Small and Startup IT Firms, Information Chasms, and the Market for Acquisitions

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Abstract: Small and startup IT (SSIT) firms are responsible for a lot of important IT innovations in the IT industry. Several SSIT firms are then bought by larger, more established IT companies that want to drive their innovation, add new product and service lines, or limit competition. However, because SSIT firms are often small and difficult to find, it is hard for many of them to show acquiring firms how good they are. We discuss three “information chasms” to explain why it is difficult for SSIT firms to show how good they are, and we suggest that the SSIT firms that successfully cross these “information chasms” can become acquired for a higher price. Using a dataset of over two hundred acquisitions of SSIT firms in the IT industry from the mid-2000s to the mid-2010s, we find that our hypotheses are confirmed. When SSIT firms invest in activities that eliminate uncertainty about the firm’s knowledge resources and promote the firm, they are acquired at a higher price. In addition, purchasers pay a premium for SSIT firms that continue to utilize mature IT during acquisitions.

Keywords: small IT firms; board of directors; start-up IT firms; firm value; venture capital; intellectual property; acquisitions; life cycle of IT

1. Introduction

Often, small and startup information technology (SSIT) firms are the hotbed for information technology innovations. SSIT firms are usually small, often employing fewer than 500 employees [1]. They are nimble and often exist to seize emerging market opportunities by quickly creating an IT product or service to address the market opportunity that fulfills emerging customer needs [2–4]. For example, from 1998 to 2000, PayPal, an SSIT firm at the time, created a portal that made it easy and secure to conduct financial transactions online. PayPal’s service was instrumental in reducing customer hesitancy in conducting financial transactions on early e-commerce sites due to security concerns. Several SSIT firms are acquired by major public corporations. For example, PayPal was acquired by eBay for USD 1.5 Billion in 2002 and became an integral part of eBay’s online payment system. Similarly, Oculus Rift, an SSIT firm specializing in VR hardware and software platform development, was acquired by Facebook in 2014.

According to research, large IT firms acquire SSIT firms for several reasons [5–7]. One line of reasoning suggests that large firms often settle into organizational inertia and lose their ability to create novel and groundbreaking innovations [8,9]. Therefore, they seek new ideas by acquiring young SSIT firms that often engage with newer and more novel marketplaces to create IT innovations [10,11]. By acquiring SSIT firms, larger IT firms are able to supplement their internal innovations and stay competitive in the marketplace [11,12]. However, while there is ample research on the motivations of large firms for acquiring SSIT firms, the research on the signals that SSIT firms must send to communicate information about their quality to potential large acquiring firms is rather limited. For example, SSIT firm quality has been studied in prior management research, and the value of certain signals such as the presence of tangible intellectual property (patents and copyrights) and the impact of corporate governance have highlighted how these
activities can be instrumental in signaling firm quality [10,12,13]. However, these studies have been conducted in non-IT industries such as the biotechnology and pharmaceutical industries. Likewise, research in entrepreneurial finance has studied the relationship between an SSIT firm’s information signaling and its impact on the provision of advice, contacts, and funds by venture capitalists [14,15]. However, a lot of prior research provides guidance and solutions that are instrumental to venture capitalists and not the owners of SSIT firms.

Two main questions deserve attention from an SSIT owner’s point of view. To begin, can an SSIT owner provide specific signals to acquirers to convey information about their quality, and, if so, what are they? Second, by communicating these signals, is an SSIT owner able to procure a higher price for their firm (top dollar) from an acquirer? These questions are significant because, even though acquirers of SSIT firms value profitability, they prefer acquisitions that do not turn out to be a ‘lemon’, and will pay more for an SSIT firm that can communicate its value creation credentials before it has been acquired [16]. However, there are significant obstacles for SSIT firms in articulating their quality to possible buyers [17] because of specific ‘information chasms’. Information chasms about SSIT firms exist because there is little information about an SSIT firm’s market presence, its products and services, its assets, potential profitability, or the viability of the technology they produce [18]. The presence of information chasms restricts the ability of acquirers to assess whether an SSIT firm will be profitable and therefore creates discounts in an SSIT firm’s acquisition price.

To understand how SSIT firms can overcome information chasms, we hypothesize the effect of alleviating signals utilized by SSIT firms to communicate their quality. Several of these hypothesized signals can be controlled and manipulated by SSIT firm owners. For example, the maturation of an SSIT firm’s management function [19], the institution of governance mechanisms through the board of directors [20], obtaining higher levels of venture capital backing [21] or protecting intellectual property through patent ownership [22] are examples of signals that can be controlled by SSIT owners. On the other hand, the maturation of the information technology that the SSIT engages in and its subsequent profitability is a factor that is outside the control of SSIT owners [23]. We hypothesize the impact of every one of these signals on the SSIT firm’s acquisition price.

We rely on research from financial economics, entrepreneurship, and management to justify our hypotheses. For example, prior literature in management, particularly in the field of impression management, symbolic management, and reputation signaling [24,25], has highlighted the value of signaling institutionally sanctioned behaviors to improve a firm’s reputation and legitimacy and thereby gain acceptance by influential firms or agencies in the firm’s competitive environment. Prior literature in management posits that such actions may be symbolic. That is, even if the adoption of sanctioned actions by a firm does not result in any substantive improvement in the firm’s overall financial well-being, it may improve the overall impression or reputation of the firm. For example, the institution of a board of directors may have a limited impact on the operations and strategic actions of the SSIT firm instituting it. However, by instituting a board, the SSIT firm could still signal to potential investors and acquirers their willingness to adhere to principles of oversight and due diligence in monitoring the investor’s investments [26]. Thus, literature on symbolic and reputation management would, in theory, suggest that instituting a board would have a positive impact on the acquisition price of the SSIT firm. We contribute to this literature by empirically testing whether such symbolic actions create value for SSIT firms by inflating their acquisition price.

Likewise, we draw from prior literature in entrepreneurship which highlights the evolutionary stages of SSIT firms [27,28]. Included among the stages of an SSIT firm’s evolution is the involvement of expertise and resource providers such as venture capitalists. Our hypothesis based on this literature tests whether an SSIT firm that progresses to a more mature stage of the entrepreneurial evolution model gains a higher acquisition price than SSIT firms that are in more nascent stages of evolution. Our empirical tests contribute to the referent literature by demonstrating the effectiveness of the entrepreneurial evolution
model in predicting an SSIT firm’s evolution and the concurrent financial value emanating from such evolution. Finally, the literature in financial economics provides the rationale for why markets react the way they do in the presence of SSIT firm signals [18,29]. For example, we justify the disparity in acquisition prices and the application of price discounts using the classical financial economics notions of information asymmetry and the threat of adverse selection. However, advances in digital and information technology have made access to information about obscure SSIT firms considerably easier over the years [30,31]. Therefore, one would posit that the threat of adverse selection in the age of digital information technology should be subdued and that our study should not discern any appreciable acquisition discounts for firms that do not signal quality versus those firms that do. In contrast to this notion, we contribute to the financial economics literature by finding that the discounts in the acquisition price of firms do not signal their quality and value to potential suitors. This finding contributes to the referent literature by confirming the continuing veracity of the threat of adverse selection in acquisition valuation even in the age of digital information technology.

We make two contributions to literature. To begin, we identify a set of signals that SSIT owners can employ to communicate firm quality and obtain extra-normal acquisition prices at the time of acquisition. Furthermore, in our analysis, we also examine the life cycle phase of the SSIT firm’s major IT activity. This factor is not controllable by SSIT owners; however, it enables us to answer whether sticking with a technology through its early immature phase pays off when a technology finally reaches maturity. Second, we use the acquisitions approach [32,33] to compare prices paid to SSIT targets that successfully signal their quality with SSIT targets that do not successfully signal quality. Our findings are presented as a post-hoc analysis and quantifies exactly how much an SSIT firm that does not signal quality is discounted at the time of acquisition. The rest of the paper is organized as follows. First, we provide a discussion of relevant prior academic research on SSIT firm acquisition valuation. In the subsequent sections, we present our hypotheses, the methodology, the results of our analysis, and then a discussion of the results. In the end, we include a discussion of the theoretical and practical contributions of this paper.

2. Prior Research

The paucity of information about privately held SSIT enterprises, as well as the associated purchase price discounts applied to the acquisition of such firms, has attracted considerable attention in previous work on firm valuation and acquisition [34–36]. We have made the following observations. First, there are significantly more acquisitions of SSIT targets in comparison to publicly owned targets in the market for corporate control. Approximately 75% of purchases targeted SSIT targets, according to past studies [37].

Second, because privately held SSIT targets are difficult to value due to information asymmetry between the seller and buyer, an acquisition price discount is commonly implemented during the acquisition of SSIT targets [38,39]. An insightful illustration of how information asymmetry heightens the risk of adverse selection for prospective acquirers and its impact on acquisition prices is seen in Akerlof’s study [40] of the market for lemons in product markets. Using Akerlof’s illustration, the owner of an SSIT firm who has superior knowledge of the caliber of his or her company may be hesitant to sell above-average assets if they cannot credibly convey this information and earn a fair price. As a result, in the face of information asymmetry and the incentives for deception on the part of SSIT owners, bidders lower their offer prices to recoup the expense of in-depth research and lengthy talks. Reducing the offer price is the traditional response to the danger of adverse selection. When a buyer targets an SSIT company, it could lower its offer to account for the chance that the target would end up being a dud [35].

Finally, three information chasms lead to the use of acquisition price discounts for SSIT targets. The first information chasm develops because SSIT targets are less visible and are not on most acquirers’ radars [36]. We call this chasm the ‘incognito information chasm.’ While information about public companies is freely available to acquirers [35,41],
the absence of the coverage of SSIT targets by analysts and the business press generates a scarcity of information on the existence of SSIT targets. As a result, SSIT targets are less noticeable to the acquirer community [42,43]. In these circumstances, SSIT target “sellers” are required to provide a discount to the buyer to cover the buyer’s greater search costs and preserve their marketability in the corporate control market [44,45]. Additionally, by reducing the number of potential bidders and prohibiting competitive bidding, lower seller visibility boosts buyer power and lowers the selling price of the SSIT target company [35]. The ‘incognito knowledge chasm’ can therefore lead to a reduction in the acquisition price for SSIT targets.

The second information chasm for acquirers arises when they have insufficient information about the assets of an SSIT target [35,46]. This issue is made worse for SSIT targets, many of whom have intangible knowledge and tacit information-based assets including employees’ know-how and non-codified intellectual property [47]. Under such circumstances, it is frequently difficult for acquirers to estimate the extent to which they may obtain value from the SSIT target’s tacit knowledge. Furthermore, the firm’s governance mechanisms and executive management become crucial in effectively communicating its innovativeness, productivity, and ability to continue its knowledge-creating initiatives [20,46]. Concerning the latter, Teece [46] contends that governance and management are crucial in two areas. The first area in which successful management affects productivity and creativity is by putting in place the proper organizational structures for making decisions, creating knowledge [48], and disseminating it, together with the proper infrastructure for codifying tacit knowledge through patenting. Second, by employing suitable control and monitoring methods, the firm’s corporate governance is in charge of stopping opportunistic behavior or shirking [49]. Together, intellectual property protection activities and the existence of a governance and management control framework can serve as a reliable indicator of the caliber of a knowledge-based SSIT organization, particularly in situations when it is challenging to determine the value of a firm’s assets. The “firm value equivocality chasm” is the name we give to the second information chasm.

The “IT value equivocality chasm”, the third information chasm, appears when acquirers focus on SSIT companies operating in developing fields of information technology. Possibly as a result of the information technology’s stage in the life cycle, investors frequently encounter a knowledge gap while evaluating the viability and business potential of the key activities of the SSIT target in such situations [38,50]. The development of any information technology proceeds through several stages, as we explain in a later section, and reaches its zenith in the later stages of the IT life cycle when there is greater clarity regarding the capabilities and business viability of the technology.

According to Becchetti and Trovato [45], the three aforementioned information chasms make it difficult for SSIT target companies to communicate their quality to potential buyers, which forces them to apply an acquisition price discount at the time of acquisition. In contrast, it stands to reason that SSIT target firms that are successful in bridging the information gaps indicated above and transmitting firm quality through the use of the proper signals will be valued more by acquirers than SSIT target firms that are not. For example, SSIT firms with a board of directors will be better placed to utilize the relationships of board members to promote and market themselves and drum up interest from several prospective bidders, thereby narrowing the “incognito information chasm” and securing a higher SSIT firm acquisition price. In a similar vein, SSIT enterprises involved in codifying their knowledge may be better able to communicate the worth of their knowledge assets to potential acquirers through the agency of patenting and copyrighting [13,15]. Similarly, the age of an SSIT firm and venture capital financing can be important indicators [51] of the management team’s maturity in managing the firm’s primary (such as technology and business development) and supporting operations (such as marketing, quality control, sales, and service) [43,51,52]. These indicators can be helpful in bridging the “firm value equivocality” chasm and in communicating SSIT firm quality. Finally, the maturity of the information technology supporting the primary IT activity of the SSIT firm can be
indicated by the life cycle stage of the information technology that comprises the primary IT activity. The “IT value equivocality chasm” is lessened by SSIT targets that use more mature information technology since they can clearly demonstrate to potential buyers their profitability and business potential. The signals used to bridge knowledge gaps are discussed in more detail in the following subsections, along with hypotheses regarding how they can affect the purchase price of SSIT firms.

3. Hypotheses

3.1. The Effect of SSIT Firm’s Organizational Characteristics on Acquisition Price

The entrepreneurial model outlines three phases in the development of SSIT firms [27,28]. The first stage starts with a founding event and ends with the founders formalizing their commercial enterprise. The creation of prototypes for an information technology product or service is frequently funded by seed money or capital provided by an angel investor. At this point, the organizational structure of SSIT enterprises is usually organic, with blurred lines of authority and flexible and fluid job descriptions. The members of the founding team are jointly responsible for making financial decisions, allocating duties, assessing employee performance, and hiring and dismissing staff. In this stage, SSIT companies look for funding as they continuously use up their early endowments and resources in the face of declining sales revenue.

The second stage starts when SSIT firms begin making money from sales. As customers offer comments on the functionality, appearance, performance, documentation, and support of the product, consumers’ demands and needs become obvious. As a result, the founders of the SSIT company start to make sense of discrepancies between their original product concepts and how their IT products and services fit into the corporate environment. SSIT companies start to formalize and streamline company operations at this point. Recurring tasks are programmed and automated through the development of organizational routines, and as the division of labor becomes less organic and flexible, additional staff members are hired [28,53].

SSIT firms move into the third stage of evolution when they start looking for and securing institutional financing. When institutional investors, such as venture capitalists, become involved, provisions in investment contracts that protect their investments are implemented. These provisions include the quick construction of top management teams, the development of governance structures, and, possibly, the establishment of a board of directors [28,43]. This stage is characterized by rapid structural development, the expansion of managerial capabilities and control, increased discipline, and the convergence of interests among different stakeholders. According to Gaule [15] and Ivanov and Xie [21], SSIT enterprises that commonly receive funding from venture capitalists have particular traits because venture capitalists want a high rate of return upon their investment [54]. According to research, venture capital-backed SSIT enterprises produce more knowledge [55,56], innovate more technologically, and generate more money [57]. Venture capitalists play a more active governance role by allowing access to specialists such as infrastructure suppliers and professionals as well as by tracking the development of businesses [55,58]. The evolution process results in the establishment of an SSIT firm that is capable of scaling up, competing successfully with established competitors, clearly communicating quality to acquirers, and bridging the “firm value equivocality chasm”. Therefore,

**Hypothesis 1 (H1). SSIT firms that are in the third stage of firm evolution will be acquired for a higher price.**

A board of directors might benefit SSIT companies in two ways. First off, it communicates to potential buyers that the SSIT firm has the right structures and control systems in place for it to succeed and add value [26,59]. A board of directors to oversee and manage business operations is a crucial component in how SSIT enterprises implement suitable governance structures and lower agency costs as they develop [60,61].
of directors prevents opportunistic, self-serving behaviors by the employees by putting in place the necessary monitoring and control systems that align agent action with the owners’ goals and prerogatives. As a result of the control and monitoring measures, the firm’s owners accrue value as opposed to losing it or misappropriating it as a result of employee self-interest, opportunism, or slacking [49,61]. Thus, the establishment of a board of directors helps eliminate uncertainty regarding the target firm’s ability to create value.

Second, by raising the SSIT firm’s visibility, renown, and reputation among potential buyers, the board members’ network connections and relational capital [53,59] help to attract more buyers and drive up the price at which the SSIT firm is acquired through open bidding. Board members also provide a sizeable quantity of human capital (expertise) in the form of market knowledge [20,62]. Other SSIT firms and established businesses are also a part of the board members’ strategic network, accelerating the hunt for strategic business partners [63]. Therefore, the engagement of institutional boundary spanners such as a board of directors promotes enhanced networking, broadens the firm’s corporate social network, increases the visibility of SSIT enterprises among acquirers, and decreases the “incognito information chasm”. Because the board of directors plays a crucial role in closing the chasms between “firm value equivocality” and “incognito information,”, we hypothesize that,

**Hypothesis 2 (H2).** SSIT firms with a BOD will be acquired for a higher price.

In comparison to younger SSIT firms, older SSIT firms develop and are more likely to express greater quality by demonstrating effective managerial oversight and control over the SSIT firm’s operations to acquirers. Previous studies point to a stronger relationship between the age of a target firm and the quality of information available on them [64]. It is particularly challenging for acquirers to determine the worth of younger firms because younger SSIT firms have less publicly available objective information about their operations than older SSIT firms [34]. Both firm reputation and social capital take time to create; however, once they do, they can be useful channels for businesses to communicate their excellence and attract the attention of other businesses [65]. In comparison to younger SSIT firms, older SSIT firms are therefore less likely to be undervalued due to the ‘incognito information’ chasm.

Older SSIT firms also have stronger social networks with other companies, including partners, rivals, and other cooperating companies in their industry. Older firms’ superior social networks play a crucial role in establishing deeper social interactions and relationship quality with the other companies in their social network [66], which increases their ability to source outside technological R&D [65]. The presence of technological R&D knowledge can be combined with existing organizational assets of knowledge exploitation, in addition to the superior organizational structures and procedures present in older SSIT firms [67], to create new technology products that are innovative, technologically distinct, and which demonstrate value [9] and minimize the firm’s “value equivocality chasm”. Thus,

**Hypothesis 3 (H3).** Older SSIT target firms will be acquired for a higher price.

### 3.2. The Effect of SSIT Firm’s Knowledge Assets on Acquisition Price

The protection and appropriation of the target firm’s intellectual property is the top priority for acquirers of knowledge-intensive SSIT firms [68]. Prior research in this area demonstrates some of the advantages of protecting IP stocks with patent and copyright rights for SSIT enterprises. First, IT patents and copyrights allow SSIT enterprises to carve up an innovation zone free of competition [18]. This allows SSIT businesses to grow and benefit from the IT products and services. Second, patents and copyrights enable SSIT companies to bring in revenue [63] by licensing the rights to use its patents to companies whose goods incorporate the patented technology. Third, in cross-licensing negotiations and contracts between the SSIT company and other IT companies, patents and copyrights are
routinely used to “barter”. Cross-licensing is commonly used to acquire access to protected information technology from other businesses and is essential for building complex IT systems with plug-and-play parts [69] instead of developing the parts in-house.

Fourth, patenting is a very effective way for SSIT firms to communicate their ability to codify tacit knowledge, their professionalism and technical expertise in doing so, and the quality of the information technology that underpins their offerings [63]. Finally, patenting and copyright protections allow SSIT firms to secure their contributions from exploitation by pre-acquisition investors. This increases the SSIT firm’s worth during the acquisition process by lowering the cost of moral hazards and the risk of delays [68,70] caused by legal battles over intellectual property ownership between both the SSIT firm’s entrepreneurs and their investors. Because patenting and copyrighting provide a legal way of quantifying a company’s intellectual property stock, they can be used to signal value [69] and decrease the company’s “value equivocality” chasm. Therefore,

**Hypothesis 4 (H4).** SSIT firms with more IP Stock will be acquired for a higher price.

### 3.3. Information Technology Maturity and Acquisition Price

The Gartner hype cycle is a great tool created by the Gartner Group to show how new information technologies change from their early stages to when the general market accepts them [71]. There are five stages in the hype cycle. The first step, called the “technology trigger,” starts with a breakthrough or public demonstration of the information technology that gains attention from the media and garners industry interest. As word spreads about the new information technology, venture capitalists and companies looking to take advantage of possible first-mover advantages are drawn to it. During this phase, however, the commercial potential of the information technology is still not known [72]. In the second phase, known as the “peak of over-inflated expectations,” people have unrealistic ideas about how useful information technology will be. Early successes are publicized, which increases interest. However, the commercial potential of the technology is still unrealized at this point [72,73]. During the third phase, known as the “trough of disillusionment”, the hype quickly dies down because the commercial failures of information technology become widely known. When information technology does not live up to the overly high expectations that were set for it, the public is disappointed about its commercial potential and its commercial value goes down [71,72].

During the “slope of enlightenment” (the fourth phase), early adopters who kept working with the technology start to understand its uses, risks, and benefits. They also start to see net benefits, which reveal how the technology can be used to make money. During this stage, the technology is made much better [72], which rekindles its potential and commercial viability. In the fifth and final phase, which is termed the “plateau of productivity,” the technology is fully commercially feasible. The technology is widely used because its real-world benefits are shown and accepted [74]. We expect SSIT firms whose main activities involve emerging information technology to be better at demonstrating to potential acquirers their business potential and profits after a distinct and convincing demonstration of the emerging technology’s economic viability, financial returns, and reduced risk in the later phases of its life cycle. Simply put, there is less doubt about the technology’s business value [73,74] as the technology matures. In the later stages of the IT life cycle, when the SSIT firm’s main activity involves information technology, better information about that technology is available. This reduces buyer uncertainty and the risk of making a bad choice, closes the “IT value equivocality” chasm, and boosts the value of the SSIT target firm. Therefore, we contend that the “slope of enlightenment” and “plateau of productivity” phases will be the best times in which to buy an SSIT firm.

**Hypothesis 5 (H5).** SSIT firms acquired during the “slope of enlightenment” and “plateau of productivity” phases will be acquired for a higher price.
4. Methodology

4.1. Sample of SSIT Firms

In our study, we looked at a group of privately owned SSIT firms in the United States that were bought between 1 January 2005 and 30 June 2016. These firms primarily provided IT products and services using IT that appeared on Gartner’s hype cycle. We retained acquisitions in which the buying company bought a majority stake (51 percent or more) in the target company. Moreover, our study only included companies for which there were data for the predictor variables, dependent variable, and control variables. The Global Industry Classifications Standard (GICS) was used to find companies in the IT industry [75,76]. The NAICS codes for these companies begin with 5415 (systems design services, computer programming services), 5112 (publishers of software), 51,913 (web search, internet publishing, and web portals), and 518 (data hosting, data processing, and related services). The SDC Platinum (https://www.refinitiv.com/ accessed on 31 May 2017) mergers and acquisitions database was then used to find the sample of acquired firms that met our criteria. The Software Equity Group’s (https://softwareequity.com/ accessed on 31 May 2017) annual financial report on the software industry gave more information about acquisition prices.

4.2. Independent and Dependent Variable Measures

We classified the Stage of firm evolution as follows. Firms were classified as stage one (STAGE = 1) if they were acquired within 12 months of receiving seed or angel capital. This classification signifies firms that are still very young and in the early stage of evolution. SSIT firms were classified as stage three (STAGE = 3) if they received venture funding or other institutional backing before acquisition. This signifies that these firms had undergone evolution and growth by obtaining intervention from venture capitalists and other institutional experts. SSIT firms that did not match the any of the above were classified as stage two (STAGE = 2). This classification is commensurate with the description of SSIT firms in different stages of evolution according to the entrepreneurial model [27,28]. VentureOne (https://www.refinitiv.com/en/financial-data/indices/venture-capital-index accessed on 31 May 2017) and index.co (https://index.co/ accessed on 25 May 2017) provide data on venture capital fundraising and operating months. Both databases include investment dates for venture-backed SSIT firms. Data from index.co was used to calculate the Age of the SSIT target firms from the date of initial funding. AGE is set as zero for firms younger than a year; one for firms that are one to three years old; two for firms that are three to five years old; and three for firms older than five years. BoardEx data (https://www.boardex.com/ accessed on 25 May 2017) were used to obtain data for the variable Board of director (BOD). SSIT target firms that had boards received a value of one for the BOD variable and zero otherwise.

The United States Patent and Trademark Office (USPTO) was used to obtain information about patent ownership (www.uspto.gov accessed on 15 June 2017). The US Copyright Office website (www.copyright.gov accessed on 15 June 2017) was mined for copyright information. We conducted our search using the SSIT firm name. We also used past names, and variations of the firm name indicated in VentureOne and index.co. The variable IP Stock is a numerical count of patents and copyrights owned by the SSIT firm prior to purchase. Gartner’s annual emerging technology hype cycles (https://www.gartner.com/en/research/methodologies/gartner-hype-cycle accessed on 15 May 2017) were used to determine the maturity of the information technology during which the firm was acquired. Each year, graphical presentations illustrating the five key phases and the current position of new information technologies in each phase are produced. If an SSIT target was purchased when its IT was in the “technology trigger” or “peak of over-inflated expectations” phases, we categorized the variable IT MATURITY as zero, signifying that the maturity of the firm’s IT was low. Similarly, for the remaining phases, IT MATURITY was categorized as one, indicating moderate levels of IT maturity when an SSIT firm was acquired during the “trough of disappointment” phase, and as two (or High
IT Maturity) for SSIT firms purchased during the “slope of enlightenment” and “plateau of productivity” phases.

Finally, our dependent variable, Acquisition price, was measured by taking the average of the revenue and EBIT multiples. Prior research has used such measures to determine how much private SSIT firms were worth when they were bought [38,77]. The SDC Platinum M&A database and the annual financial reports on the software industry from Software Equity Group were used to obtain information about revenue and EBIT multiples.

4.3. Control Variable Measures

As firms with faster growth tend to have higher valuations [78], we included a binary metric derived from the Inc 5000 list of America’s fastest-growing private companies (https://www.inc.com/inc5000/ accessed on 15 June 2017) to control for the elevated valuation associated with such firms. Firms appearing on this list were coded with a 1 for this control variable. Acquisitions of targets in unrelated industries may be overvalued or undervalued [79]. To account for either of these factors, we incorporate a binary indicator of acquisition relatedness, which is coded as one if the acquirer and target NAICS codes have the same starting two digits. Otherwise, it is zero. The size of a target SSIT firm is positively correlated with its bargaining power and asking price [80]. This is managed by incorporating the natural log of the number of employees at the SSIT target company [81]. Employee information was taken from the index.co database.

Prior research [82] indicates that acquisitions during a recession are less expensive for potential acquirers. To control this, we incorporated a binary variable encoded using National Bureau of Economic Research (NBER) time-series data (https://www.nber.org/research/business-cycle-dating accessed on 15 June 2017) and coded recessionary periods with a value of one for our control variable and zero otherwise. The acquisition year was included to account for macroeconomic variables such as inflation on the acquisition price [83]. Lastly, we incorporated several dummy variables to compensate for the varying potential economic effects of the various technologies included in our study. A summary of the study variables is provided in Table 1.

Table 1. Description of variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Measurement</th>
<th>Source for Measure</th>
</tr>
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<tbody>
<tr>
<td>Stage of firm evolution</td>
<td>The stage of the firm’s evolution according to the entrepreneurial model [27,28]</td>
<td>STAGE = 1 acq. within 12 months of receiving seed or angel capital. STAGE = 3 rec. venture funding or institutional backing; else STAGE = 2</td>
<td>VentureOne and index.co</td>
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<tr>
<td>Presence of BOD</td>
<td>Presence or absence of a board of directors [49]</td>
<td>BOD variable = 1 when board is present and zero otherwise</td>
<td>BoardEx</td>
</tr>
<tr>
<td>Firm age</td>
<td>Age of the SSIT target firms from the date of initial funding [9]</td>
<td>AGE = 0: firms &lt; 1 year; AGE = 1: firms 1–3 years; AGE = 2: firms 3–5 years; and AGE = 3: firms &gt; 5 years</td>
<td>Index.co</td>
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Table 1. Cont.

<table>
<thead>
<tr>
<th>Variable</th>
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<th>Measurement</th>
<th>Source for Measure</th>
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<tbody>
<tr>
<td>IT life cycle stage</td>
<td>Maturity of the information technology on Gartner’s Hype Cycles during which the firm was acquired [73,74]</td>
<td>Coded 0: “technology trigger” or “peak of over-inflated expectations” phases</td>
<td>Gartner’s Annual Hype Cycles <a href="https://www.gartner.com">https://www.gartner.com</a> accessed on 15 May 2017</td>
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<td>Coded 1: “trough of disappointment” phase</td>
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<td>Coded 2: “slope of enlightenment” and “plateau of productivity” phases</td>
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<tr>
<td>Acquisition Price</td>
<td>Price paid for the acquired firm [38,77]</td>
<td>Measured by taking the average of the revenue and EBIT multiples</td>
<td>SDC Platinum M&amp;A database and Software Equity Group</td>
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<tr>
<td>Growth firms</td>
<td>Control for faster growing firms as they have higher valuations [78]</td>
<td>Binary metric derived from the Inc 5000 list of America’s fastest-growing private companies</td>
<td>America’s fastest-growing private companies <a href="https://www.inc.com/inc5000/">https://www.inc.com/inc5000/</a> accessed on 15 June 2017</td>
</tr>
<tr>
<td>Relatedness of industry</td>
<td>Control for acquisitions in related industries that are undervalued [79]</td>
<td>Binary indicator of acquisition relatedness</td>
<td>SDC Platinum M&amp;A database</td>
</tr>
<tr>
<td>Firm size</td>
<td>Control for size as it is positively correlated with firms’ bargaining power and asking price [80]</td>
<td>Natural log of the number of employees at the SSIT target company</td>
<td>Index.co</td>
</tr>
<tr>
<td>Acquisition during recession</td>
<td>Control for acquisitions during a recession as they are less expensive for potential acquirers [82]</td>
<td>Binary variable encoded using National Bureau of Economic Research data</td>
<td><a href="https://www.nber.org/research/business-cycle-dating">https://www.nber.org/research/business-cycle-dating</a> accessed on 15 June 2017</td>
</tr>
<tr>
<td>Year of acquisition</td>
<td>Year the SSIT firm was acquired to control for macroeconomic factors [83]</td>
<td>Numerical value of the year</td>
<td>Index.co and SDC Platinum M&amp;A database</td>
</tr>
</tbody>
</table>

5. Analysis and Results

Sample, Diagnostics, and Analysis

The data was analyzed using Ordinary Least Squares (OLS) regression. Analyzing the relationship between one or more explanatory variables and a dependent variable can be achieved using OLS regression analysis [84]. Predictions for the dependent variable are made using OLS analysis, which minimizes what is known as the sum of square errors, which is the discrepancy between actual and predicted values. OLS regression is used in the most commonly used analysis software, including SPSS and R. As long as the data do not violate specific assumptions, the findings of an OLS regression analysis are reliable. Diagnostic tests were conducted in order to uncover any anomalies or outliers in the data, as well as to verify the assumptions behind the OLS regression. Listed below are some examples.

Studentized deleted residual values were plotted on a histogram to evaluate leverage. Because of their extreme outlier status (greater than three standard deviations from the mean), two observations had to be thrown out [85]. Overall influence was calculated using Cook’s D values. Cook’s D values greater than 4/n [84,86], where n is our sample size, were eliminated from our dataset. In addition, the normality of the dependent variable was checked using the Shapiro–Wilk test [87]. The results of this test were insignificant, which means that our data were normal. Plotting predicted values against the standardized residuals allowed us to verify the homoscedasticity assumption. We did not see a consistent
broadening or narrowing pattern that is common in heteroscedastic data. A total of 239 observations remained after performing the diagnostic assessment.

6. Results

Statistical data on our sample companies can be found in Table 2. Using the Acquisition Price Multiple (DV) as the dependent variable in the regression analysis, Table 2 shows the results. Multicollinearity was evaluated by examining the VIF and tolerance collinearity statistics. In light of the relatively small sample size [88], our regression estimates and their significance were not inflated by multicollinearity, as evidenced by VIF and tolerance values that were both well within acceptable limits (VIF 2.5 and tolerance > 0.4).

Table 2. Sample SSIT firm descriptive statistics.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (in Days)</td>
<td>173</td>
<td>3783</td>
<td>1112.65</td>
<td>792.40</td>
</tr>
<tr>
<td>Number of Employees</td>
<td>3</td>
<td>75</td>
<td>42.17</td>
<td>29.60</td>
</tr>
<tr>
<td>IP Stock</td>
<td>0</td>
<td>9</td>
<td>3.98</td>
<td>1.89</td>
</tr>
<tr>
<td>IP Stock (Micro Firms)</td>
<td>0</td>
<td>3</td>
<td>0.98</td>
<td>0.79</td>
</tr>
<tr>
<td>IP Stock (Medium Firms)</td>
<td>0</td>
<td>4</td>
<td>1.21</td>
<td>1.14</td>
</tr>
<tr>
<td>IP Stock (Macro Firms)</td>
<td>1</td>
<td>9</td>
<td>4.58</td>
<td>2.78</td>
</tr>
<tr>
<td>Acq. Price Multiple</td>
<td>0.75</td>
<td>17.41</td>
<td>6.4521</td>
<td>3.671</td>
</tr>
</tbody>
</table>

Table 3 (see below) shows that four out of five of our hypotheses received support. Unstandardized coefficients of 2.628 ***, 1.843 ***, 0.522 *, and 1.022 *** support hypotheses 1, 2, 4, and 5. The effect of SSIT firm age (B = 0.111 n.s.) on the acquisition price multiple DV was not found to be significant. It is clear that the SSIT firm’s actions can help bridge the gap between “incognito information” and firm value equivocality, according to our findings. Furthermore, our statistical analysis supports our claim that the 'IT value equivocality chasm' has been reduced as a result of the hype cycle’s influence on the evolution of information technology. For our hypotheses, our findings are summarized in Table 4.

Table 3. Data analysis results (Acq. Price Multiple as DV).

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Variable</th>
<th>B</th>
<th>Std. Error</th>
<th>t-Value</th>
<th>Tolerance</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Variables</td>
<td>TechDumLocationAwareness</td>
<td>3.184</td>
<td>0.869</td>
<td>3.664 ***</td>
<td>0.937</td>
<td>1.067</td>
</tr>
<tr>
<td></td>
<td>TechDumPredictiveAnalytics</td>
<td>3.264</td>
<td>0.758</td>
<td>4.306 ***</td>
<td>0.982</td>
<td>1.018</td>
</tr>
<tr>
<td></td>
<td>TechDumSpeechRecognition</td>
<td>3.649</td>
<td>1.421</td>
<td>2.567 **</td>
<td>0.993</td>
<td>1.007</td>
</tr>
<tr>
<td></td>
<td>TechDumVOIP</td>
<td>3.138</td>
<td>1.064</td>
<td>2.951 **</td>
<td>0.898</td>
<td>1.012</td>
</tr>
<tr>
<td></td>
<td>Growth firms</td>
<td>0.525</td>
<td>0.662</td>
<td>0.793</td>
<td>0.937</td>
<td>1.067</td>
</tr>
<tr>
<td></td>
<td>Relatedness of industry</td>
<td>−1.221</td>
<td>0.530</td>
<td>−2.305 *</td>
<td>0.964</td>
<td>1.037</td>
</tr>
<tr>
<td></td>
<td>Firm size</td>
<td>0.671</td>
<td>0.265</td>
<td>2.532</td>
<td>0.948</td>
<td>1.055</td>
</tr>
<tr>
<td></td>
<td>Acquisition during recession</td>
<td>−0.502</td>
<td>1.019</td>
<td>−0.492</td>
<td>0.737</td>
<td>1.356</td>
</tr>
<tr>
<td></td>
<td>Year of acquisition</td>
<td>−0.027</td>
<td>0.099</td>
<td>−0.270</td>
<td>0.713</td>
<td>1.402</td>
</tr>
<tr>
<td>Predictor Variables</td>
<td>Stage of firm evolution</td>
<td>2.628</td>
<td>0.278</td>
<td>9.442 ***</td>
<td>0.932</td>
<td>1.073</td>
</tr>
<tr>
<td></td>
<td>Presence of BOD</td>
<td>1.843</td>
<td>0.432</td>
<td>4.263 ***</td>
<td>0.964</td>
<td>1.037</td>
</tr>
<tr>
<td></td>
<td>Firm age</td>
<td>0.111</td>
<td>0.134</td>
<td>0.826</td>
<td>0.793</td>
<td>1.260</td>
</tr>
<tr>
<td></td>
<td>IP Stock</td>
<td>0.522</td>
<td>0.240</td>
<td>2.177 *</td>
<td>0.785</td>
<td>1.273</td>
</tr>
<tr>
<td></td>
<td>IT life cycle stage</td>
<td>1.022</td>
<td>0.227</td>
<td>4.494 ***</td>
<td>0.758</td>
<td>1.319</td>
</tr>
</tbody>
</table>

Data sources described in methodology section * p < 0.05, ** p < 0.01, *** p < 0.001 Two-tailed tests.
Table 4. Summary of hypotheses support.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1: SSIT firms that are in the third stage of firm evolution will be acquired for a higher price.</td>
<td>Supported ***</td>
</tr>
<tr>
<td>H2: SSIT firms with a BOD will be acquired for a higher price.</td>
<td>Supported ***</td>
</tr>
<tr>
<td>H3: Older SSIT target firms will be acquired for a higher price.</td>
<td>Not Supported</td>
</tr>
<tr>
<td>H4: SSIT firms with more IP Stock will be acquired for a higher price.</td>
<td>Supported **</td>
</tr>
<tr>
<td>H5: SSIT firms acquired during the “slope of enlightenment” and “plateau of productivity” phases will be acquired for a higher price.</td>
<td>Supported ***</td>
</tr>
</tbody>
</table>

Data sources described in methodology section, ** p < 0.01, *** p < 0.001 Two-tailed tests.

6.1. Analysis of Acquisition Price Discounts

We also calculated the acquisition price discount (APD) for organizations that did not signal to overcome knowledge chasms. To do this, we categorized enterprises into three categories based on their size: micro (<26 employees), medium (26 to 50 employees), and macro (>50 employees) firms. We studied the mean acquisition price multiple of SSIT firms in each category by firm evolution stage, IP stock, board presence, and IT maturity. The purchase price discount reflects differences in acquisition price multiples between high and low levels of our predictor variables (in percentage). Non-venture-backed organizations (stages 1 and 2) had the most significant APD compared to venture-backed firms (stage 3 of firm evolution). Table 5 lists APDs while Table 6 indicates that macro businesses without a BOD had a substantial APD (42.4%, p < 0.001).

Table 5. Acquisition price discounts for non-venture-backed versus venture-backed SSITs.

<table>
<thead>
<tr>
<th>Acquisition Price Multiple for Non-Venture Backed SSITs</th>
<th>Acquisition Price Multiple for Venture-Backed SSITs</th>
<th>Acquisition Price Discount Applied to Non-Venture Backed SSITs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro Firms</td>
<td>5.055</td>
<td>9.065</td>
</tr>
<tr>
<td>Medium Firms</td>
<td>5.376</td>
<td>8.602</td>
</tr>
<tr>
<td>Macro Firms</td>
<td>4.962</td>
<td>8.467</td>
</tr>
</tbody>
</table>

Data sources described in methodology section, *** p < 0.001 Two-tailed tests.

Table 6. Acquisition price discounts for SSITs based on the presence of a board of directors.

<table>
<thead>
<tr>
<th>Acquisition Price Multiple for SSITs without BODs</th>
<th>Acquisition Price Multiple for SSITs with BODs</th>
<th>Acquisition Price Discount Applied to SSITs without BODs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro Firms</td>
<td>5.726</td>
<td>7.728</td>
</tr>
<tr>
<td>Medium Firms</td>
<td>6.661</td>
<td>8.164</td>
</tr>
<tr>
<td>Macro Firms</td>
<td>5.065</td>
<td>8.796</td>
</tr>
</tbody>
</table>

Data sources described in methodology section, *** p < 0.001 Two-tailed tests.

Next, we compared SSIT companies that had no pre-acquisition patents, software copyrights, or applications with those that had at least one before acquisition. This allowed us to compute the APD that was applied to companies that have no IP stock (Table 7). The APD for micro and medium enterprises that did not have any IP stock was very significant (p < 0.001), coming in at 46.68 percent and 33.74 percent, respectively. In Tables 8–10, we estimated the APD for SSIT companies that were purchased during the early stage, the middle stage, and the mature IT stage of the IT life cycle, respectively. Statistically significant acquisition discounts were given to companies that were bought throughout the early and intermediate stages of the information technology life cycle in comparison to SSIT firms acquired during the mature stage (Tables 9 and 10).
6.2. Discussion of Results

In this study, we investigate the signals that SSIT firms send to potential buyers in order to convey the level of excellence of their business and to negotiate a higher acquisition price. During the course of this investigation, we came across evidence in favor of signals that narrow chasms including ‘firm value equivocality,’ ‘incognito information,’ and ‘IT value equivocality.’ As a consequence of conducting the aforementioned regression analysis, we discovered evidence in favor of four hypotheses that contribute to the narrowing of the chasms. Support for Hypotheses 1, 2, and 4 suggests that SSIT firms use these signals to allay acquirer concerns regarding the worth of the SSIT firm’s assets and the managing of its operations, therefore minimizing “firm value ambiguity.” There was no statistically significant association between the age of the SSIT company and the acquisition price that we discovered (Hypothesis 3). Therefore, support for Hypotheses 1, 2, and 4 implies that the most successful way for SSIT enterprises to communicate value is to attract institutional investors, make intentional attempts to implement the proper governance structure, and demonstrate the worth of their knowledge assets by using intellectual property protection mechanisms such as patents and copyrights. Taking all of this into consideration, it is clear that the most effective mechanism for SSIT firms to signal value was by attracting institutional investors.
Our investigation into the factors that influence acquisition price discounts (Tables 5–7) offers a fascinating look into the ways in which different-sized SSIT companies convey their worth to potential acquirers. The size of the target SSIT firms was a significant factor in determining the amount of acquisition price discount (APD) that was applied for our other considerations. This is true despite the fact that all SSIT companies are likely to command a higher price when they attract venture capitalists (Table 5). When the SSIT target companies did not have a board of directors at the time of acquisition, there was a tendency for those companies to be substantially undervalued (Table 6). On the other hand, small- and medium-sized businesses tended to be penalized more if they did not have any intellectual property stock (Table 7). These findings suggest that, in addition to luring venture capitalists in order to communicate value, smaller firms need to invest in developing, codifying, and safeguarding their intellectual property in order to communicate value. Furthermore, as these firms grow, they need to invest in developing traditional governance structures such as boards of directors in order to obtain a higher acquisition price during mergers and acquisitions.

Support for Hypotheses 1 and 2 suggests, among other things, that SSIT firms benefit from the cachet of social capital and the consequent prominence afforded by affiliating with venture capitalists and BODs. However, because we do not directly quantify the social capital possessed by the affiliated venture capitalists and BODs, we can only affirm indirectly that SSIT enterprises gain from such affiliations and bridge the “incognito information” chasm. Nonetheless, we are encouraged by the fact that the results of our statistical testing for Hypotheses 1 and 2 are consistent with the anticipated positive effect that any efforts to promote an SSIT firm by utilizing social capital would have on its acquisition price. The fact that our hypothesis relating the life cycle phase of the SSIT target’s primary IT activity to acquisition price (Hypothesis 5) received statistically significant support supports our contention that the life cycle of information technology itself enhances perceptions of the business value of information technology. In other words, IT maturity enables SSIT firms to explain their firms and IT’s quality more successfully, thereby justifying a greater acquisition price.

6.3. Implications for Research

Our findings are linked to theory-building efforts in management and business, and we discuss how they are relevant. Both of these bodies of research suggest, on the basis of the principle of signaling, that the ownership of intellectual property stocks such as patents and software copyrights can be used to indicate the worth of an SSIT company [63]. According to the findings of this body of research, an SSIT company that possesses a greater number of patents and other forms of intellectual property would have a higher market value than an SSIT company that possesses a lesser number of patents [13, 63, 70]. Other studies in these areas concluded that patenting has a mixed value effect on SSIT companies, causing scholars to wonder whether having patents should be important for SSIT companies [15, 89]. By providing a more nuanced observation, our research contributes to the existing theoretical foundation.

According to the findings of our research, small and medium SSIT companies receive a significant discount if they do not have any intellectual property stock (refer to Table 7). The discount ranged from approximately 45 percent for small SSIT companies to approximately 38 percent for medium SSIT companies that did not have IP stock. In addition, the majority of small and medium SSIT companies (refer to Table 1) in our sample own approximately one intellectual property stock on average (i.e., one patent or copyright). It is an open question as to whether a single IP stock is sufficient to highlight the knowledge base and intellectual property of an SSIT company. We acknowledge that this is not the case. If this is the case, then why are SSIT companies that have, on average, one more IP stock than other comparable SSIT companies earning higher acquisition prices from acquirers? We believe that the quantity of intellectual property held by a company is an excellent indicator of the worth of its SSIT business. Because we discovered evidence that SSIT enterprises can
become more valuable by filing for software-related patents or copyright, our observation contradicts the observation made by Gaule [15]; however, our observation does verify the observation made by Hoenig and Henkel (2015). Nonetheless, the size of the SSIT firm does have some bearing on this conclusion. Even the simple existence of intellectual property stock was sufficient to indicate value for small- and medium-sized businesses. However, as observed from the regression analysis, the number of software patents and copyrights did matter in the case of macro firms. This indicates that acquirers were more interested in macro enterprises that had a larger portfolio of patents and copyrights.

It is challenging to investigate phenomena affecting small- and medium-sized information technology enterprises due to their quick creation, environments that are hyper-competitive, rapid acquisitions and absorption by larger IT organizations, and the paucity of data that is available concerning medium-sized SSIT firms [19,81]. Given these limitations, the purpose of our work is to investigate in a methodical manner the means by which SSIT firms distinguish themselves by indicating their value. These assertions have not been tested in the small business and SSIT firm sample space despite the fact that the literature in symbolic and reputation management has posited the idea that institutional mechanisms, such as a board of directors, can have a positive impact on the value signaled by the organization [20,60]. This is something that our study investigates, and the findings suggest that boards may play a significant role in increasing the value of SSIT companies.

We also characterized the evolution of SSIT firms by adopting a model from the literature on entrepreneurship called the entrepreneurial evolution model [27]. This model was taken from the entrepreneurship literature. Although the model is mostly descriptive and conceptual in nature, our research was able to operationalize an experimentally useful strategy for capturing the developmental stage of small and startup information technology companies. We, therefore, provide a contribution to the relevant body of research by demonstrating that the entrepreneurial evolution model is effective in predicting the evolution of an SSIT firm as well as the concurrent financial value that arises from such evolution.

6.4. Implications for Practitioners

Our study has numerous implications for SSIT firm owners and practitioners who want to increase the value of their SSIT firms. In the end, our study shows that SSIT firm owners still have full control over the factors that affect acquisition price. First, venture capitalists can help SSIT owners increase the value of their investments and the price at which they can sell them. Often, venture capital firms rely on the abilities of their management to manage the greater risk, inadequate information, and uncertainty associated with their SSIT initiatives. Additionally, venture capitalists coach SSIT management teams and provide them with access to external resource networks. Both of these factors are essential for the expansion of SSIT firms and for facilitating the demonstration of their worth. Therefore, SSIT owners who wish to rapidly exit the market via acquisition might do so by collaborating with venture capitalists.

Second, SSIT firms have a lot of intellectual capital and knowledge that is not written down. Based on our analysis, making this knowledge clear and protecting it with patents and copyrights makes the SSIT firm more valuable. Our finding shows that organizational mechanisms, structures, and culture can be used to codify knowledge through patenting and to protect it through copyrights. This is a powerful way to show acquirers how much a company is worth. This is important for SSIT firms that make new IT services and products because fast-follower strategies are often used in IT markets that are fast-paced and have a lot of competition. This point raises two quality signals that SSIT firms send to buyers when they protect their IP. Firstly, the fact that the SSIT firm is able to codify and protect knowledge using existing intellectual property (IP) protection mechanisms shows that it can set its IT products and services apart, keep them safe, and take advantage of their value. This is particularly important for small- and medium-sized SSIT owners because protecting their IP is not always their top priority. This could be because the SSIT owner has to account for several responsibilities in the young company or because they are not sure how well
traditional IP protection mechanisms protect their IP. For small- and medium-sized SSIT entrepreneurs, our study shows that spending time protecting their IP can increase the value of their business.

Secondly, having IP stocks shows that the SSIT firm has the appropriate structures and internal processes to make new, unique intellectual properties that can be patented or copyrighted. According to the resource-based view, the utilization of people, processes, and structures to not only produce intellectual property but also to defend it is frequently difficult to duplicate, even in situations where the final product or service is susceptible to imitation by other firms, hence increasing the value of the SSIT firm to potential acquirers.

Third, owners must implement robust governance and control mechanisms as their SSIT firms continue to grow. We observed that acquisition prices were higher when the board of directors was employed to provide governance and control. Therefore, if larger SSIT firms want to increase their value, they should set up a board of directors as soon as possible. This is an important implication for people who work in the field. Board members with experience in IT can help a company improve its IT services and its own IT infrastructure [49]. Moreover, board members can find IT partners and value chain organizations through their IT-focused social networks. Additionally, appointing board members with overlaps on firms that have a lot of resources or could become potential acquirers can make it easier to assess companies that want to buy them. Board members often become publicists for the SSIT company that put them on the board. Past research has shown that many acquisition deals are made between companies whose boards overlap. Access to insider information about the target company can reduce doubts about the value of the target company and make it less expensive to buy it. A good mix of board members can also help a company improve its internal operations and organization and stand out in the competitive market for acquisitions. The star power of board members is something else that needs to be considered if the main reason for obtaining a board is to make a company more attractive to buy and gain more publicity. Therefore, smart practitioners can do more than just set up a board; they can also choose board members who can show and talk about the value of the SSIT firm to potential buyers.

Fourth, emerging information technologies receive a lot of attention, publicity, and hype during the second stage of Gartner’s hype cycle. However, the highest valuation for SSIT firms that work with emerging technologies did not occur until the information technology itself matured a lot during the last two stages of the hype cycle. We thought this would occur because the technology had advanced enough to make investors less worried about the commercial viability of new IT. This made it more profitable for SSIT firms to work with IT during these stages. Our finding, on the other hand, suggests that hype might not have as much of an effect on the valuation of SSIT firms as is made out in the news and in popular media, and that acquirer due diligence of target firms is smart and thorough in highlighting the tangible and intangible assets of SSIT firms, factoring these into their final valuation. “Don’t believe the hype”, is what we tell SSIT owners who think their companies will be worth more during the most hyped parts of an IT’s development. Instead, SSIT owners should improve their internal processes, structures, and IP protections, as well as find champions for their firms, such as board directors and venture capitalists, to raise the price of the SSIT firm when it comes time to sell. Table 11 shows Summary of study implications.
Table 11. Summary of Study Implications.

<table>
<thead>
<tr>
<th>Contemporary View</th>
<th>Our Finding</th>
<th>Implication Derived from Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>The role of BODs in SSIT firms has received little to no attention [90]. Extant</td>
<td>SSIT firms with BODs received a higher acquisition price</td>
<td>BODs can serve as champions and publicists for SSIT firms in the market for acquisitions</td>
</tr>
<tr>
<td>studies focus more on the role of managers. SSIT firms are not seen as venues for</td>
<td></td>
<td>an attract more attention from bidders. BODs can attract a larger pool of bidders and influence</td>
</tr>
<tr>
<td>BODs to exist.</td>
<td></td>
<td>SSIT acquisition price upward.</td>
</tr>
<tr>
<td>The value of patenting is questionable for SSIT firms [91,92].</td>
<td>SSIT firms with patents and copyrights received a higher</td>
<td>IP protections such as patents and copyrights are increasingly valuable for SSIT owners. The</td>
</tr>
<tr>
<td></td>
<td>acquisition price</td>
<td>only criterion is does an SSIT have patentable inventions. Increasing the appropriability of one’s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>digital inventions is highly appealing to acquirers.</td>
</tr>
<tr>
<td>Patenting invites venture capitalist attention and involvement with SSIT firms</td>
<td>SSIT firms with VC backing received a higher acquisition</td>
<td>Value creation for SSIT firms begins with investments in IP protection. The creation of</td>
</tr>
<tr>
<td>[93]. Venture Capitalist involvement results in growth of SSIT firm.</td>
<td>price</td>
<td>mechanisms to codify knowledge and then apply for patents and copyrights attracts VC involvement.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VCs serve as mentors as well as champions and publicists for the SSIT firm.</td>
</tr>
<tr>
<td>The stage of IT evolution plays an important part in SSIT firm acquisition price</td>
<td>SSIT firms involved with technologies in the third stage</td>
<td>Technology hype might dazzle and influence industry news, media, and industry laypeople. The</td>
</tr>
<tr>
<td>but events such as technology hype might affect SSIT acquisition price [73,74].</td>
<td>(not hype stage) received higher valuation</td>
<td>due diligence of potential acquirers tends to be robust and evaluates firm value bereft of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>inflated expectations. The key for SSIT firms is to become noticed in the market for acquisitions.</td>
</tr>
</tbody>
</table>

7. Limitations and Future Research

To keep the premise of our investigation straightforward, we omitted the influence of moderators and mediators. There are a number of factors that can influence an acquiring company’s value judgments and future research may find it worthwhile to examine these factors simultaneously. In entrepreneurship, for example, risk is a factor in models that evaluate SSIT firm valuations [23]. SSIT valuations may benefit from an examination of the role played by IT-related risk factors, according to information systems and IT entrepreneurship academics. Are SSIT companies that employ off-the-shelf technology in their IT goods and services more appealing to acquirers? This question arises because off-the-shelf technology poses a lower risk to acquirers and provides greater value to acquirers than highly proprietary technology does. Additional research on SSIT businesses utilizing IS-themed moderators and mediators may, if conducted, offer insight into the variables associated with IT that influence the purchase prices of these businesses.

Our study also limits the scope of acquisitions to the ones conducted in the United States of America. There are theoretical and practical reasons for this limitation. On the theoretical side, we only consider U.S. acquisitions in our sample to avoid the effect of confounding underlying reasons for acquisitions of SSIT firms in different countries. For example, in India, a primary motivation for acquiring SSIT firms is to acquire its cachet of talented employees [94]. Still, other prior research suggests significant differences in the motivation for acquiring IT startups in the U.S versus Europe [12]. Limiting the scope of this study to U.S. SSIT acquisitions controls the confounding effects of such extraneous effects.

The second reason for limiting our sample to U.S. firms is practical. In order to conduct our analyses, we required access to several third-party databases (described in the methodology section). As these databases primarily contain carefully verified and curated data on U.S. firms, it was more feasible for us to conduct a study on U.S. acquisitions versus, for example, Spanish, Indian, or Korean firms. Moreover, for this study, we had to collect patent, copyright, and other economic data which were readily available in public
sources for United States SSIT firms. Collecting this data would have been onerous for our study; however, other researchers might have the wherewithal and the resources to conduct similar studies by including different countries. Such studies could be instrumental in understanding the contrasting M&A practices of SSIT firms across different countries or regions.

For our measurement of the primary IT life cycle stage of the target organization, we used Gartner’s hype cycle phases as a foundation [71]. Based on prior research, we asserted that our metric accurately captured the development of emerging information technologies, particularly in terms of their potential to generate economic value. Future research in this area still has two interesting avenues. Construction of precise and academically sound macro indicators for the growth of the economic value of developing information technology offers an alternative to the hype cycle assessment of IT life cycles. Second, future research might find it beneficial to investigate how SSIT firms alter their communication during each phase to convey information technology features, particularly to convey their potential for business value and successfully stimulate acquisition interest.

8. Conclusions

In our paper, we look at a small set of signals that SSIT firms use to bridge information chasms and share the quality and value of their services. For a variety of reasons, existing companies view the acquisition of SSIT firms as a strategically valuable option. However, when developing new digital products, SSIT firms face a dilemma. If they produce an idea that is novel and has a lot of potential, they open themselves up to imitation and duplication by competitors as well as major technology firms such as Google or Amazon. Big technology firms have the resources (cash, expertise, data, and technology) to duplicate and improve any digital innovation that is not entirely patented, which includes the majority of digital goods.

Therefore, in order to not only survive but to actually thrive and make money through acquisitions in such environments, from the perspective of an SSIT firm owner, our research identifies three signals that can help them to minimize information chasms and avoid acquisition discounts. These signals are the firm’s evolution as a direct consequence of venture capital backing, the establishment of the board of directors, and patenting. We find that, by associating themselves with VCs and prestigious boundary spanners such as board members, an SSIT firm can increase its visibility and improve its standing in the market for M&As.

Furthermore, to protect itself from the threat of imitation by competitors and incumbent big technology firms, SSIT firms can no longer rely on antiquated mechanisms such as operational secrecy or trade secrets. Rather, they must rely on IP protection mechanisms such as patents and copyrights. Even though these mechanisms are imperfect, they provide a certain degree of appropriability. Our empirical research finds that the appropriability provided by IP protection mechanisms is valued by acquirers.

Finally, we discover that the development and degree of the maturity of the IT itself has a considerable influence on the worth of SSIT companies that are associated with it. Of course, how a technology develops, or even whether it develops and becomes mature technology, is not controllable by owners of the SSIT firms. These factors are usually determined by market factors. However, our main conclusion from this research is that SSIT owners who are interested in acquisition as an exit strategy should proactively strive to improve aspects about their SSIT firms so that they can leverage it into a higher acquisition price, if and when a technology becomes mature—a case of preparation meeting opportunity. We also encourage researchers to investigate other factors in the rapidly changing mergers and acquisitions market of SSIT firms.

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