Tech grad, innovation, and IPO success of hi-tech firms

***Abstract***

This study looks at human capital with a focus on the prestige of the educational institution(s) founders CEOs attended. We explore the relationship between human capital of founder CEOs and Initial Public Offering (IPO) Success, and look at innovation as a moderating variable. We build on human capital and upper echelon theory by developing arguments about tech grad founder CEOs and exploring relative signaling and enduring effects that the technology (non-technology) related education has on hi-tech firms.

***Introduction***

By 2021, 40% of the Fortune 500 Companies will no longer exist[1] and more than 3/4 of the S&P 500 will be compromised of companies[2] with salient exponential growth (e.g. Google, Amazon and Netflix). These so called "toothbrush test"[3] companies are likely to have three prevailing characteristics: a maven thinker at the helm, an IPO dependency to obtain the capital needed to fund continued growth (Brau and Fawcett, 2006), and an ability to creatively disrupt industries[4]. Accordingly and empirically, exponential growth can be presented by IPO success and innovation.

Early stage high-tech firms typically focus on innovation that can contribute to regional development and growth (Oakey, 1995). In fact, investor focus on the promise of growth rather

[1] Babson Olin School of Business Advertisement, Fast Company April 2011, page 121.
[2] According to Yale Professor Richard Foster.
[3] According The New York Times', Google CEO Larry Page uses the "toothbrush test" to determine whether a company is worth buying. He'll ask, "Is this something you will use once or twice a day, and does it make your life better?" After all, we use Google more often than twice a day.
[4] According to Peter Diamandis In his book,"Bold".

than profitability resulted in high-tech and internet start-ups being viewed differently from typical new ventures in that they were able to marshal substantial resources virtually independent of performance benchmarks (Carpenter et al., 2003, Mudambi and Treichel, 2005).

The role and impact of CEOs is critical for the subset of technology related IPO firms as they may require fundamentally different skill sets and competencies from CEOs compared to those required to run companies in more traditional industries. Human capital is one of the most important components of intellectual capitals and intangible assets in organizations because it stimulates technological innovations (Becker, 2002). As the science of "deconstructing genius" gains momentum, It is prudent to explore who the individual(s) behind these disruptive hi-tech companies are? Where did they go to school? Did they have greater IPO Success? How innovative are they?

Ivy League schools[5] represent the top echelon of U.S. universities, and to date various scholars have said that Ivy League has impact as an educational advantage (Becker, 1964; Cooper, Gimeno-Gascon, and Woo, 1994; Flamholtz and Lacey, 1981) and some have said it doesn't (Judge et al., 1995; Martelli and Abels, 2010; Sowell, 2008). Zhang (2012) claims that the Ivy list should be expanded to include a few other prestigious universities.

In 2014, Business Insider released its annual ranking of the Best Colleges in America and reported a new trend, making no mention of Ivy League impact, instead colleges with a strong engineering and technology pedigree ranked the highest. Engineers with a solid business plan

[5] These schools include Harvard, Yale, Princeton, Columbia, Brown, Dartmouth, Pennsylvania, and Cornell, and are among the most selective in the world. Their acceptance rates generally range from about 5 to 15percent of total applications (which themselves are likely to represent a higher-than-average quality pool, see http:// theivycoach.com/ivy-league-statistics-by-college/), and their criteria for admission are both academic and social. Miller et al. (2014) suggests that, namely, graduates of Ivy League schools with stringent admissions policies have a type of human capital that is relatively rare and highly selected and thus might well qualify as a resource. Moreover, Ivy League universities perform early-stage screening for outstanding talent and motivation (Zhang, 2008).

can end up finding extreme success at a relatively young age. Stanford University graduate with a BS in Management Science & Engineering, Instagram CEO Kevin Systrom, for example, was only 28 years old when his company sold to Facebook for $1 billion. At 24 and 26 years old respectively, Evan Spiegel and Bobby Murphy, while studying product design at Stanford, co-founded the $10-billion company Snapchat. And with high demand for a tech-focused education, these schools remain incredibly difficult to get in to. This study looks at human capital with a focus on the prestige of the educational institution(s) Founders CEOs attended. We explore the relationship between human capital of founder CEOs and Initial Public Offering (IPO) Success, and look at innovation as a moderating variable.

***Literature Review***

**Human Capital and IPO Success**

An entrepreneur's human capital has been linked to their entry into nascent entrepreneurship activities (Davidsson & Honig, 2003), venture success and entrepreneurial exit (Gimeno, Folta, Cooper & Woo, 1997; Haber & Reichel, 2007), profitability of Internet IPOs (Jain, Jayaraman & Kini, 2008). Entrepreneurs' CEOs' human capital, both firm-specific and industry-specific, is related to their post-acquisition departure (Buchholtz, Ribbens & Houle, 2003). Additionally, many researchers found a positive significant relation between human capital quality, operational performance, and market value (Huselid, 1995; Sherer, 1995; Hansson, 1997; Pennings et al, 1998). Zarutskie (2010) finds that the strongest predictors of first-time venture capital firm performance relates to management's specific human capital. Other scholars find that the variables of human capital and social capital are consistently positively correlated with organizational performance (Dimov and Shepherd, 2005; Gimeno et al., 1997).Bach at al.(2014) confirms that the extent of human capital possessed by the top management team within an entrepreneurial

threshold firm is positively associated with IPO success and points out that superior knowledge possessed by the top management teams appears to be an important determinant of IPO success. Pukthuanthong-Le et al. (2014) concludes that general and more specific human capital of board members – the CEO[6], executive directors and outside directors—gained from educational, managerial and board experience have a significant impact on IPO performance both in the short and long run.CEOs of IPOs with higher levels of education may garner more prestige and provide the legitimacy that is important for new firms (Zimmerman & Zeitz, 2002), and therefore have a positive influence on the valuation of the IPO.

Nevertheless, there are some findings contrary to expectations from a human capital perspective. Zarutskie (2010) finds that fund management teams with more MBAs perform less well than others. Dimov et. al., (2005) finds that although general human capital had a positive association with the proportion of portfolio companies that went public (IPO), specific human capital did not. However, he doesn't find that specific human capital was negatively associated with the proportion of portfolio companies that went bankrupt[7]. Miller(2014) studied 444 CEOs celebrated on the covers of major U.S. business magazines found an advantage accruing to graduates of selective universities as such CEOs led firms with higher and more sustained market valuations. He found that firms of CEOs with undergraduate Ivy League exposure outperformed others, whereas the firms of CEOs with graduate Ivy degrees did not.

**Innovation & IPO Success**

Innovation has become an increasing means of developing and maintaining industrial competitive advantage  (Soriano & Huarng, 2013). Especially in high-velocity markets, which

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7 Dimov et. al., (2005) finds that those VCFs with greater proportions of their top management teams with law experience had higher proportions of bankruptcies in their portfolios.

involve high levels of dynamism in competition and technology and where short-term competitive advantage is the norm, sales growth is a powerful metric of performance (Eisenhardt & Martin, 2000). In these technology environments, sales growth indicates the success of a firm's innovation strategy, because growth is conferred upon firms whose product and service offerings are increasingly accepted by the customers (Fombrun & Wally, 1989; Lerner, 1999; Porter, 1980).

CEOs with career experiences in output functions would tend to focus on organizational innovation and growth while CEOs with throughput-based functional backgrounds may be better equipped to ensure internal and external stability (Finkelstein and Hambrick, 1996; Hambrick and Mason, 1984). Operations of human capital increase productivity by increment of innovation by increment of quality and training the personnel in R&D department (Ballot et al, 2001; Dimov & Shepherd, 2005).

In this context human capital is considered as reflecting a firm's capacity to absorb, assimilate, and develop "new knowledge and technology" (Bartel & Lichtenberg, 1987; Cohen & Levinthal, 1990). The more new knowledge and technology is absorbed, the more innovation propensity in the firm is expected (Crepon, Duguet & Mairesse,1998; Hall & Mairesse,2006). Prior research has found a positive correlation between innovation and firm value (Griliches, 1981; Pakes, 1985).

Heeley et al., (2007) looks at which internal firm activities directly impact ability to generate rents affect pricing in the IPO market. He suggests that firm R&D and patenting activities are direct examples of potential value creation activities and provide a unique opportunity to examine the role of these activities in IPO pricing. He finds that the relationship between a firm's

innovation activities and its IPO performance is influenced by the transparency of the link between these activities and potential value creation.

Patents and patent applications are also considered to be indicators of vital technology positions and innovative activity (Ashton and Sen, 1988) and important inputs to the new product development process (Pakes, 1985). With complex technology products, a firm may need to license other patents protecting key components it does not have rights to before it can extract any value from a patented technology (Cohen, Nelson, & Walsh, 2000).

It has been argued that slack resources could play a critical role as an internal shock absorber that provides the flexibility for resource allocation as innovation projects progress over time and also shields organizations from disruption during taxing conditions (Bourgeois, 1981, & Chen and Huang, 2010).Firms without sufficient innovational slack are possibly less able to achieve breakthrough innovations, or at least ones that may propel the firm forward. Innovational slack has been viewed broadly as excess unused intellectual property as well as excess R&D spending when compared to peer firms in a specific industry (Mousa and Reed, 2010, 2012) and has been operationalized using R&D investments and patent intensity, which are both likely to be indicators of firm innovation (e.g. Hitt et al., 1997).

A recent study suggested that R&D investments are associated with increased underpricing in the IPO market (Guo, Lev, & Shi, 2005). Pegels and Thirumurthy (1996) argue that R&D expenditures contribute to an increase in knowledge and innovation, but not every R&D experiment succeeds in generating a patent or product. While the literature acknowledges that patents are not a perfect measure, their use as a measure of innovative activity is widely accepted (Hall, Jaffe, and Trajtenberg, 2001; Lanjouw, Pakes, and Putnam, 1998). Importantly, patent infor-

mation is available for both public and private firms, unlike R&D expenditures, and allows measuring firm innovative output along several dimensions.Chin et. al. (2006) ’s findings indicate that both R&D expenditures and granted patents can be used as signaling devices as their results indicate that post-IPO five-year stock performance is positively related to each innovation indicator proxy.

## Conceptual Framework and Hypotheses

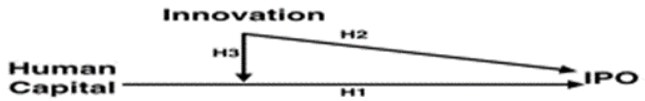


**Figure 1 Conceptual Framework**

It could also be argued that U.S. Top 20 Technology and Science Schools churn out a great chunk of high tech exponential entrepreneurs with innovation pedigrees. Consequently, founders from the U.S. Top 20 Technology and Science Schools should have greater IPO Success.

*H1: Founder CEOs with higher human capital expressed in technology (non-technology) related education will have a greater (less) IPO Success in hi-tech firms.*

Innovation activity is a critical measure for a firm in the high tech industry as it can exhibit a firm’s likelihood to gain future market share by creative disruption. High- tech firms are often regarded as innovation pioneers; as it is often largely due to their innovations of how they

got to IPO. In this vein, more innovation activity should be positively associated with IPO success.

*H2: The extent of innovation activity will be positively associated with IPO success in hi-tech firms.*

Further, we propose that there is an interaction effect between human capital and innovation, leading to the following hypothesis:

*H3: Innovation moderates human capital to IPO success. Founder CEOs with higher (lower) human capital expressed in technology-related education will have more (less) innovation activities leading to more (less) likelihood of IPO success of hi-tech firms.*

References available upon request.