Martins, & Faraj, 2012; Stuart, Hoang, & Hybels, 1999). Because entrepreneurial firms need additional resources to survive, let alone succeed, they are often characterized as weak, relating to other firms from a position of need or desperation. Except, entrepreneurial firms do not inherently interact from a position of weakness. While they do need things that they do not yet have, they do not view themselves as without resources. Entrepreneurs and their teams believe passionately in the futures and innovations that they are creating and the value that they expect to capture from what they are building (Cardon, Wincent, Singh, & Drnovsek, 2009; Hayward, Shepherd, & Griffin, 2006).

Entrepreneurs are not alone in these beliefs. Investors use the acronym FOMO, the fear of missing out, to describe their belief that some entrepreneurial firms will return enormous profits but that the investors may not recognize those firms when they have the chance. With stories of lost technology titans such as Kodak, Polaroid, and Digital Equipment, established firms have a similar FOMO around innovating entrepreneurial firms: fear of missing out on new technologies that will change their industries or instigate creative destruction (Schumpeter, 1934). Established firms have both good and not-so-good reasons to not develop every innovation themselves (Christensen & Bower, 1996; Teece, 1986); therefore, they keep an eye on entrepreneurial firms and the technology innovations they are developing (Bower & Christensen, 1995). Watchful established firms learn through a range of interactions with entrepreneurial firms from informal conversations with founders and engineers and formal structures for mentorship and incubation
(Amezcua, Grimes, Bradley, & Wiklund, 2013) to partnerships (Rothaermel, 2002), strategic investment (Benson & Ziedonis, 2009), and, eventually, acquisition (Cozzolino & Rothaermel, 2018; Dushnitsky & Lenox, 2005b).

Entrepreneurship and management theory have concluded that entrepreneurial judgement is non-contractible (Foss, Foss, Klein, & Klein, 2007; Kaul, 2013; Klein, 2008), yet entrepreneurial firms do contract and partner with other firms often. Entrepreneurs act under uncertainty toward the potential for profit (McMullen & Shepherd, 2006). The likelihood of their outcomes is unknown; therefore, they cannot contract efficiently and realize the full value of entrepreneurial profits (Foss et al., 2007; Klein, 2008). To that end, the literature on entrepreneurial-established firm partnerships is dense with warnings and recommendations to entrepreneurial firms for defensive strategies to protect against partners who might misappropriate entrepreneurial rents and innovations (Alvarez & Barney, 2001; Baum, Calabrese, & Silverman, 2000; Hallen, Katila, & Rosenberger, 2014; Katila, Rosenberger, & Eisenhardt, 2008; Tripsas, Schrader, & Sobrero, 1995). Yet, neither the entrepreneurial firms nor their would-be established firm partners can develop these innovations without each other. To understand how these firms interact and work together, we cannot solely paint entrepreneurial firms who need resources as weak or established firms who will not innovate for themselves as high powered. We need to understand how the uncertainty of resources and innovation, as well as entrepreneurial judgement to act on the potential for future profit, increases or decreases the power of entrepreneurial firms relative to their partners.

Recent literature has begun to portray entrepreneurial firms as more than resource needy entities dependent on others and instead has characterized them as actors able to make choices about their fate. Graebner and Eisenhardt (2004) explicitly reframed the entrepreneurial firm as
the target of courtship rather than the shark’s prey, highlighting how young sellers chose to be acquired by selected established firms based on behavioral factors such as common goals. Wasserman (2017) identified that entrepreneurial firms can, and do, refuse resources to maintain control over their own strategies, albeit at the cost of lower value creation. Katila et al. (2008) showed that even when entrepreneurial firms may not have higher relative power, they use secrecy, controlled timing, and strategic partner selection to successfully acquire resources while swimming with sharks. Meanwhile, Diestre and Rajagopalan (2012) found that entrepreneurial firms exercise selectivity and are more likely to ally with established firms when those partners have both the ability to create value and are incentivized to create rather than misappropriate that value. Studies have also shown that entrepreneurial firms in nascent industries preempt power struggles by taking proactive behavioral approaches to shape their context before more powerful firms enter. Santos and Eisenhardt (2009) identified how entrepreneurial firms created illusions and exploited the tendencies of others to define the boundaries of their nascent industries through preemptive persuasion rather than resource-based power.

The metaphor of entrepreneurial firms swimming with sharks portrays established firms as full of valuable resources that enable them to be predatory while entrepreneurial firms are small, potential targets with few valuable resources. The value of any resource is subjective and idiosyncratic, assessed by managers based on what value they believe their firm can create and capture using those resources (Barney, 1986; Brandenburger & Stuart Jr, 1996; Schmidt & Keil, 2013). The capturable value from the set of resources held by established firms may be widely accepted, even considered certain, but it is still an assessment of the future. Entrepreneurial judgement and the uncertain innovations under development at entrepreneurial firms will, likewise, be assessed based on the value a firm believes it could create and capture in the future
using those resources. If those resources, uncertain as they may be, can be assessed as potentially valuable, then perhaps the entrepreneur should not be painted as so small a fish.

To better understand this dynamic, this research asks how and when do entrepreneurial firms developing novel technology with uncertain resources gain relative power over established firm partners? I address this question through a longitudinal, inductive field study of three early stage, entrepreneurial firms developing new technology innovations in the energy and cleantech sector and their interactions with 28 established firm potential partners. I found that while the entrepreneurial firms in this study did not control resources that held current, agreed upon critical value to the established firms, in several cases the entrepreneurial firms were able to exert relative power and influence or overcome the resistance of their partners and to avoid being influenced themselves. The study firms gained relative power through three mechanisms rooted in the uncertainties inherent in entrepreneurship. First, the entrepreneurial firms gained speculative power when another firm believed, not only in the future value that the innovation could create, but also that in that future the entrepreneurial firm would control resources for which the other firm will have a critical need. Second, the established firm partners lost relative power when entrepreneurial firms were willing to change which resources they needed. The entrepreneurial firms found alternatives to resource dependence when they embraced the uncertainties of their market and made strategic tradeoffs to avoid being held up by their would-be partners. Lastly, with failure as their most likely outcome, the entrepreneurial firms identified thresholds after which they were willing to cease operations and walk away leaving the established firm with no option to participate in the future value of the entrepreneurial firm’s innovation and therefore increased dependence on the entrepreneurial firms.
THEORETICAL BACKGROUND

Power is the ability of one firm to influence or overcome the resistance of another (Emerson, 1962). As such, power is not an inherent characteristic of a single firm but a social attribute idiosyncratic to an interfirm relationship. Power comes from dependence on scarce or controlled resources, a function of the magnitude of the need and criticality of that dependence (Pfeffer & Salancik, 1978). Pfeffer and Salancik (1978) delineated four types of resources, which if scarce or controlled by one firm could create dependence for another to access: monetary, physical, social legitimacy, and knowledge. In practice, firms need multiple of each type of resource; therefore, the relative power between firms is not so simple as Firm A’s dependence on Firm B for Resource X. Casciaro and Piskorski (2005) addressed the multi-dimensional nature of relative power, acknowledging the bundle of resources involved in any interfirm relationship, by splitting the model of power and resource dependence into two dimensions: power imbalance and mutual dependence.

However, even between just two firms, the value of a given resource is not an objective fact. The value, and from that the need and criticality, of a resource is a subjective and idiosyncratic assessment made by firm managers about how much value they believe the firm can create and capture using that resource (Barney, 1986; Brandenburger & Stuart Jr, 1996). Likewise, the relative power between firms will be assessed by managers on both sides based on the value each believes the firms can create and capture using those resources. As such, two firms could perceive different amounts of power imbalance and mutual dependence in their relationship based on different assessments of the value of the resources to be traded and different expectations for the future.

A key uncertainty and fundamental need for any entrepreneurial firm is whether the firm
can acquire the resources needed to create value and to act on the opportunity upon which the firm was founded (McMullen & Shepherd, 2006; Packard, Clark, & Klein, 2017). If the firm cannot acquire sufficient resources, it will fail regardless of the potential for value creation from their innovation. With so dire an outcome, entrepreneurs can easily be portrayed as desperate or needy. Yet, entrepreneurs act full knowing that they face uncertainty, and resource uncertainty is not the only type they face (Folta, 2007; Gans, Stern, & Wu, 2019). Technology entrepreneurs face uncertainty about meeting desired product features and manufacturing their innovation at scale. Entrepreneurs pioneering novel innovations face uncertainty about whether a market exists for their innovation and whether they can capture sufficient margins at a price the market is willing to pay (Podolny, 1994; Rao, 2008). All entrepreneurs face uncertainties about how incumbent firms will respond to their entry into the market (Giustiziero, Kaul, & Wu, 2019). Entrepreneurial judgement involves, not only acting on that initial opportunity, but also continuing to act, react, adapt, and possibly pivot, as new information is learned and uncertainties resolve into knowledge. Whether or not they have the resources they need yet, entrepreneurial firms face and manage uncertainties with resourcefulness, which should not be discounted among their resources.

RESEARCH METHODS

This paper developed out of a larger study of several entrepreneurial firms developing novel hardware in the energy and cleantech sector. I collected the data to examine strategy evolution and strategic decision making in early stage entrepreneurial firms developing innovations with the potential to create or disrupt industries. As predicted in the entrepreneurship literature, the firms in the study explored a number of relationships with established firms and investors in their efforts to acquire financial resources, market knowledge, legitimacy, and entry into the
industry’s value chain (e.g. Alvarez & Barney, 2001; Baum et al., 2000; Eisenhardt & Schoonhoven, 1996). In contrast to predictions from research in power and resource dependence, I identified several interactions within the data in which the partnership agreements favored the entrepreneurial firms over the established firms. From this preliminary finding, I reanalyzed the data with the research question: how and when do entrepreneurial firms developing novel technology with uncertain resources gain relative power over established firm partners? Given the disagreement between prior research on power and resource dependence and these preliminary findings, I address this question with a multi-case, open-ended inquiry into the phenomenon to identify new constructs specific to this context and generate new theory (Edmondson & Mcmanus, 2007).

**Research setting**

This research examines early stage entrepreneurial firms in energy and cleantech developing novel hardware innovations from new hard-science and technology knowledge. I selected this setting because it is a sector fraught with high financial and technological uncertainties for which entrepreneurial firms seek assistance from several types of external stakeholders, including established firm partners. Unlike the high-growth technology ventures most commonly addressed in the entrepreneurship literature (Aldrich & Ruef, 2018), entrepreneurial firms founded on novel hard-science technology knowledge face longer development periods and lower return on investment multiples for their funders (Hargadon & Kenney, 2012; Mowery, Nelson, & Martin, 2010). Because of these factors, these firms are less attractive to many traditional venture capital investors whose funds tend to have a ten year schedule, which leads them to invest in ventures likely to have a liquidity event within that shorter time horizon (Gompers & Lerner, 2004). Since 2010, venture capital investment interest in this sector has
decreased drastically, and those investors still interested in this sector have focused on later stage firms at or near profitability (Saha & Muro, 2017). Consequently, these early stage hard-science and technology ventures seek financial and other resources from non-venture capital sources such as Angel investors, “family funds,” government and NGO grants, and “Strategics” (established firms and corporate strategic investors).

Currently, in the energy and cleantech sector many entrepreneurial firms are developing novel innovations from new and recombined technology knowledge to address global issues of energy efficiency, sustainability, pollution, and energy generation (Mowery et al., 2010; Nanda, Younge, & Fleming, 2015). These issues are considered among the grand challenges that nations and firms are addressing on behalf of society (George, Howard-Grenville, Joshi, & Tihanyi, 2016). Technologies that successfully address grand challenges have the potential to disrupt or create industries, at which time all firms with related technologies may be expected to adopt the new technology either by regulation or market preference. For that reason, established firms are actively watching and taking on roles with these entrepreneurial firms and in the development of these technologies (e.g. Dushnitsky & Lenox, 2005a; Hargadon, 2010; Nanda et al., 2015; Pacheco, York, & Hargrave, 2014).

Data collection

This three firm sample was compiled through introductions made through the researcher’s university network of entrepreneurs. All firms were located in the Boston metropolitan area at the time of entry to the study. Founders were approached by email or in person and asked to participate in a field based research study on how entrepreneurial firms in nascent technology industries navigate strategic change. Additionally, they were told that each firm would be kept unidentifiable in presentation and publication of the research. To this end, all firm and informant
names presented, including those of considered and contracted partners, are pseudonyms and details about the technologies and products under development are disguised.

The three entrepreneurial firms were founded to commercialize novel technology hardware and create a new market or replace an existing technology. Founded in 2009 and 2010, they address different technology areas within the energy and cleantech sector: power generation and storage (Coulomb); energy efficiency of electrical systems (Ohm); and pollution control (Ergon). All three founding teams had educations and backgrounds in engineering: two with prior startup experience and one of recently graduated students.

I conducted 62 semi-structured interviews across the three firms during which I probed founders and team members about strategic decisions that affected the firm’s strategy. I interviewed the founding entrepreneurs, top management team, engineers, and other advisors involved in strategic decisions at each firm. Interviews averaged 75 minutes in length and were recorded and transcribed.

Interviews were conducted over a one to five-year period (depending on firm entry and exit to the study) to capture the evolution of firm strategy while decisions and recollections were contemporary. Firms entered the study at different times between the second quarter of 2012 and the first quarter of 2015. Ohm entered the study a year earlier than the other firms as part of a pilot to test the research design. Two firms (Coulomb and Ohm) volunteered to continue in the study on an ongoing basis after the originally agreed upon study period. I augmented interview data with 24 onsite observations coinciding with interviews held at the firms’ offices and 38 internal and external documents, including board presentations, articles and videos about the firms and the founders, press releases by established firm partners, and stakeholder communications provided by informants. Table 1 provides an overview of the firms at entry to
the study. Table 2 details information about data collection, and the interviews and informants at each firm.

Data analysis

Preliminary data analysis for this study was performed as part of the preceding study. As mentioned, the data was initially collected for a study asking how and why do entrepreneurial firms developing novel technology evolve their strategies and technology products? During initial analysis of the data, I identified several cases in which the entrepreneurial firms made agreements with established firms that appeared to favor the entrepreneurial firms’ interests above the established firms’, an outcome that goes against predictions in the literature. While not directly significant to the original research question, those preliminary findings spawned the new research question and separate analysis of the data for this study.

In the first phase of data analysis, I identified all of the partnerships between the three entrepreneurial firms and any established firms mentioned in the collected data. The three entrepreneurial firms considered, attempted, or contracted 28 relationships with established firms during the period of study. Of those, six resulted in contracted partnerships or investment relationships and two had been developing toward partnership contracts but were canceled before reaching an agreement. At completion of data collection, four were in ongoing talks toward partnership or investment contracts while 16 had not progressed beyond initial conversations. Table 3 lists the set of considered, attempted, and contracted relationships for each entrepreneurial firm in the sample.

In the second phase of analysis, I created timelines for each of the relationships within the
data. Data was incomplete for several relationships, either because the relationships did not progress very far in their interactions or because they were not discussed in much depth during interviews. Since my goal was to understand how and when the entrepreneurial firms gained power relative to established firms, each relationship was included for comparison on the basis that incomplete or failed relationships contained information that could exclude or support alternative explanations. In each timeline, I identified which resources were discussed or proposed at different stages of the firms’ interactions, as well as which features of the agreement each firm stated as ones that they were willing or unwilling to change. For those relationships that became active partnerships during data collection, I noted both the details of the agreement and any differences in roles, responsibilities, rights, and resources during the interactions that followed. The specific contracts were never attained among the documents collected; therefore, only those details described in interviews or referred to in collected internal and external documents could be used to code partnership structures and contracts.

Defining power as the ability to influence or overcome the resistance of another (Emerson, 1962), in the third phase of analysis, I coded the relative power of the firms based on whether one firm was able to influence the other to change its position or accept terms that the firm had previously demonstrated resistance to. For a given relationship within the data, depending upon the depth of data collected, the firms attempted on multiple occasions to influence or overcome resistance of each other. I coded when and how a firm attempted to influence the other and whether the effort was successful or not. To compare against predictions from prior literature on resource-dependence and power, I also coded what resources were controlled by each firm at that time and how critical those resources were to the other firm.

Next, I identified statements made by both the entrepreneurial and established firms
regarding their valuations of the technology and their expectations of the future, especially those that signaled the firm’s beliefs regarding the other firm, the resources under its control, and the new technology under development. Since interviews were only held with members from the entrepreneurial firms, information about the valuations and expectations of the established firms were inferred from private statements made by members of the established firms to informants at the entrepreneurial firms and from public statements including press releases, as well as from actions taken by the established firms. For example, Ergon CEO Tad David described his understanding of Bohr’s belief in Ergon’s technology from their actions before their partnership negotiations were complete:

What they’re weighing here is a lot of concern around [our] company, in terms of scale and lack of track record versus this huge excitement over the concept, the technology, and the market opportunity… They’ve already gone down this path and spent the better part of a year talking about it [publicly] and studying it. They’ve hired a consulting company to do a market study on this. They probably spent hundreds of thousands of dollars on that.

From this statement and the pre-contract actions taken by Bohr, I identified that Bohr believed in the potential of Ergon’s technology to create a large, new market. This coding was supported by additional statements by the entrepreneurial firm informants as well as statements made by Bohr in public documents such as press releases.

In the last phase of analysis, I looked for patterns across the full set of relationships as well as within a single entrepreneurial firm. I examined how the valuations and expectations held by both firms about the new technologies related to when an entrepreneurial firm was successful at influencing its established firm partner. In comparing the data across all of the partnerships, I focused on developing a theoretical framework that could explain increases or decreases in power for each firm given the resources they controlled, how and when the entrepreneurial firms were able to influence the established firms’ position, and when the outcomes favored the
entrepreneurial firms.

THE ENTREPRENEURIAL FIRMS

Coulomb

Two of Coulomb’s three founders worked together as consultants vetting alternative energy generation startups for a VC. They did not believe that a single one of the projects that they performed due diligence on held the high growth investment potential that the VC wanted. From their work, they concluded that the best opportunity for value creation in this area of alternative energy generation was to develop a new manufacturing process that would allow them to redesign a key component. By improving one feature of that component, they could increase energy generation capacity across the whole sector. The VC they were working for did not consider a new manufacturing process to be “sexy” and allowed the Coulomb team to proceed on their own.

CEO Jim Allen and co-founder George Thomas found the inspiration for their technology in reams of industry and government reports on current and potential alternative energy generation systems. The crucial piece of Coulomb’s innovation was the ability to redesign that key component, which many researchers and firms within the sector had also identified as the linchpin to achieving high enough output at a low enough cost to unseat fossil fuel energy generation. However, to date, few attempts had been made and none of the proposed solutions achieved the desired outcome without introducing bigger problems for facility and system design.

To realize the value of their technology, Coulomb needed to work with firms multiple steps up and down the value chain. Generator manufacturers and generation facility owners would need to redesign their products and systems for the new component, which meant
changing their processes in more ways than just purchasing Coulomb’s manufacturing machine. Despite that, firms across the industry accepted that they would need to work together to develop financially maximized, long term alternatives to fossil fuel generation. In fact, government grant programs targeting the sector often required that applications include a group of firms from across the value chain. Coulomb used one such grant to bring together several firms, both up-stream and down, on a technical economic analysis project that also served to fund the venture when equity investors continued to turn away. Additionally, Coulomb used grants to fund R&D work at three university labs to test pieces of their technology.

The Coulomb team initiated partnership conversations with seven potential customers, many of whom brought representatives from their investment divisions to the meetings. Beyond that, Coulomb had conversations with three firms downstream of their direct customers and three upstream of their suppliers, although they focused those conversations on strategic investment rather than partnerships. Ultimately, only two customers, Volt and Rad, continued into serious talks with any potential for a formal partnership or sales contract. Neither customer successfully completed a contract with Coulomb during the period of data collection: Volt backed out of a pilot project deal before finalizing negotiations, and conversations with Rad had been tabled during negotiations with Volt.

Coulomb had approached several suppliers about strategic investment, but only initiated upstream partnership talks with three potential manufacturing partners. The team quickly assessed their would-be manufacturing partners, mainly for their product quality and customer service reputation, and chose to only pursue a partnership with one, Fermi. At the close of data collection, Coulomb and Fermi were completing technical designs and developing sales leads for a jointly manufactured machined.
Ergon

Ergon’s serial entrepreneur co-founders were between startups in 2010 when they decided to act on a technology idea that CEO Tad David had been mulling over for five years. David had an idea for a chemical process that could reduce pollution and increase energy efficiency. Co-founder Ian Roth was confident in the idea, enough to nudge David to start Ergon with him. Roth and David had several prior startup successes between them, which gave them credibility with some investors, but neither had experience in cleantech and few of the investors or firms in their networks were interested in the sector. Quickly, they found that too few investors were interested in funding any cleantech startups. After being turned away by every U.S. based Angel investor that they thought might be interested, the founders decided to focus on grants and international equity investors.

Given funders’ cold disposition toward cleantech, David and Roth believed that they needed a low capital, lean operations, founding strategy that they would achieve through partnerships. Ergon’s product is a large machine, but the firm’s core technology is embedded in only one component within that machine. To build the machine with as little up-front capital as possible, the founders decided to work with partners and subcontractors who had industry and manufacturing experience, as well as existing manufacturing facilities. Ergon’s technology innovation is a chemical process able to improve products in a mature industry that had seen little innovation in decades and where most products were priced as commodities. Customers made purchase decisions based predominantly on price and reliability, but industry wide, users talked about a need for more sustainable products with less environmental impact and better energy efficiency. Consumers and producers were looking for the products of the future, which was helpful when Ergon knocked on the doors of potential partners. Roth explained Ergon’s
supplier partnering strategy as:

We go to a supplier. We develop with them. We kind of take advantage of their desire to get a new product or increase their manufacturing capacity. We work with them, and then they will be our supplier.

During data collection for this study, Ergon contracted with four different manufacturing suppliers: two producing different parts of the core technology component and two who would manufacture and distribute the full machine in separate regions of the globe. By design, each supplier worked only with Ergon and never interacted directly with another partnering firm. To limit the hold-up they might experience from working with a single source supplier, Ergon kept an eye out for additional partners in different stages of the process and different market regions.

**Ohm**

Ohm was founded by three engineering graduate students and one MBA, all of whom wanted to be entrepreneurs. The engineers, who worked in the same lab during graduate school, brainstormed startup ideas and decided that they should build a firm based on Al Marcone’s doctoral research. The science behind Marcone’s research was revolutionary, garnering standing room audiences at scientific conferences, but as yet, none of the attempts made around the globe had managed to develop a commercial product from it. With this technology Ohm could significantly increase the energy efficiency of any electronic system, which meant the applications were innumerable.

The first decision for the team was: Which product should we build first? Within a few weeks, the team learned that their first product choice was already being addressed by a handful of entrepreneurial firms using different technologies who were closer to market launch and who had already secured all of the investor interest in that product area. The team decided to look elsewhere for a Plan B. They landed on an inaugural product that they could produce either as a component for an OEM (original equipment manufacturer) to integrate into one of its electronic
systems or as a standalone replacement part that consumers would purchase at retail. The consumer product had high margins but small market volume, while the OEM component had high market volume but rigid price constraints. Initially, the Ohm team decided on a phased development strategy in which they would launch the consumer product first and then improve the design for a lower cost OEM product. The phased strategy would generate revenue from the consumer product in the near term and provide time for the development team to iterate their design and achieve a low-cost OEM product.

More so than the other two entrepreneurial firms in this study, the Ohm team faced a huge development challenge as they were turning a scientific discovery into a manufacturable product. They had less concern about being beat to market by another firm; however, they experienced several R&D roadblocks that added months to their schedule with each delay straining their already tight financial resources. In their industry, established firm OEMs, customers, and suppliers actively scouted new technologies that could provide an advantage in the market. Market incumbents often met with entrepreneurial firms to learn about new ideas and were known to invest in promising technologies and firms. When Ohm realized that their development delays were straining both their bank account and the patience of their VC investors, the team shifted their customer discovery conversations toward strategic partnerships and investment. Ohm consulted with other entrepreneurs in their network to learn which established firms they should stay away from and which had reputations as good partners. Based on that feedback, Ohm contracted with OEM Pascal on a partnership that would give the entrepreneurial firm both financial resources and industry knowledge to complete their technology development, as well as a commitment for one year of sales. Because of the partnership with Pascal, Ohm switched their product launch schedule: Now they would launch
Pascal’s OEM component before the retail consumer product.

Time passed, and Ohm found that they needed still more funding to achieve their goals. As part of their Series B financing round, Ohm initiated partnership and investment talks with both supplier Candela and customer Mole. Both conversations appeared to be progressing well when Candela abruptly ended all negotiations and Mole chose to act only as a financial investor, although Mole did continue conversations exploring how they could expand their relationship with Ohm in the future.

POWER OF ENTREPRENEURIAL FIRMS

"Hey, it's not worth zero! Well, yes it is. Because if we don't put any money in it, it's not worth anything. That might be true. But you're also at the table negotiating, so clearly it's worth something." – Ohm CTO Al Marcone

The entrepreneurial firms in this study did not control resources that held current, agreed upon, certain value or criticality to other firms, yet they exerted power. In several interactions with established firm partners, the three entrepreneurial firms were able to influence and overcome the resistance of others and to avoid being influenced themselves. The study firms gained relative power through three mechanisms rooted in the uncertainties inherent in entrepreneurship. First, these pioneering firms gained speculative power when other firms believed in a potential future in which the entrepreneurial firms controlled critically needed resources. Second, their established firm partners lost relative power when the entrepreneurial firms were willing to change their strategies and the resources they needed, accepting potentially less ideal performance targets in a tradeoff for alternatives to resource dependence. Third, acknowledging that failure was their most likely outcome, the entrepreneurial firms identified thresholds after which they were willing to cease operations and walk away, which would also end the established firm’s access to their innovation.
Speculative power from uncertain future resources

Without question, the teams at each entrepreneurial firm believed that they were developing a technology that would change their industry, and potentially the planet. They accepted that their vision for the future was uncertain, but they believed they could achieve that potential future and create significant value with their innovations. When established firm potential partners believed, not only in the possibility of industry change, but also that they would then become dependent on the innovating firm for access to that technology, then the entrepreneurial firms gained speculative power.

During the period of study, none of the entrepreneurial firms had completed development of their technology innovations, so they did not control physical or knowledge resources with certain, agreed upon value or criticality to other firms. They did have technology knowledge under development that had the potential for value creation and future criticality. Each established firm partner calculated their own expected value and speculation of future dependence. In several interactions in the data, the entrepreneurial firms were able to leverage enough speculative power to overcome an established firms’ resistance and get them to accept different terms in negotiations. In other cases, the entrepreneurial firms did not have enough speculative power to shift the power imbalance to their favor.

Initially, Bohr declared that they would not sign an exclusive production contract; however, they believed that Ergon’s technology coupled with their manufacturing capabilities could create a new category that would impact the industry worldwide, which gave Ergon the power to overcome Bohr’s resistance. Bohr is a Fortune Global 500 manufacturing firm with customers in nearly every country on the planet and offices in half of them. They have cemented their market position by staying at the forefront of new industries and new product categories.
From the beginning, Bohr presented themselves as Ergon’s best manufacturing partner, describing their value add to CEO Tad David as the key to successfully creating this new product category:

They thought, “We, Bohr, can actually increase the chance of this happening by plunking down our own resources and making sure. The hardest part of this is making this [core component]. We’re the best in the world at this. We’re the biggest. We’re the best, and we have the most talented [team]. If we step in and do this that increases the probability the market will then materialize.”

Bohr believed in the future of this technology so strongly that they spent a year, before beginning negotiations on the partnership contract, studying it and speaking publicly about their interest – they spent hundreds of thousands of dollars to have a consulting company do a market analysis before they scheduled contract talks.

When negotiations began, Ergon proposed an exclusive deal in which Bohr would invest in improving the design for better manufacturing and scale-up while the entrepreneurial firm would commit to buying specified volumes each year, but Bohr could not sell to anyone else. Believing they were too early in the process to define the volumes or pricing needed to be profitable, especially if they only had one customer, Bohr’s negotiators told David:

“We can’t sign an exclusive agreement. We don’t know enough about what this is going to be in order to sign an exclusive. Without any other protection, we can’t do this.”

Bohr’s negotiators counter proposed that they be granted a license to manufacture the core technology component, a license that would put control of the technology key to Ergon’s value proposition in Bohr’s hands. As David explained, he understood that Bohr wanted protection in case the entrepreneurial firm did not survive:

What they want in return is that they need to have a license for our technology, so that in case we end up not buying enough of it or not buying at all, they can at least go sell it to someone else… Not only are we small and unreliable, but we also control the IP. So, if we decide to do something weird, like go away and give it to somebody else, they’re holding a bag, and they can’t do anything.
Negotiations continued in David’s words: “a soap opera, which lasted several months” and twice “reached a point of: Okay, the deal is off. We’re walking away.”

Both firms agreed that Bohr was by far the best manufacturer to shepherd Ergon’s technology into commercialization, and Bohr was willing to put $10 million toward doing so – three times more money than Ergon had raised in financing to date. However, without the novel technology that Ergon controlled, no commercialization or new technology category creation could happen. Despite controlling far more monetary, physical, and knowledge resources than their entrepreneurial partner, Bohr ultimately agreed to a contract that, while not fully exclusive, excluded nearly every firm that would be interested in the technology and put the onus of identifying who was excluded on the established firm. Ergon CEO David described the three key elements of his contract victory:

They cannot sell it to what I call “excluded customers”. That’s one piece. Then, of course, the key is, who’s on that list? That’s where our victory is comprehensive. Excluded is anybody who is or was a customer of ours and also by chain. Basically they can’t sell it to somebody who is going to sell it to somebody who was a customer of ours... If anybody’s ever installed a unit that was originally sourced through our supply chain, it’s off limits in terms of getting to source replacement [parts] through a different supply chain that traces back to Bohr. The other thing is that they cannot sell to any kind of firm that is infringing on any of our IP. If they do sell to somebody and we think they’re infringing, we notify them. Now the burden is on them to prove that they’re not. They can’t just say, “Oh well.” We would take them to court. Once you’re put on the list, it automatically generates a process that they can’t do it. The third thing is that when they sell to a third party that is authorized, they have to pay me royalty... Those are the elements that protect me in this deal.

Despite having few of their own resources and therefore seemingly low relative power, Ergon was able to use their speculative power and Bohr’s belief in the future Ergon was creating to overcome the established firm’s resistance on what Bohr initially claimed was the most important part of their agreement.

For Coulomb and Fermi, Coulomb’s speculative power was set the moment Fermi
realized that the development work the established firm had been doing on a similar solution was not only technologically inferior but also infringed on Coulomb’s patents. After Coulomb’s negotiations with first customer Volt fell apart over concerns about the inexperienced entrepreneurial firm building their own machine, Coulomb went looking for a partner with machine manufacturing experience. They began conversations with Fermi, which had more than a century of manufacturing experience and had recently been acquired by an international firm with billions in annual revenue. Fermi built machines in an adjacent industry that Coulomb was adapting processes from into their innovation and whose production capacity across the world had slowed near saturation. Fermi had identified the same value creation opportunity from a new manufacturing process as Coulomb, but as CEO Jim Allen explained, until Coulomb knocked on their door, Fermi thought that the IP for this technology could not be patented or controlled:

[Fermi] got down into the reeds of the patents and realized that not only did our patents protect what we have, our patents enabled us to prevent them from doing even the technology that they wanted to do – and that everyone else wanted to do. Basically, they were getting into it. They were ready to drop serious money to build a demonstration project around their technology – even though they weren't happy with the technology, they didn't have any engagement with the industry, and they believed it was going to be commodity industry. They didn't think it was patent controllable. It wasn't until they really vetted our patents that they realized there is blocking IP to be had in the space, and we had it.

One of their engineers told a Coulomb team member that Fermi found Coulomb’s technology “very exciting and very scary.” Once they understood the IP landscape, Fermi was motivated to partner with Coulomb, which they now knew was their only opportunity to enter the market.

Fermi brought significant monetary and social legitimacy resources to the partnership, but Coulomb controlled patents on the key future resource and therefore had the speculative power to orchestrate an agreement in which the entrepreneurial firm retained complete ownership of all IP. Fermi would build and sell the machine, but each buyer must contract with Coulomb to license the technology, paid per unit produced by each machine. CEO Allen
explained that however the machine was sold, control of the IP was the most important thing to Coulomb’s long term strategy:

We've always swung for long term value and control of the technology. This is the part of the Fermi deal that we made sure of: that any way in which we break up, we're always left with complete control of our technology. They never get access to the patents we hold to date unless they're working with us, and then everything that is co-developed, we get full access to. They get full access to the co-developed stuff, though the vast majority of that they can't practice without the previous stuff, and we get full access to all of it -- meaning that we still have access to everything.

Fermi would put up approximately $20 million to build each machine and collect a 10% margin at its sale, but they would get no percentage of the $100 to $200 million worth of production each machine could do in a year. Furthermore, Fermi could only retain their exclusivity as Coulomb’s sole machine manufacturer as long as they sold at least one machine every six months. Despite putting tens of millions of dollars and their reputation as a skilled manufacturer into production of each machine, Fermi was the lower power, dependent partner. Fermi committed to the partnership because they believed that the future of the industry involved this technology change, a belief that endowed the entrepreneurial firm with speculative power and the ability to influence Fermi in negotiations.

These established firms believed in the future value of the entrepreneurial firm’s technology enough to start conversations about partnership, but that belief did not inherently bestow higher power upon the innovating young firm. Only when the established firm also believed that in that future the entrepreneurial firm would control those valued resources such that the established firm was more dependent on the entrepreneurial firm than the entrepreneurial firm was on them, did the entrepreneurial firm gain advantage from speculative power. Like Fermi, Volt believed that the technological change Coulomb would produce was coming to their industry, but they also believed that as the customer with the largest market share, they were more critical to Coulomb than Coulomb was critical to them. Even with control over the
technology IP, Coulomb could not gain enough relative power to overcome Volt’s resistance to risk.

Coulomb CEO Jim Allen believed that Volt was their ideal first customer because they were:

Biggest in the world [with] lots of technologies that are well aligned with us. We know that they want to move in the direction we want to go in. They’ve already developed a number of very complementary technologies. We know we technically fit in very well.

Volt showed their interest in Coulomb’s technology in several ways. They recommended engineers from Volt’s recently downsized R&D division for positions on Coulomb’s growing team. Then, they joined the entrepreneurial firm on a $1M grant proposal, committing 500 hours of engineering time to help Coulomb develop an economic and engineering “paper study” of the new technology. Allen described being happily confused when Volt’s team agreed to join the grant application without any compensation or written commitments for future sales:

What Volt said – though I don’t fully believe this; I don’t understand their reasoning here – they said, “Well, we don’t need to require exclusivity because we won’t have any trouble buying up all of your capacity.” This was after we discussed half a billion dollars’ worth of capacity. They were like “Yeah. No problem.”

Volt was confident that as the sole customer they would maintain higher relative power over Coulomb. Regardless of who controlled the new technology, Volt believed they would not become dependent on the entrepreneurial firm.

After work on the grant began, Allen proposed a joint venture in which Coulomb would construct and run their first pilot prototype machine in a building alongside one of Volt’s manufacturing facilities. The components produced by the prototype would have a 20% cost advantage over Volt’s current process but would not achieve the full potential of Coulomb’s innovation. Allen knew Volt was cautious and risk averse, so Coulomb proposed the partnership
as a joint venture so that Volt would see the partnership as “We’re building a factory” instead of as an investment in the entrepreneurial firm. Allen proposed pricing “at cost plus a license fee back to our parent.”

By the spring of 2016, Volt had completed due diligence on Coulomb’s technology and the two firms began formal negotiations on a deal to convert a section of Volt’s factory for the new machine. Then, Volt abruptly ceased negotiations and told Coulomb that the endeavor was “too risky for them.” To Allen and his team, the explanation for the shift was clear, but it still came as a surprise:

They don't build manufacturing equipment, so I think they had a hard time wrapping their head around the risk of building the machine… It was surprising, because they had invested significant resources into working with us for a long time, due diligence and everything.

Coulomb had offered to lower the price per component and reiterated that Volt’s own expertise would shore up any missing capabilities at the entrepreneurial firm, but the established firm could not be swayed. Noteably, Volt had not stopped believing in the potential of Coulomb’s technology. After Volt learned about Coulomb’s manufacturing partnership with Fermi, they restarted conversations about buying the first machine. Their failure to contract was not due to a lack of belief in the technology or future industry change but because Coulomb did not have enough speculative power to overcome Volt’s resistance to accept the risk of a machine built by an inexperienced entrepreneurial firm.

Despite holding few resources with current, certain value, the entrepreneurial firms did control uncertain future resources that both they and the established firms they interacted with assessed as holding some speculated value. When the established firms also believed that in that future they would be dependent on the entrepreneurial firms for those valued resources, then
entrepreneurial firms found themselves imbued with speculative power that increased the current relative power of the entrepreneurial firm.

**Trading off for alternatives to dependence**

The relative power between two firms depends, not only on the value of a controlled resource, but more importantly on how critically the other firm needs that resource. Each entrepreneurial firm in this study needed specific resources that they did not control to achieve their planned strategies; however, given how uncertain success with that planned strategy was, they were also open to trade off alternatives. As Ohm CEO Cam Fahey explained, with incomplete knowledge and limited resources, she had no delusions that the current strategy was perfect:

> It was kind of like: this is what we are doing until proven that it is bad. We weren't trying to have all of the options and make sure this one was the best. It was like: this is what we are doing unless there is a real roadblock.

Knowing they were not certain that they had the best answers, the entrepreneurial firms were willing change their plan if an established firm partner demanded more than they wanted to accept. By changing which resources they used to achieve the current strategy or by changing their strategy overall, the entrepreneurial firm found alternatives to dependence which decreased the established firms’ power over them.

*Changing Resources* The entrepreneurial firms in this study were willing to trade product performance targets, targets they were uncertain whether the market truly demanded, in exchange for a better bargaining position. When an established firm that controlled a needed resource tried to influence the entrepreneurial firm to accept unfavorable terms, the entrepreneurial firm could decrease that firm’s power by changing which resources they used. When Ohm found themselves too low power to stimulate the supply chain for the most technologically optimized version of their product, they changed the product’s design to use different parts and then found themselves pursued by the established firms who had previously
been too powerful to bend to Ohm's time and quality needs.

To achieve the full potential of their novel technology, Ohm needed customized parts, specifically they needed advanced alpha-parts. For several years, the alpha-part industry had been exploring a new technology of its own. Advanced alpha-parts were still under development, but a few suppliers were selling them for use in another market, unfortunately, that market had different specifications and looser performance requirements than Ohm needed. Small alpha-part firms told Ohm they would need to wait three months and could not guarantee the reliability of brand new designs -- which meant most of Ohm's potential buyers would not accept these suppliers anyway. Meanwhile, larger alpha-part suppliers were excited to see a new product that could kick start advanced alpha-parts sales. Candela told the Ohm team: "It is amazing that you guys can do this. It’s going to take us 18 months to make this part and validate that it works."

From informal conversations with Candela's technical team, CTO Marcone knew it could be done much faster:

   Eighteen months seems like a lifetime in a startup…They tell you 18 months, but, if they really put their entire set of resources against it, it’s probably six. What you really need to win is to have it be six.

Despite knowing what Candela could do, Ohm was unable to convince the established firm to move faster. Ohm found itself neither powerful enough to overcome their customers' resistance to products made with alpha-parts from small firms nor to influence large suppliers to produce advanced alpha-parts more quickly. Principal engineer, Robert Owen, explained Ohm's predicament:

   The [novel technology design] is a great [product], but we don’t have the ability to drive the supply chain to where we need it to be. No one’s going to make devices optimized for us until we prove to them that they should.

Rather than accept their predicament, Ohm's engineers redesigned their product to use currently available alpha-parts. The alternative design would not hit the “game changing efficiency” of
Ohm's original design, but it would still be significantly better than any product currently available in the market. Despite their desire to design the most technologically optimized product, the Ohm team admitted that they did not truly know whether the market would require a product that exceeded current efficiency by so much. CTO Marcone believed the firm's odds became better with the alternative design because of the shorter path to market:

You have to shape the company to meet the environment… There is value in not being super rigid about what we are doing process wise or even the technology. I feel like at this point it’s always a fine line between we have all this time invested in this technology we understand it pretty well -- and you don’t want to do something stupid by breaking off too early and throwing the baby away with the bath water. But, if you hold on too long, you might auger into the ground. Throwing away 10 years of working on [the original design] – not throwing it away, it is true that we are putting it to the side, shelving it in favor of something else where we weren’t sure – I think was a scary thing but it was totally necessary.

Rather than be slowed, low powered, with no good supply chain options, Ohm changed which resources they used so that they were one of many buyers in a competitive supply chain with little power asymmetry.

After the redesign and the failure of their negotiations with Candela, Ohm found itself unexpectedly, once again, the object of Candela's increasing interest. Ohm received accolades at the industry's annual trade show with the alternative design product, which Candela knew used traditional alpha-parts and expected would be followed into the market by an advanced alpha-parts design. Whereas months before, Candela could not be influenced to speed their advanced alpha-parts development process to help Ohm produce an optimized product. Now Candela was hinting to others at the trade show that the two firms were working together on an advanced alpha-parts product and dropping by Ohm's office to deliver demo parts for the startup's engineers to try out. The established firm even went so far as to begin talks to lead Ohm's Series B funding round as a large strategic investor and to initiate a development partnership, as CEO Cam Fahey explained:
As part of their investment, we were going to do a commercial program where we targeted an application and built a system with co-optimizing their [alpha-part] devices and our [product] which gives you better performance. That’s probably a [three years away] product. It was something that we were excited about.

By changing the resources they needed in their initial product Ohm shifted the power between themselves and Candela. The established firm went from higher power, unwilling to change their efforts and timeline for the entrepreneurial firm, to an active suitor trying to insure their position as Ohm's supplier and investor in the next generation of products.

*Changing Strategy* For the entrepreneurial firms in this study, an alternative to dependence could be as small as a change in the resources needed or as large as changing the firm’s strategy. When Ohm found themselves unable to convince customer and strategic partner, Pascal, to accept the final design for their B2B component product so they could begin production and sales, Ohm chose to change their whole product strategy rather than continue to be dependent on the risk averse established firm. In the fall of 2014, Ohm used the speculative power endowed by Pascal’s belief in their technology to sign a $5M NRE (non-recurring engineering) agreement with the Fortune Global 500 multinational conglomerate, one of the largest worldwide OEM customers in their market. Ohm would use the money to complete development of their B2B product, and Pascal would disperse the funds over four milestones. After the fourth milestone, the final production design was approved, Pascal would have one year of complete exclusivity as the only firm Ohm could sell to in their market – one year as the only firm with the most technologically advanced and efficient component.

Then, Pascal refused to accept the fourth milestone, claiming that the design did not pass a certification test and holding up all sales of the entrepreneurial firm’s first product. For their first negotiation tactic, Ohm tried to convince the Pascal team that the tests were not appropriate for Ohm’s technology. As Program Manager Sarah Ren explained:
We tried to reason with Pascal that it doesn’t quite make sense in today’s world, these specs just no longer make sense. Because it’s kind of a tech boss exercise that they do on their engineering team, in a sense, that they weren’t really willing to compromise any of the specs.

When that did not succeed, the Ohm team worked to correct any issue with their product design that might cause it to fail one of the tests. Ohm CTO Al Marcone explained the efforts the team made against unexpected resistance to resolve the issues with the last product test:

What they were doing all of last year was running a slow game of attrition, whereby we’d have a prototype that was submitted for evaluation and, one at a time, they would identify a problem… From June to November, we’ve done this thing three times… We went back and we made all the changes. In March, this year, we sent them this thing. We did everything they said we needed to do. I was like: “Finally, this thing is going to ship.” They get it and it gets sent back. They say, “It doesn’t work. It’s no good.”

Rather than continue to be held up by their higher power established firm partner, Ohm decided to side step the whole situation and change their product strategy. The contract between the two firms granted Pascal one year as Ohm’s exclusive customer in Pascal’s market, but it did not preclude Ohm from selling a product that used the same technology in a different market. After months unable to influence Pascal to accept the final milestone, Ohm decided to stop work on the Pascal product, and instead launch a consumer product in what was originally going to be their second market. As Program Manager Sarah Ren explained:

Because the core technology is so similar [in the second market product] and because we have total control over the product, we said: “Hey, maybe it makes sense for us to release [the second market product] so we can actually see some positive cash flow for once.”

Ohm’s team had contracted with Pascal as part of a strategy to launch their first product in a large, mass market that they believed would be a good inaugural market for their new-to-the-world technology. While that plan made sense, whether it truly was the best way to introduce their new technology to the world was uncertain – the team had previously questioned whether a higher margin first market, even if it was smaller, might have been a better starting place. Once Pascal’s higher power allowed it to become a roadblock, Ohm decided that a smaller market with
higher margins was a better alternative to dependence on a partner willing to hold the entrepreneurial firm’s first year of product sales hostage.

**Thresholds from a willingness to walk away**

The employees at the entrepreneurial firms in this study fully understood that most entrepreneurial firms fail and that exiting the firm could be a better outcome for them than continuing to invest time, money, and effort. On multiple occasions, managers and team members mentioned “just walking away” as an alternative to an investor or partner proposal. Ohm Principal Engineer Robert Owen explained that sometimes he asked himself if they were staying for the wrong reasons when the right thing to do would be to walk away:

> We’re going to be in serious danger of diluting the employee ownership stake to such a point where it doesn’t make sense for us to still be killing ourselves to do this… At some point, you run into that sunk costs dilemma: You’ve done something for so long you may as well see it through, but that’s a bad idea.

Like Owen, all of the firms’ employees were working hard and committed to their firms, but they also had limits to what made the work worthwhile, which meant that they had limits after which they could not be influenced or have their resistance overcome because exiting was a better choice. If the entrepreneurial firm ceased, the established firm would lose its opportunity to participate in the potential value creation of the entrepreneurial firm’s new technology innovation. Since that would take away potentially valuable future resources from the established firm, the willingness to exit created a threshold on the power an established firm could wield over them.

While not the case for all entrepreneurs, the technology entrepreneurs in this study were aware that they and their teams had alternatives to entrepreneurship. Program Manager Sarah Ren mentioned how recruiters regularly called the Ohm offices: "Our teams are constantly getting poached by recruiters. Many of us can find jobs elsewhere, and perhaps a better
compensation package if you take both stock options plus base salary into account." Coulomb co-founder Nikki Abe admitted that once her team was being paid competitive salaries and no longer living paycheck to paycheck without savings, she slept better at night because they were her real worry if the firm ran out of money and closed: "They are going to be fine. They are not like on the edge trying to keep this company going. They are totally normal people now."

Willingness to fail is not inherently empowering, but, in considering that alternative, the entrepreneurial firms in this study explicitly assessed how critically they needed the resources controlled by others. In those moments, the entrepreneurial firms made a choice to either accept the higher power influence of an established firm or stand their ground empowered to either overcome the established firm's resistance or cease operations. When, after more than a year, Henry had not assigned anyone to work on half of their partnership project, Ergon CEO Tad David considered whether to court other partners with alternative resources or to wait for Henry to start the work. David concluded that without a partner with Henry's manufacturing capabilities and market share Ergon had too low a chance for success, so he opted to wait, if need be to "hunker down, send all our employees home, or half of them home, and just preserve our cash." David decided that Henry’s resources were critical to whether Ergon succeeded or failed and accepted the entrepreneurial firm’s lower relative power.

However, when Mole and their representative on Ohm’s board of directors decided that they wanted to replace Ohm’s Co-founder/CEO with a more experienced CEO, the established firm was blocked by the entrepreneurial team’s willingness to exit rather than accept terms they did not want. When board members had previously discussed replacing the Co-founder/CEO, Ohm’s CTO Al Marcone said straight out: "No way. You can't just replace Cam. I'm leaving if you do." Mole had decided that they wanted a change in Ohm's strategic direction that they
believed required a new CEO, so Mole representative Dan Katumi and independent investor Dean Markos initiated conversations with other employees to find out whether the entrepreneurial firm could survive without the CTO. Principal Engineer Owen told them:

I was very honest with him. I said, "I'm loyal to Al. I think he is incredibly important to this company. I think that if he's gone — it's not absolutely certain that everyone will leave – but unless you do something like triple everyone's salary, there's not going to be a reasonable incentive for everyone to stay here."

Similarly, Program Manager Ren told them: "I think if Al throws his hands up in the air and says, 'I'm done with this,' the firm will not survive." After that, Mole quieted their efforts to replace the CEO and shift Ohm's strategic direction, even as they continued conversations about investing in the entrepreneurial firm’s next round of funding. The entrepreneurial firm strongly needed Mole's financial, project, and network resources at that point in time, but their willingness to exit the firm rather than accept management and strategy changes they did not want gave them higher relative power over the established firm.

When the entrepreneurial firms in this study considered ceasing operations, they defined a bottom to the criticality of their need for a given resource. Below that threshold, they would be willing to walk away from the firm and no longer have any need or criticality for the resource. At that same time, the established firms would lose their chance to participate in the new technology. As they approached that threshold, the entrepreneurial firm had less critical need and became harder to influence while their established firm partner had more need criticality in the entrepreneurial firm’s resources, decreasing the established firm’s relative power.

**DISCUSSION**

Entrepreneurial firms do not have an abundance of resources, in fact they are intrinsically in want of resources, but they do have sources of power and the ability to influence established firm partners. A defining feature of the entrepreneurial firm is a context of uncertainty (Foss & Klein,
How an entrepreneurial firm and others view that uncertainty can either increase the power of that entrepreneurial firm or decrease the power of an established firm partner. In this inductive study, I identified three mechanisms by which that happens. First, while established firms may not choose to act under uncertainty to develop an innovation themselves, they may still see value in and speculate about that future. If the established firm believes it will be dependent on the entrepreneurial firm in that future then the entrepreneurial firm is endowed with speculative power based on the criticality of potential future resource need. Second, because entrepreneurial firms know that their strategies are uncertain, they can lower an established firm’s relative power by trading uncertain performance characteristics for alternatives to dependence by changing the resources they use or the firm’s strategy on a larger scale. Once an entrepreneurial firm removes the need for a specific resource, they decrease the power of the firm who controls it. Third, since most entrepreneurial firms are likely to fail, they can further decrease the power an established firm holds over them by being willing to shutter the firm and walk away, blocking the established firm’s opportunity to participate in the innovation and defining the threshold past which they have no dependence.

**Uncertainty increasing power**

In this study, I found that uncertainty can be a driver of increased relative power, which seems counter intuitive at first blush. Power comes from control of resources while uncertainty is associated with a lack of control. However, managing uncertainty requires flexibility and the ability to adapt through continuous and dynamic decision making (Alvarez & Barney, 2005; Packard et al., 2017). In relationships between entrepreneurial firms and established firms, established firms are often characterized as powerful “sharks” because they have clear goals and they control resources the entrepreneurial firm needs (Colombo & Shafi, 2016; Diestre &
Rajagopalan, 2012; Katila et al., 2008). Yet, established firms are also often unwilling or unable to wade into developing uncertain innovations because they are constrained by organizational inertia due to existing stocks of resources and capabilities (Abernathy & Clark, 1985; Henderson & Clark, 1990; Tripsas, 2009) and current customer expectations (Bower & Christensen, 1995; Christensen, 1997). They are tied to existing supply chains and expectations by their control of resources, legitimacy, and market share, which create lock-in and decrease their ability to diffuse resource dependence. Established firms lose power because they are constrained by the stock of resources they already hold.

On the other hand, entrepreneurial firms benefit from the liabilities of newness and gain relative power from flexibility. According to Stinchcombe’s theory of the “liabilities of newness,” entrepreneurial firms are at greater risk of failure because they have limited knowledge and capabilities, are still developing their organizational processes, and have few existing strong ties, all while being dependent on cooperation with “strangers” (Stinchcombe, 1965, pg. 149). Because of these liabilities, entrepreneurial firms are less efficient with what time and resources they have, which can increase the likelihood that they run out of resources and fail before they find their way. However, since they are still figuring out which processes work best for them and which strangers to cooperate with, entrepreneurial firms have the advantage of flexibility and therefore the ability to create alternatives to dependence. When entrepreneurial firms manage their uncertainty with flexibility, they can step out from dependence on others, decreasing that firm’s relative power and increasing their own.

**Time and the social definition of power**

Speculative power is power derived from a firm’s control of resources that another firm believes it may depend upon in some uncertain potential future. It is most clearly observed in the context
of novel innovation for which the appropriable value of current knowledge resources is uncertain and significant time must pass before that value will be verified. In this context, only the judgement and beliefs of decision makers can be used to assess the how likely it is an innovation will reach the market, what market impact and value creation that innovation will have, and how dependent others will be on the knowledge or physical resources related to that innovation. While this appears to be a special case of future expectation and power, I propose that it is instead an extreme case that highlights the under examined role of time and the social definition of power and resource dependence.

For one firm to wield power, another firm must accept that they are dependent, that they have some critical need for a resource controlled by the focal firm. Power is a social judgement made by a firm’s decision makers, not an objective measure with a known, universally agreed upon value to be entered on a balance sheet. In the interactions between firms, each firm assesses for itself the value of resources controlled by the other and the criticality of need for those resources. Ex ante, that assessment is idiosyncratic to the firm (Barney, 1986; Schmidt & Keil, 2013) and how the firm expects to create added value from that resource (Brandenburger & Stuart Jr, 1996), but it is also subjective judgement. The ultimate value and criticality of need cannot be known until the resources have been used and transformed into captured value (Brandenburger & Stuart Jr, 1996). While power between firms is most often assessed and wielded at the same time, at the time when firms interact, contract, or partner, all judgements of power are made by people based on the consideration of future value.

Power is not based on control of resources with certain, current value but on assessment of expected value and dependence. Resources are used in the future, albeit usually the near future, and are contracted based on expectations about what will happen then. The power of
entrepreneurial firms, whose uncertain valuations are based on judgement about potential future value creation, comes from the flexibility necessary to manage uncertainty and the inherent temporal and social definition of power.

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### TABLES & FIGURES

#### Table 1: Description of entrepreneurial firms

<table>
<thead>
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<th>Firm</th>
<th>Founded</th>
<th>Team</th>
<th>Cleantech area</th>
<th>Innovation in</th>
<th>Founder experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coulomb</td>
<td>2009</td>
<td>4+</td>
<td>Power Generation</td>
<td>Manufacturing process</td>
<td>Two engineering consultants and one engineering professor</td>
</tr>
<tr>
<td>Ergon</td>
<td>2010</td>
<td>8</td>
<td>Pollution Control</td>
<td>Chemical process</td>
<td>Two serial entrepreneur engineers</td>
</tr>
<tr>
<td>Ohm</td>
<td>2010</td>
<td>10+</td>
<td>Energy Efficiency</td>
<td>Application of new science</td>
<td>Three engineering graduates and one MBA</td>
</tr>
</tbody>
</table>

+Additional advisors, interns, consultants, or university lab graduate students not otherwise included in this count

#### Table 2: Description of data collected

<table>
<thead>
<tr>
<th>Firm</th>
<th>Period in study</th>
<th>Months in study</th>
<th>Number of interviews</th>
<th>Interviewees</th>
<th>Observations</th>
<th>Documents</th>
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<tr>
<td>Coulomb</td>
<td>Q3 2013 – Q1 2018</td>
<td>56</td>
<td>16</td>
<td>CEO, Co-Founder Engineering Lead, Co-Founder Advisor, Co-Founder Engineering Project Manager Dir Operations &amp; Development</td>
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<td>Ergon</td>
<td>Q1 2014 – Q4 2014</td>
<td>9</td>
<td>5</td>
<td>CEO, Co-founder VP Sales &amp; Bus Dev, Co-founder</td>
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<td>Ohm</td>
<td>Q2 2012 – Q4 2018</td>
<td>64</td>
<td>41</td>
<td>CEO, Co-Founder CTO, Co-Founder Dir Ops, Co-Founder VP Sales &amp; Marketing Program Manager (1) Program Manager (2) Dir Engineering Development Senior Principal Engineer Principal Engineer</td>
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**Total** | 62 | 24 | 38 |
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<th>Established firm</th>
<th>Relationship</th>
<th>Partnership status</th>
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<tr>
<td>Coulomb</td>
<td>Fermi</td>
<td>Manufacturer</td>
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<td>Volt</td>
<td>Customer</td>
<td>Failed to contract</td>
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<td></td>
<td>Rad</td>
<td>Customer</td>
<td>Ongoing talks</td>
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<tr>
<td></td>
<td>5 Firms</td>
<td>Customer</td>
<td>Initial talks only</td>
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<td></td>
<td>2 Firms</td>
<td>Manufacturer</td>
<td>Initial talks only</td>
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<tr>
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<td>3 Firms</td>
<td>Downstream of Customer in Value Chain</td>
<td>Initial talks only</td>
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<tr>
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<td>3 Firms</td>
<td>Upstream of Customer in Value Chain</td>
<td>Initial talks only</td>
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<tr>
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<td>Bohr</td>
<td>Component manufacturer</td>
<td>Contracted</td>
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<td>Henry</td>
<td>Manufacturing &amp; distribution, U.S. region</td>
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<td></td>
<td>Cal</td>
<td>Component manufacturer</td>
<td>Contracted</td>
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<td>Gray</td>
<td>Manufacturing &amp; distribution, single region</td>
<td>Contracted</td>
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<tr>
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<td>Pascal</td>
<td>Customer</td>
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<td>Candela</td>
<td>Supplier &amp; equity investor</td>
<td>Failed to contract</td>
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<td>Mole</td>
<td>Customer &amp; equity investor</td>
<td>Ongoing talks</td>
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<td>Ongoing talks</td>
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