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CURRENT ISSUES FACED BY TECHNOLOGY ENTREPRENEURS

A great idea does not always result in a successful product. Often the winners are the ones to make it over all the hurdles along the way.

Technically savvy professionals often come up with good ideas that could be of value to firms and to other individuals. With a little luck, funding, and hard work, the better of these ideas can lead to successful new firms or perhaps even entirely new industries. Moving an idea past development and into the market incurs so many roadblocks that the entrepreneur who attempts to launch a new venture wonders why it is so difficult to tackle what at the outset seem to be mundane speedbumps unrelated to the basic product idea. Many times, it is not the best idea that ultimately dominates a market but the idea that was most efficiently and effectively moved through all the intermediate steps,

Illustration by Lisa Haney

hurdles, and problems in order to reach market acceptance and profitability.

Here, we discuss the challenges faced by entrepreneurs in the computing and IT field as they attempt to commercialize an idea. Unfortunately, today's entrepreneurs find that many issues unrelated to product development and application have a major influence on the process. We discuss why these issues are relevant and then provide some solutions that are actionable.

First the Good News

The decline of the computing and IT industries has thankfully ended. Soon after the technology decline of a few years ago, computing industry professionals and pundits were often known to say that in the long-run the prospects for the field were bright but the short-term was terrible—without anyone specifying how long the "short-term" really was. Recent trends suggest the "long-run" has finally arrived.

- Sales figures are up for many leading technology companies such as Intel and Microsoft.
- Job postings for IT professionals have reached the highest levels since the technology bust of 2001 [6].
- Stock prices are up.
- Venture capital investment in 2004 increased a healthy 8% nationwide, but in the bellwether State of Washington with its strong Microsoft presence, venture capital investment went up a whopping 67%, mostly in Seattle and surroundings, according to VentureOne and Ernst & Young [1]. Similar increases have been seen in 2005 and 2006.
- The amazing story of Google achieving significant market penetration and billions of dollars in market capitalization within six years of formation shows that some are responding to the earlier downturn nicely.

Established companies tend to feel the effects of market improvement first. The opportunities and fortunes of early-stage entrepreneurs tend to lag by several fiscal quarters depending on the products and markets. There are, however, opportunities amid the challenges as technology start-ups navigate toward market success.

Challenges for Today's Entrepreneurs

Lack of capital or capital that is more difficult to secure? Early stage computing and IT ventures are some of the riskiest investments an investor can make. In addition to the technology not working, it is possible there is no real market at the price and service level offered. Satellite phones and satellite-based Internet services had a difficult time competing with low-cost cellular services that expanded to some of the most remote parts of the world.

Indications are that capital is available again. On the other hand, while there is $50 billion to $75 billion waiting on the sidelines, should there be investments deemed suitable by venture capitalists [8], these investments will probably go to the strongest players. The problem is that most ventures are too small and too risky for venture capital investments. The firms that are successful at receiving venture capital investments have only numbered in the thousands each year, with a peak of 8,068 firms in 2000 (the accompanying table shows these numbers must be viewed as approximate, given the nature and definition of deals and their timing). For millions of entrepreneurs, venture capital is not a viable source of start-up funding, and they should not base their strategies such that they rely heavily on venture capital investment.

Entrepreneurial firms started by individuals with either a track record of starting successful ventures or who have held senior positions in technology firms are more likely to attract the attention of venture capitalists. All others should rely on methods that do not require large infusions of capital at the outset. These include technologies that do not require significant sums to convert to useful products; or products and services that create rapid cash flow even if these are small. If the investment required is too small or the risk too high for institutional investors, angel investors might be suitable investor prospects.

Angel investors are typically those who invest smaller amounts, and are willing to lend a hand in helping the business succeed. Angel investors are willing to accept smaller cash flows and do not require the business to scale up rapidly. Unlike institutional investors, who focus mostly on the profit-and-loss picture, angel investors often have an intrinsic interest in the specific industry and have been professionally successful in that industry. Most communities have these angels in their midst. Sometimes, those who have become wealthy in other industries, for example, real estate, decide to become angels in the technology space, although they do not fully understand the finer points of the industry.

A larger question that some entrepreneurs are asking: Has the climate for start-ups changed so much that current financing models do not allow for a profitable exit for those starting a company? For those

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relying on venture capital and other institutional financing this might well be true with the exception of the rare start-up with truly spectacular potential. Entrepreneurs who insist on traditional institutional financing should definitely compare their prospects from starting a technology start-up with working in an established company that provides opportunities to examine and introduce new products for the enterprise without the financial risk of a start-up, as such entrepreneurial skills that are valued highly in innovative companies. However, with the right approach to financing and spending there are still successful opportunities available in technology entrepreneurship.

Year	No. of Deals	Total Investment (in billions of dollars)
1995	1870	7.6
1996	2609	11.5
1997	3181	14.8
1998	3691	21.2
1999	5604	54.3
2000	8068	105.9
2001	4609	40.7
2002	3033	21.3
2003	2779	18.4
2004	2876	20.9
2005	2400	22.8
2006	2454	25.8

Source: Money Tree Survey by PricewaterhouseCoopers, Thomson Venture Economics, and Venture Capital Association.

Venture capital investment by number of deals and total investment.

Too many start-ups raise capital and spend it too fast ("high burn-rate") and expect more capital to be invested. Until the product is ready to make waves in the market, the start-up team should be very small (say, one to three individuals), and attempt to be self-supporting for a year or two, at least in part, by offering related billable services. The team should develop sales skills to sell small lots of the first versions of the product to generate some quick revenue. These early sales, no matter how small the account, help to provide a basis to make larger sales volumes in the future, but more important, help fine-tune the marketing, sales, and product development. The start-up is advised to form a Board of Directors/Mentors from the time of company formation so that these professionals can assist in raising capital and conserving the capital that has been raised.

Lack of highly skilled employees, again! During the dot-com-induced downturn there were complaints about high unemployment levels among those who are highly skilled. As markets pick up, however, firms are finding they are unable to recruit enough employees who are highly skilled or even have the desired skill set. The Bureau of Labor Statistics projects that three of the 10 fastest-growing occupations in 2002–2012 are computer and IT related: Network systems and data communication analysts, computer software engineers—applications, and computer software engineers—systems software [9]. Consequently, we should not be surprised by the seemingly conflicting report from Gartner Group stating that 50% of IT operations jobs could be lost by 2025 due to automation, while research firm IT Workforce notes that certain technology skills are in higher demand than ever and pay is rising [3]. Even in 2001, when hiring slowed down considerably, fully half the jobs created were expected to go unfilled because of underqualified applicants [10].

Entrepreneurial firms are particularly hard-hit in this area as they are out-bid by larger firms for skilled professionals. Technology start-up firms are also at a disadvantage as they may not have an organized hiring department or the links to a large pool of highly skilled potential employees who fit perfectly with the job requirements, or even the capacity to judge job applicants on how they would fit best into the multifarious requirements of an entrepreneurial firm. Even when technology start-ups manage to attract talent, they offer higher risk given the greater possibility of failure of the product markets. Post-technology-bubble conservatism has moved many professionals to larger and more stable companies. Even as the environment recovers it may be more difficult to convince them of the promise of success in technology ven-

tures, so the entrepreneur must position the offers with attractive job features.

The management team at technology start-ups must view making contacts with skilled professionals as a fundamental requirement for the success of the venture. Such contacts are enhanced by active networking efforts, the use of well-connected attorneys and accountants who cater to entrepreneurial firms, membership in professional organizations, attending technology conferences, and an active effort to maintain at least email contact with a large pool of skilled professionals who may be long-term employee-prospects for the firm. Even if skilled employees are located, it might be difficult to hire them at relatively low wages. However, the granting of a substantially large number of options will help. More important, almost all firms big and small require employees to exercise their vested options when they quit their jobs, and in many cases this involves a large out-of-pocket cost for non-liquid stock in pre-IPO companies. A technology start-up willing to let valuable employees hold on to the options that have vested even if they quit their job and allow them to exercise the vested options for the full duration of the option plan (for example, 10 years) would encourage skilled professionals to accept employment.

Lack of skilled employees might come as a surprise to those who are long-term unemployed in the IT and computing fields. There are many skilled older IT professionals available in the market due to the dot-com decline, many of whom are willing to work on a part-time or full-time basis in exchange for a combination of stock and salary. Technology entrepreneurs should recognize that start-up ventures require a much broader set of skills than merely having expertise in the latest technologies and these older employees might well be better suited for these jobs given their experience. Such employees are available in communities where large technological firms have ceased operations or where certain production lines have been shut down. For example, in Renton, WA, when the Boeing 757 production line was being shut down, the City of Renton was concerned about what to do for a number of highly skilled engineers who were going to be looking for work [7]. Start-up companies should realize that geographical factors will skew availability, and the skills that are available in great supply in an area are what they should settle for, since few people actually relocate to work for a start-up.

Outsourcing as threat or opportunity? Outsourcing to foreign locations where there is a large pool of highly skilled people willing to work at low or moderate wages can be a competitive problem for entrepreneurial ventures. Outsourcing of manufacturing and even design of PC systems has led to lowered R&D spending by larger U.S.-based firms, but has taken away some opportunities for smaller firms and subcontractors within this industry. On the other hand, the number of jobs lost due to technological innovation, productivity, and the general economy far exceed job losses due to outsourcing to offshore locations [4].

Another interesting phenomenon within outsourcing is that many outsourced jobs in the U.S. are being outsourced to other firms *within the U.S.* Outsourcing offers many opportunities for entrepreneurial firms in the U.S. to bid on outsource contracts from larger firms. Toward that end, entrepreneurs should make an effort to lower the risk to large firms from outsourcing at modest cost reductions rather than trying to compete only on price (which many pure-offshore outsourcers tend to offer). Risk reduction to the buyer is achieved by demonstrating the security of data and networks, control mechanisms for employees, reliability of products, and strong local presence including the ability for many face-to-face meetings. There is a trend toward U.S.-based companies partnering with companies in India among other places to offer the combination of U.S. presence and, hence, face-to-face coordination with clients, and yet a lower rate per man-hour by combining expensive and inexpensive resources. These companies offer "blended" billing rates combined with one-stop, U.S.-based project ownership where the coordination between U.S. and offshore teams is transparent to the client. Thus, a blended billing rate is one more tool for smaller U.S.-based entrepreneurial companies to offer competitive outsourcing services.

Lack of skilled customers in the right markets. Computing technologies have become simplified for users over the years, and a higher degree of education and skills among the potential customers has made it easier to implement computing solutions. However, education levels vary widely across the U.S. Indeed, Seattle has the highest proportion of adult population (50%) with at least a four-year college degree of any major city in the U.S. Within the state of Washington, however, the proportions are significantly lower in parts of Eastern Washington and even within certain areas of Seattle.

The extent of successful implementation of new technologies depends on both the skill levels of users within the target markets and the complexity level of the product from a usability standpoint. Too many ERP solutions have failed, for example, because the

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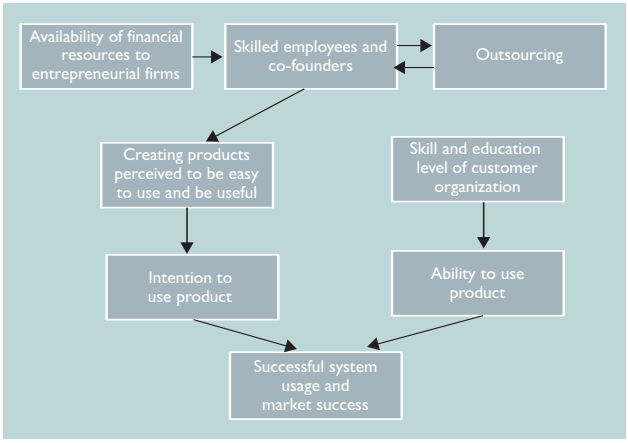
average IT employee at the firm where the implementation is taking place does not have the necessary skills to implement and configure the system, and sometimes users do not have the required skill level to be able to use the system effectively. Creating products and services that can be implemented by the "average employee" at a typical firm is one of the keys to the success of the technology entrepreneur.

Value still drives success of new products. The value in a new product (either real or perceived) drives the success of that project in the marketplace perhaps more than ever before. Fortunately, there is research on information systems that can be useful to entrepreneurs considering the launch and/or development of a new IT product or service. Research on the Technology Acceptance Model (TAM) has found that perceived usefulness and perceived ease of use are the two most important features of technology acceptance [5]. Entrepreneurial ventures that produce solutions that appear "nice to have" but fail on these two measures will tend to fail.



Technology Acceptance and Market Success Model (TAMSM).

The original TAM was developed by F.D. Davis and subsequently revised by Davis, Bagozzi, and Warshaw in 1989 [2]. We suggest a new model that combines market success and technology acceptance. High-tech acceptance does not automatically imply that the product and firm will succeed in the market. Availability of financial resources, availability of skilled employees, outsourcing resources, and skill and education levels of users are all relevant in the market success of a product.

The Technology Acceptance and Market Success Model (TAMSM) is presented in the accompanying figure with the added factors: the availability of financial resources including investment and the ability to attract skilled employees including co-founders. Skilled personnel help to secure outsource contracts from other firms, which help to build the internal resources and entryway to the market. In contrast, the firm can also make use of other outsource firms that can supply needed skills in a cost-effective manner. All these factors help to produce a product that has a higher probability of having greater perceived usefulness and ease of use. The perceived usefulness and ease of use influence intention to use. Within the marketplace, the skill and education level of the customer and/or organization purchasing the product will influence their ability to use it. Both the ability to use the product successfully and the intention to use the product jointly determine the market success of the product, which is the final output of the TAMSM. Lastly, there could be a difference between real and perceived value in some cases. While perceptions of value are important initially, there must be real value in the long run or new products will fail. The Apple Newton is a good example of a product that seemed to have good perceived value, but when buyers began to use it on an everyday basis, they began to find it less useful. Eventually, the Apple Newton failed in the market in spite of its initial positive reception.

Penetrating the firewall with a new product.

CTOs and CIOs of many large firms are wary of loading the untested software developed by small entrepreneurial firms on corporate systems even if they have better features than the ones from larger, more trusted suppliers. Etrieve, Inc., an innovative company in the area of email retrieval and conversion to audio messages with cell phones, ran up against the firewalls of many firms where they attempted to implement their solution. Security concerns in recent years have precluded these solutions that allow company employees to access data or solutions from outside or transfer any information to outside locations. New ventures that create software and hardware solutions that ignore these firewalls will find a persistent roadblock to market acceptance, at least at the enterprise level.

Some entrepreneurial firms work around this problem by having solutions loaded on servers that are external to the firm (for example, external Web-hosting solutions). But even in these cases, security is still a concern because data must ultimately be passed to and from these internal systems. Although security and firewalls are an increasing concern in almost all markets, concerns about firewalls are less relevant for entrepreneurs working in the consumer markets.

Similarly, technology solutions are most acceptable to organizations if they do not fundamentally alter current operations or systems. Entrepreneurs must consult and work closely with eventual customers from the onset of a venture. Product design must be fundamentally driven by compatibility with existing, popular hardware, software, firewall security, and networking equipment. Products that are eventually successful will have to be tested by customers within organizations at the earliest stages for compatibility.

Conclusion

Entrepreneurs developing products or services within the computing and IT fields have some interesting new challenges facing them, but there are ways to manage these challenges successfully or steer around them. Press reports abound of firms that have either succeeded or failed. Careful analysis and evaluation suggests that entrepreneurial firms can take positive steps to improve their success rates. In order to succeed, a firm must follow a flexible strategy that reduces the risk to investors, relies on appropriate capital sources, takes innovative steps to attracting and keeping skilled employees, reacts appropriately to outsourcing and lack of requisite skills among customers, while creating products that are secure and compatible with other technologies. Entrepreneurs in the technology arena can also learn from research on technology acceptance that shows customers' perceptions of usefulness and ease of use will drive or constrain a new technology's ultimate acceptance, adoption, and use. Being concerned with firewalls in the design stage and creating designs that do not require users to fundamentally alter current operations are two other guidelines that are useful for the success of the technology entrepreneur.

Entrepreneurs in the computing field should be encouraged to start businesses now as the market has shaken off the dot-com crash; too many well-qualified professionals are still too hesitant. This article has focused on the early stages of bringing ideas to market. Future studies should discuss the aspects of the TAMSM model introduced in this study that deal with activities after getting the product developed for a target market. These challenges include launching the product, marketing, sales, and business execution including operations and partnering. C

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