PICKING WINNERS

AN INVESTOR'S GUIDE TO DISRUPTIVE INNOVATION

INTRODUCTION

Attending college in the late 1970's, I made ends meet by playing blackjack – but I'm no gambler. By studying the theory of card-counting, I gained a consistent statistical advantage over the casino. The more I bet, the more I won. The gamblers seated next to me could have studied card-counting, too, but instead they relied on gut instinct – and lost. For them, blackjack was a game of *chance*; for me, it was a game of *skill*.

Generally speaking, stock-picking is a game of chance, too – but it doesn't have to be. By studying the theory of *disruptive innovation* you can improve your odds of picking winners – and put your own kids through college.

That's no exaggeration. According to Prof. Clayton Christensen of the Harvard Business School, whose widely-accepted theories form the foundation of this article, "there are enormous returns and significant first-mover advantages associated with early entry into the emerging markets in which disruptive technologies are initially used" [1a, p. 141], and "making highly differentiable products with strong cost advantages is a license to print money – and lots of it" [1b, p.151].

The theory of disruptive innovation is old enough to have been rigorously tested and proven, but new enough that most investors – and even many venture capitalists – don't know about it.

In this article, I will explain the theory of disruptive innovation, propose questions that you can ask to explore a firm's disruptive potential, use those questions to explore a case study, and sum up my conclusions. I will draw the article's examples and case study from the musical instrument industry, because it's a fun industry and most people are at least somewhat familiar with musical instruments.

We'll start our exploration of disruptive innovation with a discussion of Value Chain Evolution.

VALUE CHAIN EVOLUTION

INTEGRATION, MODULARITY, & SPECIALIZATION

Every firm has a *value chain*, which describes the activities by which the firm adds value to its products. A typical value chain includes activities such as procurement, receiving, manufacturing, shipping, marketing, sales, and customer service. For each activity, a firm must decide whether to *execute* the activity in-house; to *outsource* that activity to a specialist; or to *specialize* in just that one activity.

Executing an activity in-house gives the firm complete control over that activity. Those activities which are not outsourced are said to be *integrated* into the firm. A firm that executes all activities in-house is said to be *vertically integrated*. Integration is good, because it allows the firm to develop a *core competency* in an activity that is not available to its competitors.

Outsourcing an activity to a specialist allows the firm to take advantage of the specialist's core competency in that activity. A firm that outsources most of its activities is said to be *modular*. Modularity is good, because it reduces the number of core competencies that a firm has to develop and maintain, allowing it to focus on the most valuable competencies.

A specialist firm can perform an activity for many clients. Specialists are integrated, by definition.

The concepts of integration and modularity apply to product architectures, too. For example, most laptop computers have an integrated monitor (screen), whereas desktop computers usually have modular monitors. Using a modular product architecture makes it easier for a firm to outsource the product's components (modules), whereas using a integrated product architecture tends to require vertical integration. That is, a firm's product architecture tends to reflect its corporate architecture, and *vice versa*.

OVER-SHOOTING

When an industry is new, its ability to help customers get an important job done makes them willing to pay an extra margin for the industry's latest technological advances. The industry's leading firms – its *incumbents* – use their most demanding customers' feedback to guide the development of products that do that important job better and better, year after year.

Eventually, though, the incumbents' products over-shoot the needs their *least* demanding customers. These customers don't need the latest features and refuse to pay extra for them. As even more features are added, more customers' needs are over-shot. Once the industry's *most*-demanding customers' needs are over-shot, too, no one's left who's willing to pay extra for new features, and the incumbents' margins teeter on the brink of collapse.

MODULARITY

When a given link in the industry's value chain is about to over-shoot a significant portion of its customers' needs, it is economically efficient for one or more firms to develop a modular interface around the over-shot link and outsource it to a specialist. This works best if the whole industry can agree on the module's specifications.

Modularization allows firms to shift their resources to those aspects of their products which haven't yet over-shot customers' needs, and therefore can still benefit from integration. The modular component or activity can then be supplied by anyone, and becomes a commodity as far as the incumbents are concerned.

Examples of modularity in the music products industry include:

- The standard ¼-inch (6.5mm) audio jack, at either end of a cable connecting an electric guitar to its amplifier;
- the MIDI specification, which defines the interface between electronic music controllers and sound-generating electronics;
- MusicXML, which defines the interface between electronic music notation data and computer programs designed to display or manipulate that data; and

- The software "plug-in" interfaces that allow new music notations to be supported by existing music editing programs such as Finale! and Sibelius.

CONSERVATION OF INTEGRATION

If integration is good, and modularity is good, how can a firm decide what activities & components to integrate, outsource, or specialize? The answer is actually quite simple.

> At any given time, to maximize profits, a firm should (a) integrate those activities & components that *under*-shoot the needs of potential customers, while (b) outsourcing those activities & components that *over*-shoot the needs of potential customers.

This rule poses three challenges. First, firms must be able to restructure flexibly to change their focus of integration as their value chain evolves. Second, firms must understand how this evolution changes the pool of potential customers. Third, firms must look beyond the needs of their *current* customers to embrace the needs of their *potential* customers, too.

One of the most interesting recent advances in the science of business is *The Law of Conservation of Attractive Profits*, or more simply the *Conservation of Integration*. The idea is that whenever over-shooting turns a given link in the value chain into a profitless, commoditized module, the opportunity to earn attractive profits from a proprietary *integrated* product will emerge at an adjacent link. Hence the total amount of integration (and profit-potential) is constant; it just moves around the chain.

How does disruptive innovation fit into the context of Value Chain Evolution? We'll discuss that in the next section.

KINDS OF INNOVATIONS

SUSTAINING INNOVATIONS

Incumbents excel at commercializing those innovations which:

- leverage the *resources* the incumbent has available,
- fit into the incumbent's commercialization *processes*, and
- can be prioritized by the incumbent's *values*.

It's easy for Marshall to commercialize innovations that make guitar amps louder, or for Fender to commercialize innovations that make guitar-players look sexier, or for Roland to commercialize innovations that allow keyboard synthesizers to produce new sounds. Over time, those firms have developed the resources, processes, and values to do exactly those things very efficiently. Innovations that sustain the product-improvement trajectories *of the incumbents* are called *sustaining* innovations.

It is very difficult for a small start-up company to build a profitable business around a sustaining innovation, because the incumbent's extensive resources, processes, and values can be brought to bear directly on its smaller competitor. Such start-ups are often acquired inexpensively by incumbents, returning little value to the start-up's investors.

Don't invest in small companies that offer only incumbent-sustaining innovations.

DISRUPTIVE INNOVATIONS

Innovations which are not sustaining to an industry's incumbents are called *disruptive* innovations. There are a number of different kinds of disruptive innovations, emerging from the circumstances of the market.

- A *low-end* disruptive innovation offers over-shot customers an inferior solution at much lower cost. Casio's Casiotone electronic keyboards come to mind.

- A *displacing* disruptive innovation replaces a well-defined module with a specialist's product. For example, the MIDI (Musical Instrument Digital Interface) standard allowed software-based synthesizers to replace the hardware-based synths offered by the incumbents who originally defined MIDI.

- A *new-market* disruptive innovation attracts new customers to an industry by making it easier for customers to do something that previously required too much skill, knowledge, or inconvenience. Apple's GarageBand, for example, makes it so easy to assemble loops that anyone can do it.

Displacing disruptive innovations can start low-end and/or new market disruptions. Starting out as specialist provider of a unique module allows a start-up firm to focus its limited resources on its one greatest point of differentiation. Later, it can expand outward to integrate adjacent links in the industry's value chain.

Although incumbents excel at commercializing *sustaining* innovations, they *almost always lose* to start-ups armed with *disruptive* innovations [1c, p. *xv*]. The reason for this – asymmetry – will be discussed in the next section.

INNOVATION STRATEGY

ASYMMETRY

Generally speaking, incumbent firms are run by managers who are as smart, educated, experienced, and forward-looking as their disruptive challengers. Yet in example after example throughout business history, incumbents have lost their leadership to scrappy young start-ups with disruptive innovations. Why?

The answer is in the *asymmetries* that can emerge between the incumbent and the challenger. These asymmetries can lead the incumbent to retreat from the challenger for *sound business reasons*, which smart, educated, experienced, and forward-looking managers at the incumbents rationally decide to follow.

Here's an example.

- Imagine an industry which has three tiers of customers: A, B, and C. Tier A customers buy in low volume, at high margins of 20%. Tier B customers buy in higher volume, but at only 10%. Tier C has the highest volume, but serving them earns the incumbent only 5%.

- Now, imagine that a challenger emerges with a simple, cheap, crude, low-end disruption that can profitably meet the needs of the industry's most over-shot customers – those in Tier C – with a product that's not as good as the incumbent's, but which is much cheaper.

- The incumbent's managers must decide: should they spend a high proportion of the incumbent's limited resources defending its Tier C customers from the disruptor's attack, or should they spend that same money expanding the incumbent's share of the higher-margin Tier A and B customers?

- Running the numbers clearly shows that the latter choice – focusing the incumbent's resources on the higher-margin customers – is the best choice. So its managers make the *rational business decision* to retreat from the disruptor's attack, abandoning its Tier C customers. Investing in its highest-margin tiers allow the incumbent to streamline its expenses. Its margins go up, its share price goes up, its managers get bonuses, and the disruptor takes over Tier C.

- But the disruptor wants to move up-margin, too. With the profit it earns from serving Tier C, the disruptor's R&D improves its product so it meets the needs of the next tier up (Tier B), while remaining simpler and cheaper than the incumbents' products. With this improved product, the disruptor attacks Tier B.

- Once again, the incumbent's managers have to decide how to invest its limited resources, and once again the numbers clearly show that retreating from Tier B is the right business choice. Once again, the incumbent abandons its lowest-margin customers and invest in growing its share of the next tier (Tier A). Once again, the incumbent's costs are streamlined. Once again, its margins go up, its share price goes up, its managers get bonuses, and the disruptor takes over Tier B.

- With the profits the disruptor is now earning from Tier B and Tier C, its R&D again improves its simple, cheap products until they meet the refined needs of Tier A customers. The incumbent's managers suddenly realize that they can't retreat any further; they have to stand and fight for their Tier A customers…but it's too late. The low-end challenger's products are simple, cheap, and good enough for all but the most demanding Tier A customers. The incumbent firm, once the dominant player in its industry, finds that it has only a tiny high-end niche left. Eventually, it sells out to the disruptor, which uses the former-incumbent's name to brand its highest-end products.

The above sequence has occurred repeatedly throughout the history of business, in many different industries. It is driven by the inevitable business forces of over-shooting and margin-seeking.

All firms are motivated by the same rational desire to earn ever-higher margins. In the above example, however, the incumbents and low-end challenger perceive the contested tier differently. To the low-end disruptor, the contested tier is high-margin; to the incumbent, it's low margin. This is an *asymmetry of perception*.

In the context of disruptive innovations, an *asymmetry* is any difference which leads an incumbent to retreat from a disruptor *for sound business reasons*. Other kinds of asymmetries include asymmetries of motivation, resources, and skill. Such asymmetries make an incumbent's strengths irrelevant, because they are not brought to bear against the disruptor until it is too late. Disruptors should seek every opportunity to create similar asymmetries in their products, business models, and value chains.

An alternative to creating asymmetries is called *cramming*, which is discussed in the next section.

CRAMMING

Whenever an incumbent invents something that could disrupt its own business, it inevitably tries to *cram* that invention into its existing value chain. The invention is folded by the chain's values, spindled to fit the chain's resources, and mutilated by the chain's commercialization processes – wringing out its disruptive potential and turning it into a sustaining innovation. This is precisely what the incumbent's resources, processes, and values have been developed to do, after all: deliver sustaining innovations to its most-valuable customers.

Using the terminology of the previous section, the goal of the cramming process is to remove any asymmetries that would make the innovation disruptive to the incumbent.

Incumbents aren't the only ones who strip the asymmetries from their innovations by cramming. Often, market challengers with highly-disruptive innovations attempt to cram them into the industry's established value chain in exactly the same way, thinking that by doing so they can take advantage of the industry's existing value chain – but this never works. By its very nature, the industry's established value chain forces compromises on the challenger's product and business model that strip away its asymmetries, and make it a *sustaining* innovation instead.

The idea of asymmetries explains why small challengers with sustaining innovations always lose to incumbents. Stripping away an innovation's asymmetries forces the innovator to attack the incumbent's strengths – a losing strategy every time.

As Sun Tzu says in The Art of War, "In war, the Way is to avoid what is strong and to strike at what is weak." It is therefore essential that disruptors *create* asymmetries, thereby allowing it to attack the industry's incumbents where they are weak.

The industry's existing value chain (or network) has been carefully honed and crafted to strip asymmetries from every innovation that passes through it. That's why it should be *avoided* wherever possible. To quote Christensen [1c, p. 63], "Firms have the best chance of creating asymmetries if they reside in or build a freestanding value network, completely separate from their competitors."

Creating an entirely new value chain may seem like a daunting challenge, but it can actually be quite simple in today's globalised and Internet-connected world. This issue will be revisited in the case study, later in this article.

NEW MARKET DISRUPTION

While low-end disruptive innovation attempts to deliver low-cost products to over-shot customers, thus taking market share from an industry's incumbents, the purpose of a *new market* disruptive innovation is to create an entirely new market – a market in which the incumbents and their value chain play as small a role as possible.

In their book "Blue Ocean Strategy" [2], Kim & Maubourgne call the new markets created by new market disruptions "blue oceans," and recommend similar strategies for maximizing asymmetries.

Tellis & Golder, in their book "Will and Vision" [4], describe new market disruptions as "a unique vision of the mass market."

According to Christensen [1c, p. 8], "New market disruptions have the greatest potential for long-term industry change. However, they are the hardest innovations to identify."

Elsewhere [1b,p. 102], Christensen says: "How can you know whether current non-consumers can be enticed to begin consuming? When only a fraction of a population is using a product, of course, some of the non-consumption may simply reflect the fact that there just isn't a job needing to be done in the lives of those non-consumers."

The best way to identify potentially-profitable opportunities to convert non-consumers to consumers is to look for *failed attempts to consume* the industry's products – attempts that fail because those products are too complicated, unreliable, or otherwise unsatisfactory.

According to Christensen [1b, p. 80], Sony – in its most-successful era – identified situations in which "miniaturized, solid-state electronics technology might help a larger population of less-skilled and less-affluent people to accomplish, more conveniently and at less expense, jobs that they were already trying to get done through awkward, unsatisfactory means." The key point of this quote is that people were *already trying to get a job done*, but were *failing* because the industry's products required too much skill, expense, or tolerance for awkwardness and dissatisfaction.

In such circumstances, customers will often *internalize the failure*, thinking that the fault lies within themselves, rather than in the industry's products. By helping these customers succeed, the disruptive innovator helps them do their job and also *makes them feel better about themselves* – a marketer's dream.

If a disruptor's products can deliver *success* to the mass market, then they can *take off*. Then "sales increase many times over several years. The profits from such increases are huge, and can sustain innovation and investment for greater rewards in future. Overall, the downside of failure in such cases tends to be several times smaller than the upside of success" [4, p. 135].

To quote Christensen again, "making highly differentiable products with strong cost advantages is a license to print money – and lots of it" [1b, p. 151].

Due to asymmetries, this money can be printed without significant competition. Kim & Maubourgne state that more often than not, new-market disruptors "will go without credible challenges for ten to fifteen years" [2, 185]. That's why investing in new market disruptions can be a relatively *low-risk, high-return* strategy.

What signals should investors look for, to identify (a) innovations with new market disruptive potential, and (b) firms with the right skills and strategies to exploit their disruptive potential?

SIGNALS OF SUCCESS

According to Kim & Mauborgne [2, p. 37], the initial signals to look for are:

- DIVERGENCE: a product benefit that is distinctly different from its competitors;
- FOCUS: a narrow and relentless focus on delivering that unique benefit to customers; and
- TAGLINE: a memorable slogan that sums up the product's unique benefit in a clear, concise, and compelling way.

Once those criteria are met, they recommend asking the following questions [2, p. 118]:

- Does the product deliver a unique, valuable benefit to customers?
- Is its price easily affordable by the mass market?

- Are the firm's costs low enough to earn an attractive profit at that price?

- Is the firm's management aware of, and addressing, the barriers to adoption that might otherwise prevent or delay the mass market's adoption of the product?

Tellis & Golder suggest looking for a slightly different but overlapping set of criteria [4, p. 41]:

- Vision: a unique, revolutionary, and inspiring vision of serving the mass market.

- Will: persistence under adversity, relentless innovation, the commitment of financial resources, and asset leverage.

Christensen [1c, 22-23, 49, & 68-69] suggests the most extensive set of questions:

- What jobs are customers in the industry trying to get done? Are the customers not served, under-shot, or over-shot by current products?

- Do integrated or specialist business models currently prevail? Are its interfaces modular?

- Where are new business models emerging? Is there growth in fringe markets?

- What are the incumbents' business models? What are their motivations? What are their skills?

- Where are the symmetries and asymmetries? Do the asymmetries tilt in favor of the incumbent or the disruptive challenger? Is it possible to create a business model that creates asymmetries?

- Does the innovation naturally fit its target market? Is there evidence of cramming?

- Is the company in a situation in which the right strategy needs to emerge? Is the firm giving itself the freedom to encourage emergent forces? Have managers wrestled with problems that they are likely to have to face again? Have they shown the capacity to learn?

I suggest that all of these authors are describing essentially the same *Signals of Success*, which boil down to just these few:

1. Does the firm's *product* deliver a unique benefit to which the mass market is likely to respond?

2. Does the firm's *management* already have experience with the introduction and exploitation of disruptive innovations?

3. Does the firm's *strategy* maximize its disruptive potential – for example, by creating asymmetries, avoiding cramming, keeping costs and prices low, and integrating or modularizing appropriately – while making it possible to learn and adapt rapidly?

4. Are the firm's *owners* willing to commit their own resources, and capable of getting other people to commit theirs, to maximize the firm's disruptive potential?

In the next section, we'll examine the current state of the musical instrument industry to set the stage for our case study of Thumtronics Ltd.

THE MUSIC PRODUCTS INDUSTRY

Globally, the music products industry sells US$17 billion worth of musical instruments, accessories, sheet music, and related items at retail each year through a network of retail outlets specifically dedicated to music products. Additional product is sold through mass merchants such as Wal*Mart, and by local craftsmen (especially in third-world countries), but little data is available on sales of these products. Of the music products tracked by The Music Trades in 2005, approximately 44% was sold in the USA, 27% in Europe, 16% in Japan, 2% in Australia, and 11% elsewhere.

The incumbents of the music products industry – the top five global sellers – are Yamaha, Roland, Kawai, Harman, and Fender, who among them had US$7 billion in revenues, mostly at wholesale. This is such a high proportion of the industry's overall earnings that, like most incumbents, they probably think that their leadership positions are secure. Are they?

No. Their leadership of the music products industry is actually very weak. Four factors set the stage for disruptive innovation in the music products industry: commoditization; globalization; mis-integration; and a low participation rate.

LOW PARTICIPATION RATE

Yamaha's annual report for 2005 (Yamaha, 2005) states that "the proportion of musical performers remains less than 10% of the total population." According to the US Census Bureau (Adult Participation in Selected Leisure Activities by Frequency, 2004), only 8% of the US population played a musical instrument in the last year, and only 4% played at least once per week.

Yet according to a Gallop poll of American households, over 90% said that music is part of a well-rounded education, 84% said that they wished they *had learned* to play a musical instrument, and 67% said that they would like *to learn* to play a musical instrument in future.

If ten times as many people wish they had learned to play a musical instrument than actually do so, then what's stopping them? Beginners' instruments have never been cheaper, so it's not price. It seems more likely that learning to play a musical instrument is *just too hard* for the average consumer. This conclusion is supported by sales of music education materials. It is widely agreed that for every 100 Beginner's Guides sold, only 20 Intermediate Guides and 2 Advanced Guides are sold. That is, 80% of people who try to learn to play a musical instrument fail to get beyond the "beginner" level, and 98% fail to get beyond the "intermediate" level. Hordes of people are trying to consume the industry's products…and failing.

Why?

Most people in the music products industry believe that only a tiny percentage of the world's population has the natural talent and dedication needed to overcome the inherent difficulties of music-making. Even Yamaha's flagship market-growth program, the Clavinova Connection, is based on the presumption that learning to deeply understand music would require "a complex series of tedious exercises," so it provides only the most superficial music education.

Another problem with the music products industry is the expense of music lessons, which can easily cost more than a beginner's instrument. Many students can't afford private music lessons, and public schools are cutting back on music education.

In summary, many of the music products industry's potential customers are already trying to get a job done, but they are failing because the industry's products *require too much skill, expense, or tolerance for awkwardness and dissatisfaction*.

Sound familiar? It should, because these are *precisely* the pre-conditions Christensen describes for a new-market disruptive innovation.

MIS- INTEGRATION

Yamaha's 2005 Annual Report proudly states that "Yamaha is the world's only integrated manufacturer of a full lineup of musical instruments spanning all acoustic and digital types." In addition to designing and manufacturing its musical instruments, Yamaha markets and distributes its music products globally; it even manufactures the chips for its electronic music products. Its regional subsidiaries (often joint ventures) provide marketing, training, and financing services to retailers, who in turn provide training and sometimes financing to their consumers.

The music products industry's other incumbents are similarly integrated. They own, equip, staff, and operate their own factories, and they operate networks of distributors, often as join ventures.

Whenever (a) the commoditized inputs available on the open market are inadequate for an industry's specialized outputs, and (b) communication costs are high, then this kind of broad, deep integration is economically efficient. However, globalization has pushed down the costs of the industry's inputs, and the Internet has slashed communication costs, allowing increased modularization, and the emergence of contract service providers in product design, manufacturing, and logistics suggests that the exploitation of this modularization could reduce costs. Likewise, the quality of sound emitted by both acoustic and electronic instruments has overshot the needs of all but the industry's most-demanding customers, inviting low-end disruption – which the industry's Japanese and American incumbents are currently facing from Chinese challengers.

Christensen states that "whereas integration at one point was a competitive necessity, it later becomes a competitive disadvantage" [1b, p. 134]. The integration/modularization structure of the music products industry's incumbents is similar to that of most companies that went multi-national after WWII. This structure helped them grow *then*, but limits their growth *now*.

The incumbents' mis-integration provides an opportunity for a challenger to outsource those activities and components which over-shoot the needs of potential customers, and to integrate those which do not.

COMMODITIZATION

To the consumer market, a sax is a sax is a sax; the only relevant metric is price. That is the definition of a "commodity." The margins of the music products industry's incumbents prove that their products are commodities, too. Because Yamaha is the dominant market leader, this analysis will use Yamaha to represent all of the incumbents.

In 2005, the average profit margin for Flextronics and Selectron – two of the world's largest contract manufacturers of electronic products – was 3.8%. If a manufacturer of *other companies' products* can earn margins of 3.8%, then we could reasonably expect that Yamaha, with its well-known brand and extensive patent portfolio, would be earning much higher margins than that. After all, in 2005 Microsoft's margins were 46.3% and Apple's were 29.0%. Even Dell Computer, which operates in the completely commoditized PC industry, earned margins of 6.2%.

But according to Yamaha's 2005 annual report, its profit margin was *only 4.7%*. That's just 0.9% higher than what contract manufacturers earned that year! Yet fiscal 2005 wasn't a particularly bad year for Yamaha; the average of its last five years' profit margin is about the same.

This suggests that Yamaha's non-manufacturing assets – such as intellectual property (patents, trademarks, copyrights), branding, good will, distribution network, etc. – are essentially *worthless*.

It's not that Yamaha doesn't care about R&D; it does. Its annual report states that "securing, protecting and using related intellectual property is another prime aim to ensure that Yamaha retains a competitive technical edge." And it's not that Yamaha isn't spending enough on R&D; for example, it spent the same percentage of its net sales on R&D in 2005 that Apple did (4%).

The problem is that the industry's products – including Yamaha's – are locked into designs that were standardized hundreds of years ago: trumpets, clarinets, guitars, pianos, etc. As a result, they have been completely commoditized. Electronic music synthesis technology provided a brief opportunity for product differentiation, on which Yamaha and Roland capitalized brilliantly. However, now the major synthesis patents are starting to fall into the public domain, and modular music synthesis chips are available off-the-shelf – so even electronic music synthesis technology is becoming commoditized.

The commoditization of the industry's products is a direct result of over-shooting the needs of its customers; its low profit margins are the result of its incumbents' mis-integration; and this, in turn, is a consequence of the incumbents' belief that most music students will fail.

If a challenger could (a) find a way to dramatically improve the success rate of its products' customers (b) at a lower price and (c) integrate across the interfaces that mattered to their success while (d) outsourcing everything else, then this challenger would have the potential to reap high margins from what is now a commoditized industry. This is not surprising; as Tellis & Golder state, "A stagnant, seemingly mature market may be just the opportunity for a new way to serve consumer needs" [4, p. 101].

GLOBALIZATION

The International Monetary Fund defines "globalization" as "the growing economic interdependence of countries worldwide through (a) increasing volume and variety of cross-border transactions in goods and services, (b) freer international capital flows, and (c) more rapid and widespread diffusion of technology." All three of these characteristics work to the disadvantage of the incumbents in the music products industry – but only because their products are commoditized.

First, globalization makes it easier for capital, knowledge, and jobs to flow to low-wage countries, and easier for the resulting products to flow to high-wage countries. When an industry's products are commoditized, this is likely to be fatal to the market leaders. They can buy time by shifting an ever-increasing percentage of their operations to low-wage countries, but by doing so they are simply training their future competitors. Eventually, firms based in the low-wage country are likely to displace the previous market leaders. That's how American companies displaced the European instrument makers in the early 1900's, how the Japanese displaced the Americans in the late 1900's, and how the Chinese are now displacing the Japanese (and everyone else).

Second, globalization has produced a "mercenary army" of global service providers that can efficiently provide high-quality specialized services at low cost. These service providers are available to any new entrant to the music products industry. For example, a contract engineering

firm such as Wipro or Grey Innovation could help design a new electronic musical instrument to the new entrant's specifications; an Electronics Manufacturing Services provider such as Flextronics, Sanmina-SCI, and Selectron could manufacture it; and a third-party logistics supplier such as DHL or UPS could warehouse and deliver it. These firms provide higher-quality services at lower cost than most firms can deliver internally.

Third, rapidly-improving global communications technology has provided a new means of educating the public about new products. Previously, if one wanted to introduce a radically-new musical instrument, one had to train a special sales force to demonstrate the benefits of that instrument in a retail setting. That is, one had to pay the usual high costs of bricks-and-mortar distribution, and *also* the cost of dedicated sales people. Given the low unit volumes (and therefore high costs) of any new instrument's initial production, this made the introduction of new instruments prohibitively expensive. The music products industry developed its rule of thumb that "new instruments always fail" because when introducing new radically-new musical instruments through its brick-and-mortar retail channel, they *did* always fail.

But with the Internet – and, increasingly, with mobile phones – consumers can learn the benefits of new products *for free*, just by downloading demo videos. This is particularly useful for firms selling musical instruments, as they are featured prominently in almost every music video. Buying products online is just as easy, which has made the Internet the fastest-growing sales channel in the music products industry.

Every aspect of globalization threatens the music products industry's incumbents, because they are mis-integrated, because their products are hard to learn and use, and *because their products are commoditized*. However, these same aspects of globalization can provide great benefits to a new entrant with non-commodity products.

CASE STUDY: THUMTRONICS LTD

How could a new entrant challenge the incumbents of the music products industry? This case study will attempt to answer that question.

The case study focuses on Thumtronics Ltd, a start-up company that is commercializing a new market disruptive innovation. Thumtronics' products and business model were designed specifically to maximize their disruptive potential, which makes them particularly appropriate for this case study.

THUMTRONICS' PRODUCTS

In brief, Thumtronics has made a scientific breakthrough in the display and control of musical information, the details of which are beyond the scope of this discussion. This breakthrough has been embodied in a suite of products, including:

- a new electronic musical instrument, called the Thummer™, that, compared to all other musical instruments, is
    - more emotionally expressive,
    - easier to teach, learn, and play by ear or with traditional notation, and
    - provides unique insights into the music of other cultures; and
- a new musical staff, called ThumLine™, that

- makes learning to play the Thummer even easier than it is to learn with traditional notation, and that

- can be implemented as a software "plug-in" to popular music notation programs (such as Finale! and Sibelius).

The conclusion that Thumtronics' innovations are a major leap forward, providing dramatic customer benefits, is supported by many experts. A number of patents have been filed, in all of the major jurisdictions, protecting these innovations.

Henceforth in this case study, it is assumed that using the Thummer (and, optionally, ThumLine) will make it easier for *potential* customers of the music products industry to:

- understand the intellectual concepts of music; to

- gain the motor skills needed to control a musical instrument without conscious thought; and to

- express themselves musically.

The Thummer is a MIDI-compatible controller, which allows it to control the sound produced by any MIDI-compatible electronic music synthesizer (whether hardware or software). The quality of such sounds has improved dramatically in recent years, making it nearly impossible for the average customer to tell the difference between the recordings of an acoustic sound and an electronic sound.

The Thummer is small and light, being about the size of a thick paperback book, and weighing less than a pound (under 450g) – so it is inexpensive to ship, compared to most other musical instruments. It has few moving parts (so all else being equal) the Thummer should be relatively inexpensive to manufacture and reliable to use.

As Christensen said, "Great science does indeed simplify. It opens the door for both new-market and low-end disruptive innovations" [1c, p. 16].

With that in mind, we're prepared to answer the first Signal of Success question: *Does the firm's product deliver a unique benefit to which the mass market is likely to respond?*

The answer appears to be "yes."

THUMTRONICS' MANAGEMENT

The second Signal of Success question is: *Does the firm's management already have experience with the introduction and exploitation of disruptive innovations?*

The answer to this question also appears to be "yes."

- JIM PLAMONDON (45), Chief Executive Officer, was with Microsoft Corporation for eight years (1992-2000), first in Silicon Valley and then in Redmond, Washington State, USA. At Microsoft, Jim was responsible for establishing Microsoft's proprietary technologies as *de facto* standards. Jim designed and executed some of Microsoft's most successful technology-standardization campaigns and taught other Microsoft employees how to do so. After "retiring" from Microsoft at age 39, Jim spent years studying the theory underlying the successful marketing of new technology products (*e.g.*, small-world networks, path dependence & customer lock-in, complexity theory, disruptive innovation, business strategy, and psychology) and

started a Master's thesis on the subject, which was postponed indefinitely upon his invention of the Thummer. Jim is the author of this article.

- SCOTT HORSBURGH (40), Chief Financial Officer, served previously as CFO and Director of Kinetic Ltd for seven years and four years respectively, gaining considerable expertise in managing the finances of high-tech start-up companies.

It should be noted that while Microsoft's innovations were *sustaining* for Microsoft, they were frequently disruptive to others. Likewise, Thumtronics' innovations are sustaining to its own business model, but disruptive to the incumbents of the music products industry. Thus Jim's work at Microsoft provided a "school of experience" that prepared him well for the challenges he is likely to face at Thumtronics.

Together, Jim and Scott have both theoretical understanding and practical hands-on experience to *profitably* bring disruptive innovations to market.

THUMTRONICS' STRATEGY

The third Signal of Success question is, *Does the firm's strategy maximize its disruptive potential while making it possible to learn and adapt rapidly?*

To answer this, we'll need to understand how Thumtronics' business strategy will create asymmetries, avoiding cramming, keep costs and prices low, and integrate or modularize appropriately.

OVERVIEW

Thumtronics is following a three-phase strategy, which starts with *displacing* disruptive innovations, shifts its emphasis to *new market* disruptive innovations, and then follows a self-sustaining trajectory. In every phase, its strategy is geared to maximizing the disruptive effects of its innovations.

In the first phase, Thumtronics will introduce the Thummer as a *displacing* disruptive innovation. The MIDI and USB-MIDI specifications define the interfaces by which the Thummer communicates with electronic music synthesizers (both hardware and software). These specifications are well-defined and widely supported. In this phase, Thumtronics will emphasize the *expressive power* of the Thummer. The Thummer – especially the eMotion Thummer, with internal motion sensors – has proven to be compelling to many musicians, and unusually capable of attracting free publicity. In this phase, Thumtronics will leverage that free PR to establish that the Thummer is an instrument *worth learning*. This narrow focus on a single displacing disruption is expected to Thumtronics' costs low and help it become profitable rapidly.

In the second phase, Thumtronics will shift its emphasis to learning music with ThumLine through online music lessons. This will also start as a displacing disruptive innovation. The MusicXML and Finale! PDK specifications define the interfaces by which music notation information is (a) exchanged between applications and (b) displayed, respectively. Previous to the specification of these two interfaces, it would have been essentially impossible to introduce a new music notation. With these two specifications, all one has to do is download a ThumLine plug-in, load it into Finale!, and voila! One can see all of the world's music in ThumLine, instantly.

In the third phase, Thumtronics expects to produce an integrated solution to the mass market, expanding and consolidating the use of the Thummer and ThumLine in performance and in private music education. Developing an integrated instrument should not be difficult, as low-cost music synthesis electronics are available off-the-shelf. Marketing is likely to focus on

infomercials, mass-market retailers, multi-level marketing, and eventually a chain of company-owned retail stores. Thumtronics expects to introduce, at some point, an up-scale brand of Thummer (as Toyota introduced Lexus), to provide a higher-margin brand to which experienced and demanding Thummer-players can "step up."

INTEGRATION & MODULARIZATION

Thumtronics' integration strategy is focused on integrating across those interfaces which the customer interacts with directly, including (a) *displaying* musical information, (b) *controlling* musical information, (c) *learning* to read, write, and control musical information, and (d) *exchanging* information with Thumtronics and its community of customers. Thumtronics expects to outsource everything else to modularized providers.

CONTROLLING: THUMMER™

The first commercial version of the Thummer™ is expected to be an *electronic music controller*. As such, makes no sound of its own. Instead, it communicates with electronic music synthesis products through two well-defined interfaces: (a) a MIDI-Out connector, and (b) a USB peripheral connector supported by a USB-MIDI driver. The customer can use either connector, with the appropriate cable, to connect the Thummer to a personal computer running electronic music synthesis software, or to electronic music synthesis hardware, or both.

The MIDI and USB technologies are very well-defined and standardized, allowing seamless interoperation of the Thummer with hardware and software from a wide number of third-party providers.

DISPLAYING: THUMLINE™

ThumLine™ is a new musical staff notation for displaying and editing musical information. It can be implemented as a specialized software module, which communicates with other music notation software through two well-defined interfaces: (a) MusicXML, a standard data format for specifying notation-oriented data, and (b) the software Plug-in Developer's Kit (PDK) for Finale!, a popular music notation software application. MusicXML and Finale!'s PDK are both well-defined and widely-supported specifications. The music notation interfaces of other popular commercial music notation applications such as Sibelius are less well-defined.

There are also a number of open-source software applications for music notation, such as Calliope, Lime, and LilyPond, which could be extended to support ThumLine without great difficulty or expense. Even if these open-source programs are not of competitive commercial quality now, they are entirely adequate for the needs of entry-level music students, and they can be improved rapidly at relatively low cost using open outsourcing.

LEARNING: THUMMUSIC™

Thumtronics intends to develop a new curriculum for learning to read, write, and control musical information based on the Thummer and ThumLine staff notation, called the ThumMusic™ System. It is expected that this curriculum will be made available online, on DVD, and through human-led private lessons. Because ThumLine is patented and its clef & staff are trademarked, ThumLine cannot be used for any purpose without Thumtronics' permission, giving Thumtronics a degree of control not available to any other music lesson provider or content developer.

Recently, many nations have established standards for music education, which define the body of knowledge that music students are expected to have mastered at various levels of proficiency. The emergence of these "rules" makes it easier for Thumtronics to develop a single new curriculum which meets the standards of these various national bodies.

By controlling both the Thummer and the ThumMusic curriculum, Thumtronics can integrate across the instrument-curriculum interface. For example, the Thummer (or the software it connects to) can track the every button-press, every joystick movement, and so on, so that the student's practice time can be analyzed remotely, whether by server-based software or by music teachers.

Likewise, Thumtronics can integrate across other aspects of music education value chain, providing – for example – competence examinations and certifications. Because the Thummer is electronic, and includes the widely-supported USB interface, it should be easier (compared to acoustic instruments) to take advantage of the possibilities afforded by computers and the Internet for modularizing and outsourcing education-related activities.

EXCHANGING: THUMMER.COM

Thumtronics will seek to integrate across the interface that connects Thumtronics to its customers, and those customers to each other, by building a useful and efficient website for purchasing Thumtronics' products, learning how to use them, and sharing relevant information with others.

Generally, Thumtronics expects to integrate its sales and marketing activity, relying heavily on Internet-based marketing and free PR in the wider media to drive potential customers to its website. Thumtronics also expects to use direct marketing techniques to sell its products to customers without the need for the music products industry's expensive and cumbersome distribution system.

However, Thumtronics also expects to modularize and outsource its marketing efforts to some extent. One way to do so is by establishing an online affiliate marketing program such as that of Amazon.com, paying commissions to websites that drive profitable traffic to Thumtronics' website.

Another approach that Thumtronics could use to modularize and outsource its marketing would be to set up a multi-level marketing network of private music teachers, using music education materials copyrighted by Thumtronics. Because Thumtronics' products make music significantly simpler to teach, learn, and play, participation in this network could give its members a decisive advantage in the competitive private music lesson market.

SOFTWARE: OPEN OUTSOURCING

Even those software elements that Thumtronics is integrating need not, necessarily, be developed in-house. Instead, Thumtronics can use a combination of open source software development and outsourcing that's known as "open outsourcing." This approach leverages a small team of in-house software architects and project managers to coordinate the efforts of software development *volunteers* from first-world nations and *contractors* from third-world nations. Open outsourcing could be particularly effective in the modification of Thumtronics' courseware to meet the needs of different ethnic and language groups, who may need different musical examples in their version of the curriculum.

Because the Thummer has the potential to be defended by broad, deep patents, it can remain proprietary for decades. Encouraging the development of free, open-source software that takes advantage of the Thummer's unique features could produce abundant, inexpensive software for it. That would make the proprietary Thummer more valuable to customers [3, p. 56], which would tend to accelerate is rate of sales growth.

GLOBALIZED SERVICE PROVIDERS

The Thummer is a typical consumer electronics product, which makes it easy to outsource many activities in Thumtronics' value chain. For example, product engineering, manufacturing, and logistics can be outsourced to globalized contract service providers such as, for example, Grey Innovation, Sanmina-SCI, and UPS respectively.

ADAPTABILITY

It is essential, when launching a new market disruption, to constantly test the firm's assumptions and strategy against the emerging realities of the marketplace. Thumtronics is already doing this. For example, it had initially assumed that "working and wannabe musicians" would form a significant part of the early market for the Thummer. It tested this hypothesis by surveying the 200+ members of its ThumClub – people from around the world who had asked, via the Internet, to be contacted when the Thummer became available.

Thumtronics was surprised to discover that working musicians and wannabes made up less than 15% of ThumClub members. Instead, most were what Thumtronics called "Music Brains" – serious musical hobbyists with degrees or jobs in science or engineering. These Music Brains were tightly connected via the Internet, well paid, high-spending, logical and inquisitive, performed regularly in public to significant audiences, and were generally very enthusiastic about the Thummer's potential. Market research revealed that there are more than 2.5 million Music Brains worldwide[1] – a group which should be large enough to take Thumtronics to profitability. Thumtronics is now targeting Music Brains as its initial niche and adjusting its marketing plans accordingly.

KEEP COSTS & PRICES LOW

Thumtronics' Founder developed software for Apple's Macintosh in the 1980's, and then marketed innovative technologies at Microsoft in the 1990's, so he has first-hand experience with the two companies' business models. Apple sought to charge high margins, whereas Microsoft traded away short-term margins for growth, economies of scale, and network effects. Microsoft's strategy has clearly proven to be the correct one, and Thumtronics expects to follow it closely.

When pushing into the mass market, Thumtronics expects to develop a low-priced "complete solution" for consumers – a Thummer controller with sound-generating electronics and a suite of lessons on DVD and/or Internet. It is intended that its price should be low enough to appeal not just to First World consumers, but to the emerging middle class in China and India, too.

Thumtronics expects to keep its costs low by outsourcing product development, manufacturing, and logistics to globalized service providers; relying on open outsourcing for software and courseware development; outsourcing some aspects of marketing to online associates and a multi-level marketing network of music lesson providers; and employing minimal staff at below-average pay, compensated largely through share options.

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[1] The US Census Bureau reports (ibid.) that about 8% of Americans play a musical instrument for fun, and also that there are 13 million Americans working in science and engineering. Eight percent of 13 million is 1.1 million – the number of Music Brains in the USA. That is, ((0.08 * 13 million) / 300 million = 0.35% of Americans are Music Brains. What is the USA's percentage of the major markets' total number of Music Brains? Perhaps it is the same as the USA's percentage of the global music products industry's revenue (43%), in which case there are (1.1 / 0.43 =) 2.4 million Music Brains in the major markets. Alternatively, if it's is the same as the USA's percentage of the population of the major markets (USA: 300, European Union: 450, and Japan: 125), then the number of Music Brains is (0.0035 * (300 + 450 + 125) =) 3 million. Much of the world's population is outside of these three major markets, so it is conservative to estimate that there are "over 2.5 million" Music Brains in the world.

AVOID CRAMMING

The Music Trades is the trade magazine of the American music products industry. Published continuously since 1890, it has tracked every twist and turn in the history of the industry, from player pianos to accordions to electric guitars and now to DJ's turntables. On page 116 of its April 2006 issue – in response to the rhetorical question, "What constitutes a music products company?" – appears the editorial comment that "we include firms that rely on the specialized channel of m.i. [musical instrument] retailers for a significant percentage of their revenue."

According to The Music Trades, therefore, Thumtronics is not part of the music products industry – and you can see why: Thumtronics' value chain is completely separate from that of the industry's incumbents. The Thummer™ and ThumLine™ don't match with the industry's values ("It's not sexy," "It's not used in school bands," "No one I know reads ThumLine," "New instruments don't sell," etc.), nor do they leverage the industry's existing resources, nor fit into its processes.

So, odd as it may seem, The Music Trades is right: the hottest music products in the music products industry aren't part of the music products industry.

Thumtronics will seek to maintain and extend this separation between itself and the music products industry. For example, consumer-level Thummers are much more likely to be sold through infomercials and mass-market retailers than through "the specialized channel of m.i. retailers." Likewise, once the installed base of Thummers has grown sufficiently to create demand for high-end bricks-and-mortar distribution, Thumtronics is more likely to open a global network of company-owned retail stores/schools, like Apple's, than to sell through traditional musical instrument distribution. (Establishing such a network of company-owned retail stores/schools should be seen as an extension of Thumtronics' integration of the *sales & marketing* activity, not integration of the *distribution* activity.)

Thumtronics' strategy is *the very opposite* of cramming.

CREATE ASYMMETRIES

Thumtronics' strategy, outlined above, clearly creates many asymmetries with the music product industry's incumbents. Their instruments have traditional, commoditized interfaces; Thumtronics' instruments have novel, patent-pending interfaces. They expect students to learn traditional music notation (or, more accurately, to *fail* to learn traditional music notation); Thumtronics expects students to *succeed* at leading ThumLine notation. They have integrated their manufacturing and distribution activities through joint ventures; Thumtronics will outsource these and other functions to globalized contract service providers. They are focused on segmentation and niche marketing; Thumtronics is focused on aggregating demand into a single mass market. They are selling to a mature, stagnant market; Thumtronics expects to sell into a new, rapidly-growing market. They collect endorsements from famous artists; Thumtronics' innovations will enable new artists to acquire fame.

In every case above, Thumtronics strengths are aligned against the incumbents' weaknesses. Even better, the incumbents' *values* are likely to cause them to underestimate Thumtronics' strengths.

- They believe that musical success depends on talent, so why help untalented students learn music?

- They believe that one of the guitar's major attractions is its phallic nature, so how can the Thummer sell if it's not a phallic symbol?

- They believe that new instruments don't sell anyway, so why make one?

- They believe that alternatives to standard music notation have always failed before (conveniently forgetting guitar tab), so why should this one succeed?

- They believe that customers insist on touching an instrument before buying it, so who'd buy them online?

And so on. Thumtronics' greatest asset may be its *asymmetry of values* relative to the incumbents.

Thumtronics has filed patents on its innovations – with broad, deep claims – in all of the major jurisdictions, thus erecting an *asymmetry of intellectual property*. This asymmetry is tilted strongly in Thumtronics' favor, despite the incumbents' patent portfolios, because (a) Thumtronics' patents are focused on areas that the incumbents' aren't (*e.g.*, ease of learning and expressiveness), and (b) the incumbents' patents are generally wrapped up in modularized components (*e.g.*, sound synthesis chips or modules) which are commercially available off-the-shelf to Thumtronics and/or its customers.

Thumtronics' use of direct marketing should help it establish constant long-term contact with its customers, whereas the incumbents' long distribution path forms a nearly-impenetrable barrier to the flow of information. This should give Thumtronics an *asymmetry of information* vs. the incumbents.

Likewise, as Thumtronics grows, it can be expected to develop an *asymmetry of skills* in direct marketing, managing outsourced globalized service providers, the management of open-outsourcing-based software products, and the management of multi-level marketing networks of music lesson providers. The industry's incumbents can't begin to acquire these skills without undertaking a massive and expensive re-structuring of their businesses.

THUMTRONICS' OWNERS

The last Signal of Success question is, *Are the firm's owners willing to commit their own resources, and capable of getting other people to commit theirs, to maximize the firm's disruptive potential?*

The answer here also appears to be "yes."

Thumtronics' Founder and CEO, Jim Plamondon, has invested over a million dollars in Thumtronics, while its CFO, Scott Horsburgh, has arranged for the additional investment of a quarter million from himself, his friends, and family. Thumtronics has also acquired hundreds of thousands of dollars in government grants. Jim and Scott are taking reduced pay while getting Thumtronics going, to keep its costs as low as possible. They have negotiated a concession from Grey Innovation, a key supplier, to accept part of its product engineering fee in shares – something that Grey has done on just two of its more than 200 projects.

Now, Thumtronics has issued a public (unlisted) share offer, in which anyone can invest, seeking $1.5 million to bring the Thummer to market; see www.thummer.com for details.

VISION

Thumtronics envisions *Musical Understanding for Everyone.*

What could the music products industry look like twenty years from now, if Thumtronics is able to successfully execute its strategy?

First, Thumtronics could *grow the industry*. We've already seen from NAMM's 2003 Gallop poll that nearly everyone wants young people to study music, that 80 percent of adult non-players wish that they'd learned to play an instrument, and that two-thirds of such non-players would like to become players. By meeting this demand for musical ability with a higher success rate, Thumtronics could increase the industry's participation rate.

By how much? It's impossible to say for sure, in advance. Given the glowing reviews from credible and experienced music educators, growing the market by just 10% seems reasonably conservative. That would grow the industry's participation rate from 8% to 8.8%, which is only slightly higher than "play billiards/pool" and considerably less than "attend rock music performances," according to the US Census Bureau. All else being equal, this 10% increase in the industry's participation rate should yield a corresponding increase in the music products' industry retail sales, from AU$20 billion to $22 billion, while also growing the similar-sized music *lesson* industry by a similar amount. That's approximately AU$4 billion in growth, overall.

Second, Thumtronics could *own the growth*. Many patent applications have been filed with broad, deep claims, giving Thumtronics the exclusive right to make & sell Thummer-like instruments and ThumLine-based lesson materials. A pervasive global multi-level marketing network of Thumtronics-certified music teachers, combined with Internet/DVD music lessons and Thumtronics-owned retail stores/schools, could make learning the Thummer more convenient and potentially lower-cost than any alternative – thereby allowing Thumtronics to "own" the corresponding growth in the music *lesson* industry, too.

The world would be a much better place as a result of Thumtronics' commercial success. More people would be able to understand, play, compose, and improvise their own music; they would have a more expressive instrument, which rewarded deep study with unparalleled virtuosity; and the Thummer's unique capability to encompass the music of many cultures could truly unite the world through music.

If Thumtronics grew the music products and music lesson markets by this small percentage and captured that growth, then – all else being equal – it would be earning more revenue than today's industry leader, Yamaha, did in 2005.

It is entirely possible that a small start-up can grow rapidly to become its industry's revenue leader. A recent report from McKinsey & Co., "Extreme Competition," stated that once-small challengers were "toppling" industry leaders at an increasing rate, fueled by exactly the kind of disruptive and globalized processes described in this document. Indeed, the report stated that "mature companies with seemingly dominant industry positions are particularly vulnerable: they face a double whammy of more intense competition and declining average industry performance. Companies on top … face the perpetual risk that smaller or more nimble attackers will topple them using product innovation or new business models that compensate for a lack of scale or scope."

Further, if Thumtronics' products gain the protection offered by the many patent applications it has filed, then they would not be commodities, so Thumtronics would be likely to earn higher margins than Yamaha or the music products industry's other current incumbents.

How profitable could Thumtronics be? It's impossible to know in advance, of course. However, the history of the music products industry does provide one instructive example. In 1935, Laurens Hammond unveiled the first Hammond Organ, based on his patented "tone-wheel" technology. Originally intended to replace the pipe organ, Hammond entered the home market in the 1950's with a low-cost, easy-to-learn version. To quote The Music Trades' 100th

Anniversary Edition, p. 207, "Hammond…created the easy-play, home entertainment keyboard market and secured a near-monopoly position for his company. Through astute management and marketing, he also turned in the most remarkable financial performance in industry history. For over 20 years, Hammond consistently had after-tax profits of 25% of sales." Hammond delivered unique ease-of-learning in a patented product at an affordable price, just as Thumtronics is doing, so – all else being equal – Thumtronics may have the potential to gain similar margins.

That's a scenario with an attractive upside for Thumtronics' early investors. You can see why Tellis & Golder stated that "Overall, the downside of failure in such cases tends to be several times smaller than the upside of success" [4, p. 135].

In this vision of the future, what would become of the traditional music products industry – the makers and resellers of guitars, trumpets, pianos, etc.? It's impossible to say. Perhaps beginners, as they advance in knowledge and skill, would find that playing the Thummer using ThumLine notation continues to meet their needs. Or perhaps learning to deeply understand music using the Thummer and ThumLine would make learning traditional instruments and notation so much easier that sales of traditional products would increase.

Either way, Thumtronics wins, because Thumtronics isn't "expanding its share of the traditional industry." Thumtronics is *growing the market*. That's where the money is – and that's what makes the world a better place, too.

SUMMARY

Investors can increase their odds of picking winners by understanding the theory of disruptive innovation. This theory holds that an industry's leaders – the *incumbents* – develop resources, processes, and values that make it more efficient at commercializing those innovations which best fit the needs and abilities of its value chain (*sustaining* innovations) but are essentially incapable of commercializing those innovations which do not fit this value chain (*disruptive* innovations).

By commercializing many sustaining innovations over time, incumbents eventually *over-shoot* the needs of their least-demanding customers. This creates the opportunity for a *low-end* disruptive innovation, serving these over-shot customers' needs with a lower-cost, less-functional product.

Over-shooting leads to *modularization* and *commoditization*. To be economically efficient, firms should *integrate* only those activities/components which are not yet over-shot, *outsourcing* the rest to modular *specialists*.

The emergence of a well-specified, modular *interface* creates the opportunity for a *displacing* disruptive innovation, in which a specialist provides a module that displaces that of the incumbents and/or other specialists.

The kind of disruptive innovation with the potential for the greatest economic return is the *new market* disruptive innovations, which helps "a larger population of less-skilled and less-affluent people to accomplish, more conveniently and at less expense, jobs that they were already trying to get done through awkward, unsatisfactory means" [1b, p. 80].

An innovation is more potentially disruptive if it is combined with a strategy that creates and exploits *asymmetries* of perception, motivation, skill, and resources between the innovator and the incumbents. These asymmetries enable the challenger to focus its limited resources against the incumbents' weaknesses and avoid their strengths. Innovations can be stripped of asymmetries

by *cramming* them through the industry's existing *value chain*. A challenger has the best chance of disrupting its incumbents if it establishes an independent value chain.

The disruptive potential of an investment opportunity can be measured by asking the following four questions, with "yes" answers indicating a higher disruptive potential:

1. Does the firm's *product* deliver a unique benefit to which the mass market is likely to respond?

2. Does the firm's *management* already have experience with the introduction and exploitation of disruptive innovations?

3. Are the firm's *owners* willing to commit their own resources, and capable of getting other people to commit theirs, to maximize the firm's disruptive potential?

4. Does the firm's *strategy* maximize its disruptive potential – for example, by creating asymmetries, avoiding cramming, keeping costs and prices low, and integrating or modularizing appropriately – while making it possible to learn and adapt rapidly?

The music products industry is a mature industry with global retail revenues of AU$20 billion per year and an annual growth rate of 3.5%. Its revenues are earned primarily from the USA, Europe, and Japan. The private music lesson industry appears to be approximately the same size, although firm data is unavailable.

The music products industry is ripe for disruption. It shows signs of *failed attempts to consume*, *mis-integration*, *commoditization*, and *poor exploitation of globalization*. The private music lesson industry is fragmented, without any significant incumbents.

Thumtronics' scientific breakthrough in the display and control of musical information makes music dramatically easier to learn when using its Thummer™ instrument, and especially when also using its ThumLine™ music notation. Also, the Thummer is more expressive than any previous musical instrument. *These are unique benefits to which the mass market is likely respond.*

Thumtronics' *management already has experience with the introduction and exploitation of disruptive innovations*, from its experience in Silicon Valley, Microsoft, and Kinetic Systems.

Thumtronics' *owners have demonstrated a willingness to commit their own resources* by investing over a million dollars of their own money in developing its innovations, *and a capability to get other people* – such as a key supplier, Grey Innovation – *to commit theirs, to maximize the firm's disruptive potential.*

Thumtronics' *strategy maximizes its disruptive potential by creating asymmetries, avoiding cramming, keeping costs and prices low, and integrating or modularizing appropriately, while making it possible to learn and adapt rapidly.*

Thumtronics' disruptive innovations and strategies give it the potential to grow the industry and to capture that growth, possibly by enough to become the industry's revenue leader. If Thumtronics' products gain the extensive patent protection for which it has applied, then it should be able to capture higher margins from its earnings than do current industry leaders.

Thumtronics' unique vision of the mass market has the potential to produce a very large upside for its early investors with little downside risk, because "making highly differentiable products with strong cost advantages is a license to print money – and lots of it" [1b, p. 151].

CONCLUSIONS

Investing in early-stage companies is always a risky proposition, and no one company can ever be "a sure thing." But by understanding the theory of disruptive innovation, you can select a portfolio of firms which have the highest potential for successfully executing a disruptive strategy – and thereby gain a consistent statistical advantage over the market. In the market, as in the casino, knowledge is power. You can bet on it.

REFERENCES

[1] The theory of disruptive innovation used in this article was developed primarily by Prof. Clayton Christensen of the Harvard Business School. It is described in a series of books entitled "The Innovator's Dilemma" (1a, 1997), "The Innovator's Solution" (1b, 2003), and "Seeing What's Next" (1c, 2004).

[2] Kim and Mauborgne's "Blue Ocean Strategy" (2005) builds on Christensen's theory to describe how to use low-price, high-value disruptive innovations to build new markets with relatively low risk compared to launching "me-too" products in a crowded market.

[3] Oz Shy's "The Economics of Network Industries" (2001) is an important textbook and reference work for any firm that hopes to harness the enormous power of network effects in extending and solidifying its market leadership.

[4] Tellis & Golder's "Will and Vision" (2002) describes the characteristics of products, strategies, and leaders necessary to tap into the mass market, and extols the "huge profits" that can be made thereby.