

On the Challenges of Commercializing Technology Innovation

1.0 Introduction

It's now recognized that technology innovation, and especially the commercialization of technology innovation, is key to future prosperity in the industrialized world, as the following quote suggests:

"Where does new wealth come from? Like a four year old asking how babies are born, it's a deceptively direct question that often disarms our conventional capacity to answer ... In the New Economy, the greatest rewards go to companies that create new business models -- ideas that spark new sources of revenue based on changing technology, demographics, and consumer habits. By definition, new business models destroy old ones, why is why creating new wealth is a threat to every traditional (unimaginative) business. Never before have strategy life-cycles been shorter and market leadership counted for less. Call it the First Law of the Innovation Economy: companies that are not constantly pursuing innovation will be overwhelmed by it." [8]

In a previous article [7], we looked at how new (software) companies start-up, and the particular problems they face as they do their best to avoid bankruptcy and grow into successful businesses.

In this companion article, we'll look more closely at the commercialization of technology innovation that is often the raison d'être of the start-up adventure. And while creating a product from technology innovation can pose enormous technical challenges, it turns out that the real barriers to commercialization are primarily *market-related*.

Unfortunately, marketing remains a mysterious and even suspicious subject for most technology people. So let's begin with [11] who reminds us that "marketing" means trying to have what someone wants to buy, as opposed to "selling" or trying to find someone to buy what you already have.

In what follows, I shall limit my remarks to technology innovation which leads to new *business products*. That's just because business research [1] suggests that when new companies succeed in commercializing technology innovation, they are overwhelmingly creating products for businesses, not consumers.

2.0 On technology innovation

One good starting place to better understand the commercialization of technology innovation is [3]. Although the author's focus is on how established companies in established markets come to lose their dominant positions to newcomers, he nonetheless describes in some detail just what technology innovation is and how new companies come to be founded and grow in step with markets that emerge for their new products. (Later in their evolution, such new companies grow "up-market" to invade and then dominate established markets, pushing aside the established players.)

In particular, Christensen suggests that technology innovation can take on two very different forms. First there is "sustaining" innovation, technology development which contributes directly to improving existing products and creating new ones for established markets. And this is what "industrial" R&D is all about, as companies struggle to grow their market share by better understanding and anticipating (existing) customer needs and refining their product offering accordingly.

Sometimes, university researchers contribute "indirectly" to this industrial R&D, perhaps by building a proof-of-concept prototype to evaluate the merits of a new approach to an existing problem. But sustaining innovation is simply too strategic to be out-sourced and that's why it's conducted in-house and in secret. As a result, university research is

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Abstract

While creating a product from technology innovation can pose enormous technical challenges, this article suggests that the real barriers to commercialization are primarily *market-related*. Here we'll highlight the give-and-take between supplier and customer that is key to market-creating innovation and new business wealth, as new products are defined and selling challenges are overcome.

Sommaire

Bien que la mise au point, sous forme commerciale, d'une innovation technologique puisse présenter des problèmes techniques de taille, cet article argumente que les véritables défis de commercialisation sont ailleurs, sur le plan mise en marché. Or, c'est le va-et-vient entre le fournisseur de produit et ses (premiers) clients qui est au coeur de la réussite, au fur et à mesure que les caractéristiques du produit et les stratégies de vente se précisent.

often perceived by business people as primarily serving a training function, i.e. creating new potential hires with advanced skills who can quickly become productive in industrial settings.

On the other hand, the results of much, if not most, university research is better described as "disruptive" innovation which provides tantalizing glimpses of new and possibly profitable future products. But such technology typically offers *less* of what products do now because they do things *differently*. Even with sufficient technical refinement, the disruptive innovation might only

become a simpler, more convenient and more reliable product, providing less functionality and reduced performance. As a result, such a product would also have to command a lower selling price. For all of these reasons, established companies now selling products in established markets are not only *not* interested in such disruptive innovation (since it cannot contribute directly to their current business growth), they *cannot* be interested. This is the essence of Christensen's "innovator's dilemma."

Nonetheless, truly innovative new products do indeed see the light of day, largely thanks to the efforts of brand new companies or brand new divisions within existing companies. And before we look more closely at how markets emerge in response to the creation of their new products, we must stop to remember that technology innovation is just that, "technology". Indeed, this is why university researchers often talk of possible "applications" for their work. Consider, for example, new (mathematical and computing) technology to model and interpret partial information in a statistical way. Two possible "applications" might be image processing to improve quality control in a factory setting, and automated speech recognition as part of a smart telephone exchange.

Still, even a "technology" somehow adapted for an "application" isn't quite a "product". Using a convenient vocabulary from [13], such an applied technology is just a "device", because it only addresses a subset of the customer's needs. Part of the commercialization effort, then, is to define and create a "whole product" around the device that provides real added value to the customer. To return to our previous examples, we'd need to add all kinds of extra elements such as a user interface to configure the "device", a database for storing customer-specific device

First Law of the Innovation Economy:

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parameters (appropriate factory parts, employee names, etc.), a different user interface for trouble-shooting problems by the customer, perhaps the means to provide technical support remotely (via modem) by the product supplier, and, of course, suitable documentation. Seen in this light, the commercialization of technology innovation will always require substantial “peripheral” technical effort to create an appropriate whole product.

3.0 On creating new markets

Returning to [3], recall that “disruptive” technology innovation offers a different set of attributes of little value to established markets and as a result, commercialization typically means finding different kinds of customers outside established markets and refining the product offering with them, with the hope that eventually, enough new customers will be found with enough shared characteristics so that a new, different, market will emerge, making the new venture (eventually) a successful business.



Not surprisingly, business history [1] teaches us that companies that were most successful at commercializing technology innovation were those that understood that the primary challenge was a marketing one: to “build” a market, i.e. to find enough customers, where product competition occurs along the dimensions favored by the attributes of the innovation. And that’s why, as suggested in [11]:

“With few exceptions, [new high tech] companies are not battling to share markets. They are battling to create markets: to get prospects to want and use their [new] products and services.”

And while these new markets are emerging, little companies (with the right guidance) can be growing into bigger ones off the “radar screens” of established players which are concentrating their sights elsewhere, i.e. on established markets.

It’s significant that the study described in [1] concludes by suggesting that creating new markets is significantly less risky, and more financially rewarding, than entering established markets against entrenched competition. Still, commercializing technology innovation typically involves substantial *market risk*: that an emerging market will not develop, or emerge too slowly, or never become big enough, to sustain commercialization efforts. (In contrast, entering established markets against entrenched competition involves substantial, sometimes insurmountable, *competitive risk*.)

But as emerging markets become big enough, there are typically overwhelming “first mover” advantages since there is rarely place for more than just a few players. Indeed, high tech is a “winner takes all” industry whereby the products of just a handful of players enjoy overwhelming dominance. As described in [9], this is especially true in the software industry, where a first mover can become an “industry standard” or reference. Then, as more and more customers choose that product, it becomes harder and harder for everyone else to choose anything else. Moreover, once the purchasing decision is made, customers become “locked in” and become “loyal” to the first mover, especially when conversion costs are high.

Still, the dot-com failures remind us that “being first to market”, when there is no market, is a recipe for disaster. Indeed, pioneers will go broke when a market fails to develop, or more typically, when the market emerges too slowly i.e., remains too small for too long to sustain their commercialisation efforts. And the world is full of examples of new companies overtaking pioneering ones just as emerging markets became established and started to really grow [14]. And that’s why first movers must create significant “barriers to entry” in order to make their market positions “defensible”, i.e. only when it becomes extremely difficult to copy new products soon enough to “catch the wave” as the market emerges, can first movers enjoy overwhelming business success. And such barriers to entry are typically a combination of superior technology and especially, superior market knowledge as reflected in product features.

But the foregoing seems to suggest that right off the bat, we can see our way clear to finding those first customers and creating winning products they *will* purchase. The only worry seems to be where to look, and

whether or not they are enough of them. Dream on!

Practically, there are other, much more fundamental, kinds of “market risk”, as the following quotation from [6] makes clear:

“When a new venture does succeed, more often than not it is in a market other than the one it was originally intended to serve, with products or services not quite those with which it had set out, bought in large part by customers it did not even think of when it started, and used for a host of purposes besides the ones for which the products were designed.”

Now here’s another variation on the same theme from [3]:

“Research has shown, in fact, that the vast majority of successful new business ventures abandoned their original business strategies and learned what would and would not work in the market. Guessing the right strategy at the outset isn’t nearly as important to success as conserving enough resources so that new business initiatives get a 2nd or 3rd stab at getting it right.”

Remember: sales are, of course, the ultimate yardstick for “getting it right”!

And the importance of remaining focused on your *business*, instead of on your (first) product, is key, as suggested by [4]:

“Luck favours the persistent. This simple truth is a fundamental cornerstone of successful company builders ... If you equate the success of your company with the success of a specific idea, as many business people do, then you’re more likely to give up on your company if that idea fails.”

This suggests that early products should remain simple and easy to change, as suppliers learn, along with their first customers, to determine appropriate product features, as emerging markets develop as part of the give-and-take between customer and supplier.

4.0 On financing imperatives

In [4], the authors review the continuing business success of 3M and observe that:

“With mottos like ‘make a little, sell a little’, and ‘take small steps’, 3M understood that big things often evolve from little things; but since you can’t tell ahead of time which little things will turn into big things, you have to try lots of little things, keep the ones that work, and discard the ones that don’t.”

Of course, new companies just starting out rarely have the financial means to “try lots of little things” but with sufficient patience and persistence, much can be done, one thing at a time.

But “start small, grow slowly” business adventures are of little or no interest to Venture Capital firms looking to invest in a massive way and hit home runs as quickly as possible e.g. after 3-5 years. Such investors will always prefer to place larger amounts with fewer companies than smaller amounts with many more companies, simply to make

their own account management more efficient. (Of course, some time into the future, some of these companies might become sufficiently large as their markets become sufficiently established or at least “knowable”, to present suitable investment opportunities.)

In contrast, consider the following business advice from [3]:

“I don’t want my organization to have pockets that are too deep. While I don’t want my people to feel pressure to generate significant profit (this would force us into a fruitless search for an instant large market), I want them to feel constant pressure to find some way – some set of customers somewhere – to make our small organization cash-positive as fast as possible.”

So in the beginning, financial needs must be small because the emerg-

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ing market is small, increasing slowly as the company size grows in step with the size of the emerging market. As a result, it's hard for institutional investors, even those with "patient capital", to consider funding such new ventures since the financial investments at the beginning are so small.

Not only that, since the small company is growing in step with the market that its innovative products are creating, the company simply can't put to good use any sizable investment that might be made! Indeed, the only way to grow faster than "your" market would be to create multiple (innovative) products at the same time (ideally, variations on the same theme) to help create multiple new markets at the same time.

Still, this is counter to the "bowling alley" wisdom proposed by [13] which suggests that you ought to first concentrate your business efforts in one place, and then evolve "horizontally" to reach "neighbouring" markets with similar needs that can be met by derived products. This reasoning is predicated on the need to concentrate on the give-and-take as supplier and buyer together "discover" what to do. And as you might guess, it becomes harder and harder to do this right as the number of emerging markets increases. In practice, it's already hard enough to acquire the detailed "market" knowledge about just one set of customers!

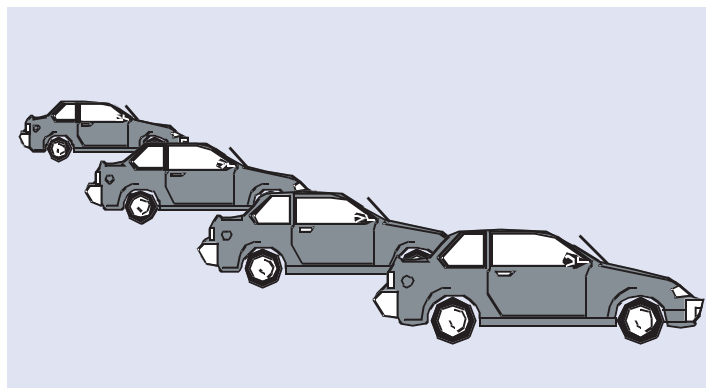
5.0 On business imperatives

Since "learning by discovery" is necessarily uncertain, proceeding as it does by trial and error, the supplier must be "small enough" with an appropriate cost structure (salaries, promotional budgets, overhead, etc.) that reflects the size of the emerging market. Only then are small opportunities and small victories important. And only then can a series of small victories gradually make it possible for small businesses to become profitable and grow.

Stated otherwise, new product development plans must be carefully "modulated" in order to grow in step with the size of the emerging market. And if your company is counting on sales revenue (as opposed to investors' capital) to stay in business, then you'd be wise to "innovate a little, sell a little", to paraphrase 3M's strategy! Note too that the "right" product possibilities will only "reveal" themselves to players engaged in this give-and-take, not bystanders, as companies work to better understand their new customers.

But what happens when even "innovate a little" requires a substantial investment in time and dollars? (This can happen when many interconnected bits of new technology must be developed at the same time.) If eventual "payback" (sales revenue) can't really be estimated, then how can you proceed? Here I'd like to suggest that "co-development" is one answer, whereby the customer and supplier together contribute in a technical and especially financial way [12]. Now, with a stake in the outcome, the customer will likely work more closely with the supplier (over several iterations) to make the new product a success. Note too that the supplier's out-of-pocket investment becomes smaller and moreover, if all goes well, that first customer becomes the supplier's key industry reference and the means to sell to other customers with similar business needs.

In practice, the situation is a little more complicated. Remember that in general, a business product is typically purchased to become part of a different business product or service, on down the "value/buying chain" to the final end-user. Consider this: A sells a product to B who builds it into his product offering for C who then provides a service to D. As a result, there is room for the supplier (who is commercialising the technology innovation) to develop strategic alliances with *partners* in addition to



customers (end-users). Indeed, a recent survey of world-class software suppliers [9] clearly found that one key to business success is precisely the concept of alliances among suppliers of complementary products and services.

(Over time, I have become a believer in this "ecology" of business idea, and interested readers might wish to turn to Jane Jacob's latest offering [10] a search for universal principles that characterize complex systems, both "natural" and "human made".)

This also suggests that the successful commercialisation of one technology innovation often depends upon a constellation of other things being "just right". Consider the following example from the early days of the century as described in [2]. Having "built a better mousetrap", key players in the newly emerging automobile industry (including General Motors and Goodyear) built "seedling miles" along proposed highway routes. Then, once there were enough cars on the road, i.e. once the emerging market grew large enough, governments were persuaded to take over. (The rest, of course, is "history", as more and more of the world gets paved over. But that's a topic for another article!)

As a result, you sometimes hear commercialisation failure blamed on being "ahead of the market", marketing-speak which suggests that the guilty parties neglected to ensure that all of the stars were in the appropriate constellation. (Think again of the nascent car builders and their need for roads, not to mention gas stations!)

There is a second way that small, growing (product-based) companies can better secure their future in the midst of market uncertainty. You might want to consider complementing your *product-based* sales revenues with *project-based* service/consultation revenues. In this way, as you continue to promote your new (innovative) products, you'll be able to keep your business afloat with other sources of funding. Ideally, the one flows into the other, instead of creating internal chaos.

6.0 On selling innovative products

So we've now seen that the creation of a (whole) product from technology innovation entails significant technical and especially marketing effort. Still, the challenges associated with *selling* that product can be even more daunting! Why? Because selling a truly innovative (think "market-creating") product means that before your potential customer can be persuaded to buy your product (so that money changes hands), you must first educate that potential customer about the *idea* of your product.

Of course, anyone with a product to sell can encounter selling problems. But established products have, in established markets, well-defined value/buying chains and so long as a new product simply enhances an old one, the purchasing decisions remain similar and the same people (e.g. in a purchasing department) follow the same procedures to obtain authorization, shipping details, etc.

Now consider selling a truly innovative product. First off, there is no established market (of course) so much effort must be devoted to identifying suitable potential customers. And in our over-worked world, those potential customers must now make time for something "new" in their busy day already filled with "ordinary" concerns (think existing products for existing markets). Here's where your powers of persuasion and perseverance are put to the test, as you "push open" doors that open just a crack, in order to earn an opportunity just to present your innovative product and begin the selling process.

But even here, the traditional purchasing dynamic breaks down. Faced with a truly different kind of product, many more people now must "climb onboard". This means that you'll need to make your new product available in some kind of "evaluation mode", and *cheaply*, so that your potential customer can call in everyone who might have something to say about it. And the larger the price tag, the more people consulted, and the longer the evaluation will be, stretching into weeks if not months! Remember that in many cases, your selling price (for the new product) will be just a small part of the real cost to your customer, who must struggle to change his business practices and learn to do things differently after the product purchase.

Worse, in many if not most cases, your potential customer will also seek guidance from *his own* customers, since the modern business-to-business world is, as previously noted, full of "value/buying chains". So let's return to A who sells a product to B who builds it into his product offering for C who then provides a service to D. Now consider that you just won't get very far with A until B and perhaps C have had a chance to speak up (and talk with A). And then, in many cases, you'll discover

that having pushed open the door, your product is not suited to this potential customer so that instead of selling (earning money to pay down your expenses), you're back to marketing (spending money to learn more about what the "right" product might be).

And so companies operating in emerging markets struggle with two kinds of problems: proving to potential customers that their new products will provide real added value, and quickly building a critical mass of customers with sufficiently common needs *and buying patterns* so that enough sales can be made. To address these problems, such companies often look to strike alliances with established players in order to gain product credibility and accelerate product promotion through 3^d party distribution. And as we've noted already, if you're lucky, such distributors will also be co-development *partners*, sharing the technical and financial risks associated with your commercialisation efforts.

Finally, let's not forget that electronic connectivity is making the world a smaller place all the time. According to one recent estimate [5], 30% of all products and services today are involved in international trade. By 2020, this is expected to rise to 50%. Practically, there is both an upside and downside to this "global village". On the upside, when markets are emerging, they are now emerging on a global scale, so that in your early days, you might have just a handful of customers "nearby" but enough other customers "far away", all sharing similar needs, to keep you in business. This suggests then that right from the start, you ought to think about how your new (innovative) product could be sold (and delivered and maintained) to customers who are far away. Now for the downside: while you're busy in your own corner of the world, someone else might be busy in another corner of the world chasing down something very similar!

Of course, in the old (pre-Internet days), we relied on things like physical distances, oceans, and language barriers to keep such companies and their products separate. But now, with electronic connectivity and the overwhelming use of English as the global "lingua franca", that unknown competitor, regardless of his native language, will be creating an English language version just as you are doing now! On the other hand, even here, this one world/one language can work in your favour because customers in his home country might just be ready to buy your (English language) product as is!



7.0 Conclusions

In this article, I've tried to make the case that while creating a product from a technology innovation can pose enormous technical challenges, the real barriers to commercialization are primarily *market-related*. As we've seen, the give-and-take between supplier and customer is key to market-creating innovation and new business wealth. And this is necessarily a perilous exercise, all the way from defining a winning set of product features to overcoming technical hurdles to addressing selling challenges! As a result, companies grow in step with the markets they are creating for their new products, and for the most part, this means that they grow slowly. So be patient, work hard, keep the faith, and remember: "Luck favours the persistent" [4]!

8.0 References

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