The New Technological Corporation

The software business differs in fundamental ways from established industries. Viewing the economic fundamentals of our business in the context of the larger economy suggests Autodesk may be an exemplar of a new class of information-intensive companies.

Turbo Digital

by John Walker

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One phrase that seems to recur when explaining the software business to people familiar with other industries is "this isn't like any other business". This assertion is often dismissed out of hand and, indeed, many aspects of the software business are analogous to other long established and readily-understood businesses.

But the software business is unique. The combination of minimal capital spending requirements, the extremely high operating margins that result from successful software products, low up-front investment to develop and launch a product, and the inability to predict which products will succeed among a large number of potential products combine to define an industry which behaves, both as seen by management inside and by analysts and investors examining operating result aggregates outside, unlike any well-known model.

If the software business is fundamentally different from, say, book publishing, semiconductor manufacturing, financial services, or management consulting, one cannot look to those sectors to provide prototypes of how a software company should be organised, managed, grown, and valued in the capital markets.

This paper will start from first economic principles to examine the fundamentals of a software company. Viewing those fundamentals as part of the overall economic system suggests that software companies are unique; indeed, the software industry may be the exemplar of a new class of information-intensive businesses, the New Technological Corporations. These companies must find their own way to the strategies that best fit the realities of their business. Operating experience, growth strategies, and principles of valuation derived from high-technology hardware manufacturing may be no more relevant to these new industries than the experience of building a railroad would be to broadcasting.

Theme 1: The time value of money

> *No number is as central to economic decision making as the discount rate, the numerical expression of the value of a coin in the hand versus a billfold in the bush. The risks and rewards of all investments have meaning only when compared to the prevailing discount rate.*[1]

First prelude: The age of takeovers

Recent years have seen the emergence of corporate takeovers on a scale unprecedented in the history of commerce, whether measured by the number of transactions, the total size of the deals, the audacity of the raiders, or the creativity of the instruments devised to finance the acquisitions.

Why is this? Why should corporations embark on a binge of devouring one another when equity market valuations are close to all-time highs measured by earnings and dividend yield, when interest rates on the debt

[1] The discount rate is an economic measure of the pure time value of money. Frequently news media use the term "discount rate" to denote the Federal Reserve Rediscount Rate, the rate the Federal Reserve charges banks to borrow short-term funds. This number has little to do with the true prevailing discount rate, which is set by the expectations of borrowers and lenders about the supply of and demand for money, the prospects for business, expectations of inflation, and a host of other factors.

used to finance takeovers are at historically high values, and why should these takeovers continue unabated after the worst stock market crash in history and the advent of a primary bear market marking the end of the longest period of economic expansion in decades? Are we witnessing an epiphany of Mammon where greed and rapacity trample reason, or is there an underlying rationale for these deals here, now? I believe there is, and that it illustrates the central importance of the time value of money.

When a "corporate raider" solicits the owners of a corporation to tender their shares at above the prevailing market price he is, in essence, saying that he disagrees with a valuation for a body of visible assets arrived at by the largest, most efficient, market ever created. Why do so many people who are wealthy beyond imagination have the audacity to dismiss the judgement of the marketplace? Ego?... greed?... or something else?

Perhaps the takeover artists are not the cause, but the effect, of a historic imbalance in the time value of money.

Reinvestment and risk

At the heart of the concept of the corporation is the assumption that it will generate profits (or savings), and dispose of them in the best interests of its owners, the shareholders. In the absence of taxation, management would determine what percentage of earnings should be reinvested in the corporation to maintain its position in the market and take advantage of opportunities for growth and competitive advantage, versus what should be paid out to the owners as compensation for the capital they have contributed to the corporation by purchasing its stock.

Structures of taxation which treat corporate earnings, individual income, debt service payments, and dividends differently shift the optimum strategy. Uncertainty regarding future tax policy and time lags while market participants adjust their strategies in the face of changes in taxation further complicate the process of arriving at optimal strategies. Nevertheless, taxation at the levels currently obtaining in the West affects the key decisions in deployment of corporate resources only on the margin (except for the double taxation of corporate earnings paid out as dividends; this will be discussed in greater detail below).

If the management of a corporation were omniscient, discharging their fiduciary duty to the shareholders would entail calculating the future gains to be realised by retaining corporate earnings and spending them to further develop the corporation, versus rebating them to the shareholders so that the funds may be invested as the shareholders see fit, presumably with a return no less than the discount rate—the zero risk time value of money, for which the short-term government security in a given currency serves as a proxy.

An underlying assumption of stock market investment has always been that the management of a successful corporation in a viable market could be expected to reinvest earnings in their business with an eventual yield greater than that of risk-free investments. In other words, management's knowledge and the position of the company in the marketplace will result in an expected yield that exceeds the return of zero-risk short-term debt instruments. Were this not the case, what would induce investors to forsake risk-free investments to entrust their funds to a venture where, in the direst extreme, they could lose all of their capital? For taking a chance on the future of the company, the investor demands a "risk premium"—greater total return, on the average, as compensation for assuming the risk.

In recent years an historic reversal of this situation has occurred, and it is at the heart of the takeover boom and the slow-motion liquidation of many long-established corporations. The historical discount rate for long-term (e.g. 30-year) money over the last several hundred years has been between 2% and 3%. Consider an oil company which long-term experience indicates can invest in wildcat exploration combined with an ongoing drilling program in established oil-bearing leased areas to yield a 6% contribution to future earnings from funds committed to exploration and development. Were the long term government bond yielding 3%, most investors would gladly endorse this investment in the future value of their shares, as the potential gain would be twice that of the risk-free alternative.

As I write this paper, the interest rate paid by risk-free 90 day United States Treasury Bills is 8%—more than two and a half times the historical discount rate and a

third again more than the yield that the best managements have obtained by reinvesting in their businesses in the last two hundred years. Why, then, do managements continue to drill oil wells, fund superconductivity research, launch new brands of deodorant, devise new ways of delivering sugar to the children of America, and otherwise contribute to the common wealth of humanity? I suggest it's because they don't know what else to do.

If you're an oil man, you drill, even if others snicker as your instinct becomes obsolete in an age where reserves can be purchased cheaper on the open market than sought by exploration. If you're a soap man, you try to find a new niche for the soap to wash expensive athletic sneakers.[2] If you're a cereal murderer, you seek new ways to package and promote white sugar, and so on.... And do you ever think about the alternative of just buying a Treasury Bill or giving the cash back to the shareholders? Well... no.

But somebody does—the "corporate raider"—that's what he's paid to do. His economic function is performing arbitrage between the returns to be had by reinvestment in a company's business versus liquidation and return of capital to the shareholders.

The invisible hand and its elbow

Now that we've thought a bit about reinvestment in a corporation as opposed to return of earnings and capital to the shareholders, let's look at a Leveraged Buy-Out (LBO) transaction as the consequence of this calculation by the shareholders. Many companies taken private by LBOs seem, groaning under the burden of servicing the debt undertaken in the buy-out, perched on the "lap of God". I refer to the process that puts them there as the "elbow of the invisible hand".

Imagine a successful company in a stable, easily-analysed industry with pre-tax earnings of 12.3%. If that company has no interest payments or other significant deductions, it will pay about 35% in corporate income tax on its earnings, leaving about 8% net savings. If the corporation pays out 3.8%, the average dividend yield on the Dow Jones Industrials at this writing, about 4.2% is left for reinvestment in the business. If the economy and Fortune shine on the judgement of management, and this reinvestment doubles in a year, the gain in earnings will be 8.4%, a princely sum by the standards of history, but little more than the riskless interest to be earned by the simple expedient of purchasing a Treasury Bill. So consider the plight of an investor in this company. He places his capital at total risk, subject to loss not only from incompetent management and competition, but also from economic shocks, international crises, acts of God, bear markets that reduce the value of all stocks—an endless litany of calamity the Treasury Bill holder dozes through, and for what? A dividend check in the mail that's less than half the income of the T-Bill holder. If the investor accepts the doctrine that earnings are just as good as (and in the face of taxation, better than) dividends, there's still little solace—the Price/Earnings ratio of the Dow Jones 30 Industrials stands at 12.3, the reciprocal of which is almost precisely 8%. Thus for assuming all the risks, trusting the management to optimally deploy retained earnings, and adopting the long-term investment posture which is the only way to ride out the fluctuations of the market, the stock investor receives no more than had he bought a T-Bill. Buy a share of America? Sure... and then let me tellya 'bout this bridge I got.

What's a corporate raider to do? Here's a profligate management, squandering the company's resources on so-called "reinvestments" which, despite their self-evident risk, yield less return than riskless short term government debt. Since corporate raiders are instrumentalities of the Efficient Market and Self-Sacrificing Servants of Society, their actions are merely the means through which a tortured economy seeks equilibrium. Let's see how a company looks to its investors after the raider has struck. Before, the company was as we described above—funded by shareholder's equity and retained earnings, paying a return to the shareholders, in today's environment of high interest rates, less than that available from risk-free short-term debt. After the raid is complete, the company's capitalisation has undergone a dramatic change. The previous shareholders' equity has been eliminated; equity is now concentrated in the hands of the raider and his small band of capitalist running dogs. The company has assumed a huge burden of debt—in the purest case of leveraged buy-

[2] TurboFoam Kleen-Sneak™ is a trademark of Marinchip Systems, so keep your grubby predatory hands off, O.K.?

out the debt equals the entire market capitalisation of the company.

How will that debt be serviced and paid down? By reorienting the corporation from reinvestment in its business to generating cash to repay the holders of its bonds. That this is possible is a product of the tax system and the valuations placed on companies by the stock market. First, the tax gimmick: interest payments on debt are deductible. The same policy that inflated real estate values into the stratosphere is a proximate cause of the takeover boom as well. Consider: if a corporation earns a dollar and pays it out as interest to a bond holder, the creditor receives a full dollar (pre-tax). If the corporation retains the dollar of earnings for its own use, it must pay corporate income tax on it, which shears 33% to 40% from the original dollar. Consequently a corporation can pay out almost 50% more to a bondholder in interest than it could pay a shareholder in dividends, purely as a consequence of the deductibility of interest payments. So, if the corporation uses its entire cash flow to pay the interest on the debt undertaken to buy it out, it can pay the bond holders its before tax profit, 12.3%, a 50% premium over the income to be had from the Treasury bond—enough to pique the interest of even conservative investors.

Second, the acquirer of the taken-over company usually pledges to sell off some of the assets of the original company to retire some of the debt undertaken in the acquisition. That this makes sense is indicative of an inefficiency in the market which has a rational basis in fact. Since, as we've seen, the yield returned by a profitable business to its investors is less than they can obtain without risking their capital at all, the market quite rationally values these investments below their liquidation value to one able to realise all the value inherent in them. If there is another company able to gain market share, earnings on the margin, or other benefits from the acquisition of portions of the original business, it is reasonable to expect that these portions can be sold for more than their beneficial contribution to the sales and earnings of the selling company.

What happens when a leveraged buy-out runs its course? A corporation which previously followed conventional guidelines of reinvestment, dividend payments, and service of modest debt has been transformed into an engine that generates cash flow to service the interest payments due the creditors who financed the acquisition. The result can be viewed as the unbundling of the earnings of the corporation from the possibility of appreciation of its equity—the new owners promise to pay bondholders substantially all the current earnings in the belief that they can restructure the corporation to yield additional earnings which will accrue directly to themselves.

Recapitulation

The current rash of corporate takeovers are the consequence of a historically-unprecedented circumstance: the discount rate substantially exceeding the expected yield from reinvestment of profits in well-managed, growing businesses. This situation, which has resulted in the disappearance of many companies which existed for decades, illustrates the significance of the gap between the after-tax earning potential of a company and the prevailing discount rate.

Theme 2: Leverage vs. debt

> *Leverage in finance is the control of assets which exceed the direct capital invested in their control. Leverage usually involves the assumption of debt, but leverage is not synonymous with debt. Inherent leverage, leverage without debt, is central to many investments, and is essential to understanding the New Technological Corporation.*

Second prelude: A dirt mine in Idaho

Your first reaction is the universal reaction, "*This* is a silver mine?". Having become a shareholder in Bitter Luck Next Time Mining Corporation, traded on the Spokane Stock Exchange, you've taken it upon yourself to pay a visit to your investment. What you appear to have bought for the princely sum of $0.03 per share is... a hole in the ground. A hole in some singularly barren ground.

Yet what you own is a legitimate mining property, one which exhibits great financial leverage without involving a penny of debt. Your penny stock investment can, under the right circumstances, make you a millionaire. Understanding the difference between leverage and debt prepares us to tackle the greatest manifestation of leverage of all: the technological leverage of the New Technological Corporation.

Leverage through debt

Since "leverage" is so often used as a synonym for debt, let's review how debt leverage works in a common financial transaction—buying a house. Suppose you want to buy a house as an investment, and that the house costs $100,000 (this is a hypothetical example, after all), and you can expect to get about $600 per month in rent from the house. Suppose you were fortunate enough to have the full $100,000 in savings and bought the house for cash. If you sold the house one year later for $110,000, you would have realised a total before-tax gain of $17,200 on your investment, the $10,000 appreciation in the value of the property, plus 12 months of rent at $600 per month. Dividing the proceeds by the investment, you would have realised a yield of 17.2% on your $100,000 capital.

Most people don't have $100,000 in the bank and even if they did, they wouldn't want to tie it up in one investment. Suppose, instead, you bought the house by making a $20,000 down payment and borrowed the balance of the purchase price, $80,000, by taking out a mortgage secured by the house. If mortgage rates were 12%, you'd be making payments of about $800 a month, but since those interest payments are tax-deductible you'd be able to cover them from the rental income. When you sold the house at the end of the year for $110,000, you'd end up with a gain of $10,000 (assuming the rent just covered the loan payments), or a gain of 50% on your investment of $20,000. If you'd had $100,000 with which to play the market, you could have bought *five* houses this way and wound up the year with a gain of $50,000 compared to the non-leveraged gain of $17,200.

This is debt leverage, and it works the same in real estate, trading stocks on margin, or taking over companies in leveraged buy-outs. If it's so neat, why doesn't everybody do it? Because leverage is a double edged sword. Debt leverage simply magnifies the effect of changes in price compared to your original investment. If the market moves in your favour it works to your benefit; if the market moves against you, your losses are magnified and may total much more than your original investment. In addition, once you assume debt you are committed to making the payments on it—if you miss a payment you can lose everything, so you must be very confident of a continuing flow of cash to service the debt.

These aspects of debt leverage have given it a well-deserved bad name. So many economic cataclysms, business failures, and personal bankruptcies have resulted from debt leverage that its enthusiasts tend to be the lucky and its defenders those with short memories.

Inherent leverage

Debt leverage is but one kind of leverage. Let's return to the hole in the windblown soil of Idaho to examine another. Despite appearances, you have not been taken to the cleaners. Beneath the ground is a vein of silver ore reliably assayed as bearing at least two ounces of silver for every share of stock in the "mine". But wait, you say, visions of wealth swirling before your eyes, silver is $6 an ounce! I'd better buy more stock before this gets out!

Alas, as always, there is A Catch. The ore from the Bitter Luck Next Time Mine is a substance one could describe charitably as "low grade ore" or cynically as "high grade dirt". The total cost of extracting silver from the mine, including development, excavation, and refining, works out to about $9 an ounce. Now the stock price begins to make sense: what's the value of a mine which can produce tons of silver while losing $3 on every ounce?

But suppose the price of silver rises. As long as silver sells for much less than $9 an ounce, your shares will be close to worthless. But for every dollar silver rises above $9, your shares represent $2 of real value. If silver should rise to $50, as it did in 1980, and remain there, as it did not in 1980, then each share in your mine

would be worth about \$82 ($2\times(50-9)$). If you invested 1000 dollars in shares at \$0.03 each, your investment would grow to a more than two and half million dollars. This is leverage: leverage without debt. Shares in the mine acquire value only when the price of silver crosses a specific threshold: the price of production. After that point, they track the price in a linear fashion. If you believe that the price of silver will rise at some time in the future, but you don't know when, you can place a bet on that belief by buying shares in a mine with production cost above the current price, sit back, and wait for the price to rise.

This is only one example of inherent leverage. Anybody with a stock option benefits from another. A stock option can never be worth less than zero at its strike price, but its upside gains are unbounded. Stock purchase warrants, rights offerings, options on commodity futures contracts, and convertible debt securities are all financial instruments which exhibit leverage without the assumption of debt.

Technological leverage

Consider Autodesk, Inc. Autodesk was formed with less than \$60,000 in capital, yet less than seven years later has a market valuation in excess of \$600 million—an appreciation of a *million* percent, based on essentially no capital investment, no physical plant, and no assumption of debt. This kind of performance has the distinct odor of inherent leverage and, if viewed in that light, reveals one of the fundamental properties of the New Technological Corporation.

What is the essential aspect of inherent leverage as exemplified by the Bitter Luck Next Time Mine? It's the possibility of enormous gains to be had if certain future events occur, with no out of pocket costs while waiting, and the ability to fund development of the assets from operating revenue should success smile upon the venture. What is different about the software business?

Our cost to develop and launch a new product is minuscule compared to the revenue generated from a successful product (assuming we focus on establishing new product categories rather than attempting to "buy market share" in a market dominated by others). The total expenditure involved before the decision whether a product merits further development and promotion or discontinuation is small. The value of becoming the *de facto* standard in a market is enormous. And yet the downside is no more than a write-off of the product development funds—a tiny sum compared to the capital costs of any other business.

The huge difference between the sunk costs of product development and initial marketing and the ongoing revenues from a success constitute leverage just as much as does the production cost of a mine compared to appreciation of its end-product, or the strike price of an option compared to appreciation in the underlying security or commodity. In the case of technological leverage, funds committed to new product development are multiplied by a huge factor in the revenues they return when they yield a successful product. Because the multiplier is so large, the consequences of a failure, or many consecutive failures, are of limited economic consequence except in opportunities foregone to attempt the products which failed.

Technological leverage is the economic consequence of the value of information. Technological leverage translates possession of information into economic value, multiplied by market position and the ability to compound the initial success by delivering follow-up products to the original customers. Inherent leverage always involves a nonlinear price function. In the silver mine case, the cost of production set a floor on the profit curve. A software company with a successful product turns blank magnetic media and paper purchased for pennies into products sold for thousands of dollars by adding nothing but information to them. Technological leverage in the software business stems from the tiny costs of product development as opposed to the enormous ongoing profits of success. The flip side of technological leverage is that possession of large capital resources does not confer a competitive advantage (although the credibility of an established vendor and the access to distribution channels attendant upon that position has value).

To believe in technological leverage is to acknowledge that information has a value equal to or greater than financial assets. Information—embodied in a computer program, a perception of a market niche as yet unex-

ploited, or a new way to organise a business in a market considered saturated by look-alike competitors—is capital. Capital acquired without cash constitutes leverage. Technological leverage is the capital that inheres in information, and therefore is the most powerful leverage of all. The New Technological Corporation is a corporation in which technological leverage is the predominant factor relating product development investment and operating results. The astonishing success of such corporations can best be understood in that light.

Recapitulation: nonlinearity and gain

Debt leverage is linear: it magnifies the gain or loss resulting from an investment of a given size. Inherent leverage is nonlinear but continuous: it exploits nonlinearities in the price/value curve of an investment to produce gains, often without the carrying costs or symmetrical downside risk of debt leverage. Technological leverage is not only nonlinear but is often discontinuous: the introduction of new technologies can cause discrete jumps in the economic fundamentals of a business, an industry, or an entire economy.

The experience of the last two decades of technological innovation, exemplified by Moore's law of semiconductor pricing, the exponential growth of computing power at constant cost, and the manufacturing, product cycle, and investment consequences of the replacement of machinery with software, bear witness to the power of technological leverage, the rewards that accrue to those who employ it to their benefit, and the risks to those who ignore it.

Debt leverage carries with it the risk of bankruptcy. Technological leverage bears the risk of obsolescence. Those who profit by technological leverage are running on a treadmill whose speed increases as technology advances. To fall behind is to be cast out of the game with little hope of re-entering as the pace continues to accelerate. Unlike debt leverage, technological leverage poses a "keep up or give up" choice to businesses, as the makers of mechanical calculators and watches learned too late.

Theme 3: The talent-constrained enterprise

> *The methods and patterns of growth of a business are often a consequence of the factors that constrain its growth. Most businesses are constrained by capital costs and well-understood product, manufacturing, and market limits which capital can be used to overcome. The growth of a New Technological Corporation is constrained by the supply of talent to create the technologies from which its technological leverage flows. Capital is of limited use in overcoming this constraint.*

Third prelude: What is this, really?

When Autodesk was planning their initial public offering, one key question to be decided was "Is this a CAD company or a software company?". This was not a matter of publicity nor clear communication: millions of dollars depended on the answer. At the time of our offering, personal computer software companies were out of fashion and each dollar of their earnings was valued at about $6.50 in stock price (in other words, the price/earnings ratio, or P/E, was 6.5). CAD companies, however, were the Going Thing, and commanded P/E's of about 13. So, if you were a CAD company making precisely the same number of dollars on the same volume of sales, your stock would be worth twice as much as a software company reporting identical numbers. How to classify a personal computer software company whose only product was in the CAD industry? Easy: look at the numbers and say, "Yessiree—we're a CAD company, all right".

One of the most difficult issues in performing an initial public stock offering is arriving at the valuation of the company—in other words the stock price of the offering. An incorrect valuation can have disastrous consequences: too high and the underwriting syndicate takes a bath on the offering and the lead underwriter may find it hard to fill up the next syndicate; too low and the company selling the stock foregoes millions in proceeds and may take its much more lucrative follow-on

offerings somewhere else. For a process that involves more intangible factors than most engineers believe exist in the entire world, it works almost perfectly—if product introduction disasters were as rare as underwriting calamities the world would indeed be "entrepreneur friendly". Assigning a valuation to a business is a subjective matter relying on the judgement of individuals who probably could not begin to explain how they arrive at the numbers they do, but the first and most important determining factor comes many months earlier when management answers the question "what kind of business is this, anyway?". Their answer is what I refer to as the "shape of a business".

The shape of a business

The "shape of a business" is manifested in its form of organisation, capital requirements, methods and patterns of growth, personnel requirements, and the risks to and yield from the capital invested. Businesses in the same industry will tend to have the same shape; significant deviations, unless clearly manifestations of obvious success, usually mean something is wrong within the business. This shouldn't be surprising: businesses evolve within the pattern of competition and cooperation of the marketplace much as organisms evolve within an ecosystem. Just as biology tends to find similar solutions to similar problems from many different starting points, the market tends to drive businesses with the same fundamentals to the same optimal operating ratios.

The shape of a business is often a consequence of the ultimate constraints on growth of the enterprise. Most businesses are constrained by capital costs, material cost and availability, product development cost, manufacturing capacity and costs, and market size and demographic factors. The tradeoffs among these constraints are well understood, and capital can be deployed to ameliorate any of them.

The shape of a business is reflected in the financial aggregates that measure its performance. Within a given industry, operating ratios tend to converge upon the same results. These results, in turn, can be interpreted to identify the key resources on which the growth of the business relies. In the Nineteenth century, one of the epochal events was the building of the web of railroads that interconnected each continent. Constructing a railroad required rights-of-way, largely secured by government concessions through the right of eminent domain, access to large amounts of capital to finance construction and initial operation, and labour where required for construction. Railroads were thus largely a creature of the debt market and government policy, and it was railroads which first introduced the concept of 100 year bonds and, in a few cases, perpetual bonds to the credit markets. Much of what we now call "heavy industry" similarly depended upon debt financing—wherever a massive physical plant had to be constructed before revenues could flow, debt was at the heart of the business.

Each business finds its own shape, and with that shape, the mechanisms for financing its development and growth. The intimate association of private venture capital pools with semiconductor-based high technology is a consequence of the ratio of the start-up capital costs and business development times characteristic of that business compared to the cash-out time and expected yield. Businesses with comparable 10-year risk/reward ratios, such as private satellite launching, new information utilities, and desktop chip fabrication must seek funding through other channels because the shapes of their businesses are incompatible with funding mechanisms which co-evolved with the development of more conventional businesses with which they contend for funding.

The growth of a New Technological Corporation, however, is largely constrained by the availability of talent. It is talent that identifies opportunities created by technological growth, defines and develops products to exploit them, and markets and sells the products to establish them before the niche is occupied by competitors.

Wild Talents

The talents essential to a New Technological Corporation are rare, hard to find, and difficult to identify even in an interview. They are often prone not to repeat even after a stunning success. Charles Fort's term "Wild Talents" may be appropriate to the central asset of a New Technological Corporation. Reliably staffing and ex-

panding those positions that create technological leverage is often as frustrating and seemingly impossible a task as seeking the Holy Grail or attempting to find a repeatable and unambiguous demonstration of parapsychology. Yet it is the presence of such talent and the ability to bring the products it develops to market in a timely fashion that secures the future of a company in an information-intensive industry.

There are few prototypes of talent-constrained industries available for study and the parallels one can find are imprecise and often misleading. The business closest in economic "shape" to the software company may be, to the surprise and dismay of technologically-adept software developers, the advertising agency. An advertising agency can be viewed as an inverted pyramid with extensive account relations, production, purchasing, research, marketing, and management resources which mediate the interaction between the agency's client base and a small pool of creative talent who generate the concepts that drive the campaigns that the agency, as a whole, creates.

Technologists' disdain for this economic parallel does not erase the fact that the Wild Talent that invents messages such as "The Pepsi Generation", "The Heartbeat of America", "The IBM Commitment To Service", or "Tools for the Golden Age of Engineering" creates capital just as surely as the Wild Talent that invents new computer applications or makes existing applications widely accessible at low cost. Both talents create an intangible product: *pure information* which, once released into the market, yields sales and profits thousands of times greater than the cost of creating the idea which yielded the wealth.

Recapitulation

The New Technological Corporation has a unique economic "shape" reflecting its limited capital requirements, low cost of goods, and low cost of product development. Its shape results from the technological leverage created by a small number of "good ideas" which have become accepted by the marketplace.

No company has found a way to successfully generate such ideas on a production line. Ideas flow from intermittently talented individuals who are difficult to attract and retain, and it is also difficult to screen good ideas from bad without testing them in the market.

The shape of a New Technological Corporation derives from the chief constraint on its growth, the ability to generate ideas that create its technological leverage. Financial capital is of limited use in accelerating or increasing the flow of these ideas.

Theme 4: Quantum economics

> *Modern physics tells us that reality resides not in aggregates but in discrete interactions and transformations the aggregates only dimly reflect. Economics, and the understanding of business built upon it, largely relies on interpretation of aggregates with continuous behaviour. These measures may reflect the behaviour of markets in which discrete transactions are the only reality no more than large number aggregates describe the underlying events of physics.*

Fourth prelude: Aggregates aren't reality

In the midst of preparing Autodesk's public offering, I suddenly realised that investment bankers and accountants actually believed there was a causal relationship between the percentage of sales spent on R&D or marketing and the time-delayed sales and profitability of the venture. I had never even calculated such numbers, much less assigned any significance to them, focusing instead on what specifically needed doing, then how much could be done with the resources at hand. After recovering from the offering, I began to think about the idea that "aggregates aren't reality".

The process of managing a large and growing business is very much a matter of learning how to interpret abstract aggregate measures of the performance of the business and thereby deciding what specific actions to take. In the midst of struggling for survival while learning that skill, it's hard to remember that:

Aggregates aren't reality
Reality is events, not a process.
Reality is discrete, not a continuum.

Economics as events

> "Every heat engineer knows he can design his heat engine reliably and accurately on the foundation of the second law [of thermodynamics]. Run alongside one of the molecules, however, and ask it what it thinks of the second law. It will laugh at us. It never heard of the second law. It does what it wants. All the same, a collection of billions upon billions of such molecules obeys the second law with all the accuracy one could want."
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> — John Archibald Wheeler[3]

We construct aggregates to approximate the behaviour of large numbers of discrete interactions. Sometimes they are useful, as in thermodynamics. Often they aren't, as with most macroeconometric measures. Wheeler suspects that *all* our laws of physics describe approximate behaviour of aggregates of observations; that the fundamental quantum event is all that really exists. Most of physics does not attempt to understand why these quantum events occur but simply describes the aggregate behaviour of large numbers of events. As we begin to understand the low-level mechanisms, we will get to the true physics beneath the aggregates. Similarly, in economics we try to predict behaviour of aggregates of individual transactions. Only the transactions are real; all the rest is the work of man. One may not be able to understand what drives the transactions by theorising based upon aggregates.

Parallels exist between markets and quantum mechanics. The electron has no position or momentum until you measure it. When you measure its position, you disturb it, foregoing accuracy in measuring the momentum. A share of General Motors has no price until a buyer and seller exchange it, a discrete event. This transaction/measurement affects the price of subsequent transactions. Prices are undefined until a transaction occurs, whether the purchase of a loaf of bread or the takeover of RCA by GE. Prices in a large liquid market can be predicted quite well since the effect of a single transaction is minuscule; prices in blockbuster transactions can barely be predicted at all. Similarly, you can predict interference fringes to many decimal places but which detector an individual electron will trigger in a dual slit interference experiment is unknowable in principle.

"The market was up 15 points today" is meaninglessness layered on meaninglessness. The market is neither up nor down. The market is a *place* where discrete transactions occur—a surging organic sea of buyers and sellers with different goals, opinions, and strategies, who momentarily and unpredictably agree to exchange specific assets. We aggregate these transactions into the abstraction of a continuum of price. We aggregate a selection of these abstracted continua into an average price. We then assign meanings to the action of this average, and impute its behaviour as being representative of the market.

Thermodynamics works because the number of particles is a statistical universe. Economics may not work because the number of players and events is too small. Perhaps the fundamental difference between people in a market and gas molecules in a jar is not that people have free will and gas molecules don't, but just that there are a lot more gas molecules.[4]

The further you are removed from the events, the less you're able to see what is really going on. MBAs and investment bankers are trained to look only at aggregates: "Well, if they're putting 10% of sales into R&D, that will translate into a 30% sales increase in 2 years" or "Their margins are eroding, and therefore…". Local governments work pretty well because the people who run them are actually aware of the sewers, potholes, and running dogs. Large national governments can deal only with totally abstract aggregates and consequently are less effective. Decision making must, to be effective, be based upon accurate information regarding events. To the extent that government or business

[3] "World As System Self-Synthesized By Quantum Networking", *IBM Journal of Research and Development*, Vol. 32, No. 1, January 1988.

[4] Does this mean that "psychohistory" can emerge as the number of humans in the universe surpasses Avogadro's number? How could that number of participants in a market interact given the volume they would occupy and the speed of light?

managers see and adjust only aggregates, their actions become increasingly ineffectual. As those governed or the customers of a business perceive consistently ineffectual or counterproductive actions, the legitimacy of the institution wanes.[5]

Recapitulation

The fundamental event in a business is the purchase of a product or service by an individual customer. Margins, percentages of sales, sales trends, return and defect rates, and customer satisfaction indices are all abstractions from aggregates of events. They may prove useful diagnostic tools but they are not reality. Understanding why the discrete events occur may be more useful than any of the aggregates.

Collectivism and central planning, whether in government or in the management of a large business enterprise, embody the Nineteenth century view of the world as grand machine. One can design and improve a machine. Classical liberalism is much closer to the Twentieth century interpretation: society as an aggregation of discrete events. At most one can control incentives (as one can affect a thermodynamic system by increasing the temperature or compressing it), but attempting to prescribe events doesn't work any better than Maxwell's demon.[6]

Since the wealth of a New Technological Corporation derives in large part from the technological leverage created by discontinuous shifts in the marketplace caused by a small number of innovations, it is essential that managers of the venture remain in touch with the low-level events that determine the destiny of their company. Turning a knob that controls an aggregate such as increasing research and development spending by 25% or shifting funds from marketing of an existing product to promotion of a new product will not have predictable results. Only by understanding the precise points at which the company's technological leverage is applied, then carefully analysing the reasons which lead customers to select the company's products (or a competitor's product) can useful strategic decisions be made. This requires that senior management receive accurate, extensive, and unbiased evaluations of the development of technologies related to the company's markets and act promptly to maintain and expand the company's leverage.

Theme 5: Equilibrium and efficient markets

> *Financial analysts generally assume that markets are "efficient": that prices reflect all the information known to market participants and that consequently the market sets accurate prices for the assets it trades. Market crashes, large shifts in the relative valuations of industry groups, and other fluctuations without apparent causes are difficult to explain in these terms. Perhaps markets are efficient only when near an equilibrium point and cannot be relied upon for accurate feedback in the presence of rapid or discontinuous change.*

Fifth prelude: October 19th, 1987

The NASDAQ National Market System on which Autodesk, Inc. stock is traded maintains a market surveillance office to monitor activity in stocks and attempt to detect unusual price changes, unexpected increases in trading volume, or other action which might indicate a stock reacting to information not yet publicly disclosed. When the action of a stock triggers the monitoring computer's filter, a person in the office calls an officer of the company to inquire whether the company knows of

[5] Politicians sense this when they campaign in front of a closing factory or bankrupt family farm—they're trying to tie their (aggregate) policies to a (discrete) event. But more and more, even those in the crowd or those affected doubt there is a link between what the politician proposes and events actually changing.

[6] One of most enlightening indicators of how deeply information is embedded in the structure of the universe is the discovery that Maxwell's demon fails not because of inability to measure the momentum of the molecule but rather because of the energy consumed in destroying the information from the last measurement. This seems to indicate a deep relationship between destruction of information and irreversible processes. Might one view attempts to control and prescribe at the transactional level (e.g. minimum wage, price controls) as failing the same way as Maxwell's demon—the nonlinearity at the transaction level destroys information from the market essential in providing the feedback that makes the market function efficiently?

any information which might cause the unusual trading pattern and, if so, when it will be disclosed. The patterns the computer watches for are those that indicate apparent inefficiencies in the market such as strong buying of a stock with little concern for price, which could signal accumulation of the stock by an investor who had illicitly obtained information about an impending takeover.

On October 19th, 1987, action in Autodesk's stock tripped the warning and Al Green received a call from NASDAQ's market surveillance office to ask if "there was any reason for the unusual action in Autodesk stock". Let's see, could it be that the call was placed right in the middle of the worst global financial crash in the history of economics? Quite likely....

While humorous, the event limns a deeper unity between the efficiency of a market and its closeness to the point of equilibrium between buyers and sellers. It is well known that a market can be efficient only if it is liquid: that is, has enough transaction volume so buyers and sellers are readily matched. In a "thin" or illiquid market a slight imbalance between buyers and sellers, even if momentary, can cause large swings in price unrelated to any underlying property of the asset being traded. That Autodesk stock exhibited the symptoms of an inefficient market on a day that broke all records for trading volume demonstrates that volume alone does not guarantee efficiency. Efficiency may require that the market be close to an equilibrium point in the physical sense: where not only are buyers and sellers closely matched in numbers, but that they share information, beliefs about the future, and models of valuation which form a continuum with a single modal point.

A quiet, normal day

The trading floor of the Chicago Board of Trade during business hours on a normal day would fit anybody's definition of chaos. Each trading pit is filled with screaming, arm-waving, gesticulating traders jumping up and down, scribbling on little pieces of paper, and handing notes back and forth to "runners" shuttling to and from the wire terminals where orders are received. This is an efficient market at work on a normal day. Since there are a large number of orders to buy and sell at many points around the current price (hence the many pieces of paper in the traders' order books), movements in price will be close to continuous. Since there are a large number of buyers and sellers, including floor-based "scalpers" or "locals" willing to make trades of less than a minute's duration to turn a profit of one tick in price, the market can accept large buy or sell orders without discontinuous price changes (it is unusual in a market this liquid for consecutive transactions to differ in price by more than the minimum increment of quotation, even if the overall price swings in a day are large). That a well-balanced, highly-liquid, efficient market near equilibrium looks like a cockfight where somebody forgot the chickens is evocative of the intellectual tension between the apparent messiness and anarchy of markets and their usually smooth functioning in practice.

What happens when the market diverges from equilibrium? Two days before I wrote these words Ford Motor Company issued a press release to the effect that their researchers had made major progress in developing a catalytic converter for automobiles that required no platinum. This news hit the platinum market, which had been rising strongly for much of the last year, like a sledgehammer. Now the Ford announcement, which simply reported that patents had been granted on a device which would undergo initial tests in 1989, had absolutely no impact on the near-term supply and demand for platinum, for which automotive catalytic converters represent 30% of the world demand and 60% of the U.S. demand. Nonetheless, the announcement caused a huge number of sell orders to hit the platinum market while most participants scrambled to figure out the actual significance of the development.

What did the platinum pit look like after the news arrived? Chaos squared? No, it was dead. Futures markets have daily trading limits, so when all the sell orders hit the market it simply went down the limit and business ceased because there were no buyers at the limit-down price. This was a market out of equilibrium, a market where the disequilibrium caused volume to dry up, and thus the price-setting function of the market temporarily ceased to function. (Although daily trading range limits are unique to U.S. futures markets, the same effect would have obtained in any other market through different means. On the New York Stock Ex-

change they call it "stock closed by the specialist due to order imbalance". On NASDAQ the broker-dealers simply remove their bids from the system or stop answering their phones.)

The only thing one can predict with certainty in a market is that equilibrium will be re-established at a new price, and trading will resume its chaotic course from that point.

Equilibrium and information

If markets generate accurate price information when close to equilibrium, what is the prerequisite for efficiency? It is the flow of information. As long as the information being processed by the market is information *about* the market (in other words, the balance between buyers and sellers and the prices they bid and ask), the market will act to maintain the equilibrium by adjusting the price. When exogenous information enters the market, whether the elimination of part of the demand for a commodity, supply disruption such as an unexpected freeze of the Florida orange crop, a change in the prospects for a company's earnings such as that caused by a disaster at one of the company's plants, or the launching of a takeover bid at a premium, the market's equilibrium is disturbed and the market will move chaotically and discontinuously until it finds equilibrium again.

Whenever a market is using incomplete or inaccurate information to arrive at its valuations, the prices it assigns cannot be relied upon as valid. The large shifts in the valuation of industry groups through time may be seen as the market reacting as it obtains and digests information regarding the events and realities of those industries, which may not be visible in the financial aggregates they report.

We have seen how arbitrary is the process of classifying a company within an "industry group" and how capricious the market can be in valuing these groups. To the extent that the market recognises New Technological Corporations at all, it lumps them with "high tech" and values their earnings within that sector. This aggregation may be incorrect. The great majority of "high-technology" companies are capital-intensive businesses in the producer non-durables sector, characterised by short product cycles, heavy research and development investment, rapid obsolescence of capital equipment, and rapid erosion of margins in a highly competitive market. One can dispute the validity of every single one of these assertions for a New Technological Corporation. This suggests that the market will eventually discover that the "shape" of a New Technological Corporation is not only very different from what it considers "high-tech" but is, in fact, virtually unique among companies. As this realisation dawns and its implications for the long-term earnings prospects of the group are worked out, the market can be expected to re-value the stocks of New Technological Corporations based upon their fundamentals. The properties of such businesses suggest that the revaluation will be substantial and upward.

Recapitulation

Markets arrive at prices for the assets they trade by arriving at an equilibrium between buyers and sellers. When the flow of accurate information about the fundamentals of the market fails to reach the market participants, the market diverges from equilibrium and reports inaccurate prices. Only when the information has entered the market and been absorbed by the participants are equilibrium restored and valid prices re-established.

In a market dominated by institutions with a short-term perspective, relying upon industry analysts with an MBA focus on financial aggregates, information about the events within a company or industry group can take a long time to reach the market. Consequently, there may be a long delay between the emergence of the exemplars of a new industry group and the market's recognising them as a group with its own fundamentals and principles of valuation. In addition, the potential of technology to cause discontinuous changes in values through technological leverage is generally not recognised by the market until what has been called "the creative destruction of capital" is well underway.

The market exhibits little evidence of having distinguished the fundamentals of New Technological Corporations from other "high-technology" companies with very different properties. As the managements of this

new group of companies communicate their distinguishing properties to the market both by conventional channels of education (such as meetings with securities analysts and industry forums) and by developing their businesses in directions that exploit the advantages they possess, the market can be expected to revalue their companies.

Variation 1: The New Technological Corporation

The New Technological Corporation is precisely what its name implies. Before we examine strategies such a company might adopt to better take advantage of its unique fundamentals, let's pull together the threads that describe why these companies are what they are. They are:

New...

New Technological Corporations have a new financial "shape". This shape is the product of their being talent-constrained rather than limited by more usual factors such as the cost and availability of capital. Their combination of very high operating margins, low capital requirements, and the decoupling of capital investment from future economic prospects marks them as unlike most other businesses.

Technological...

The New Technological Corporation derives its "shape" from the technological leverage it employs to achieve such high yield from small capital investments. Because the company profits by technological leverage, its future depends upon maintaining that leverage both by avoiding obsolescence and seeking other products in which technological leverage can be exploited. Because technological leverage is the result of exploiting specific ideas from Wild Talents, analysis of the aggregates of such a company without knowledge of the underlying events may reveal little about its prospects. Because the capital requirements to develop technological leverage are low, the possession of large capital resources and cash flow, while conferring stability in hard times, the ability to make acquisitions, and credibility in the market, may not be particularly useful in maintaining its technological leverage.

Corporations...

However different, New Technological Corporations coexist in the market with other firms of all kinds. In the securities markets, the stock of a New Technological Corporation may be incorrectly valued because information regarding its financial shape has not reached the market and the company is incorrectly grouped with "high-technology" companies with very different profiles. In the market for its products, the New Technological Corporation may, by failing to understand its own fundamentals at the event level, forego competitive advantages unique to it when competing against companies with different profiles.[7]

It is therefore in the interest of a New Technological Corporation to understand what distinguishes it from other companies, to exploit the advantages and palliate the penalties those distinctions confer, and, in the belief that the securities market miscomprehends and undervalues New Technological Corporations to explain, by word and deed, these distinctions to market participants.

Variation 2: What to do with the money?

The maturing New Technological Corporation faces a challenge almost unique in the annals of legitimate business: deciding how to dispose of the large and growing stream of earnings generated by its successful products. The fundamentals of its business make the happy circumstance of high earnings an occasion for making some difficult choices.

[7] A competitor may, for example, be forced into massive capital commitments to upgrade hardware to meet competitive pressure created by a small programming change in a product of a New Technological Corporation, thereby assuming a large debt burden in response to advantages obtained by a New Technological Corporation through technological leverage

Reinvest it in the business?

As the standard prospectus language goes, "The Company currently intends to retain earnings for use in its business…". Fine, but precisely how? It's when faced with answering this question that the chief executive of a New Technological Corporation begins scribbling notes for his book, "Technological Leverage—Problem Or Curse". Once a company has amassed a pool of capital adequate to ride out any conceivable financial cataclysm and respond to a competitive assault by any of the players who might challenge the company's position in the market; is promoting its current and emerging products and developing and maintaining its product line from current cash flow; is paying corporate taxes in the highest bracket; and is still generating piles of cash, this question becomes not just "a problem it's nice to have" but one that demands an answer.

The realities of technological leverage and the prevailing cost of money make the answer hard to arrive at. A New Technological Corporation seems to be what every investor dreams of in times of high interest rates: a business whose return is comparable to the debt securities that contend with equities for the investor's cash. Unlike the takeover target whose management cannot reinvest earnings with an expected yield competitive with riskless Treasury Bills, and must be compelled to return the earnings to their shareholders by the reality or threat of a leveraged buy-out, the management of a New Technological Corporation faces a different dilemma: the earnings of their corporation are exemplary and yet they cannot reinvest them at comparable yield, not because yields in the company's business are below those of the debt market, but because throwing money at Research and Development is like pushing a rope; it does not reliably generate the ideas and products from which technological leverage and future revenues flow.

Since the company's earnings come from the unpredictable results of Wild Talents, the company should obviously take every step possible to attract, retain, motivate, support, and efficiently translate the yield of its talent resources into products. But while that process may seem wasteful, inefficient, and indulgent of spoiled eccentrics, the business reality is that it doesn't cost very much compared to the earnings of a successful New Technological Corporation, so taking this obvious step (though neglected by managements that fail to understand their New Technological Corporations) does not materially affect the deployment of the earnings of the enterprise.

Retain it and grin?

Whether by conscious strategy or default, most New Technological Corporations have adopted the strategy that requires no action: simply paying taxes on the earnings and investing them in short-term money market instruments (high-finance for "putting them in the bank"). This strategy makes a tremendous amount of sense, up to a point, that point being, to adopt a cynical turn of phrase, "as long as you can get away with it".

If you believe that New Technological Corporations are undervalued by being grouped with capital-intensive "high-technology" companies, then you may be inclined to excuse the Great New Technological Corporation Price/Earnings Scam as a rational response to a market that refuses to see through the aggregates to the reality of their business. For what happens when a New Technological Corporation accumulates a large pool of financial assets is so remarkable and contraindicative of the concept of an "efficient market" that it's amazing it's still legal.

A closed-end bond fund (or unit trust) is a financial vehicle that collects money from a large number of individuals and uses the sum to purchase a diversified portfolio of bonds with given criteria of quality, composition, and maturity. Each investor owns a percentage of the total portfolio and benefits from diversification among companies and industries and economies of scale he would not have been able to take advantage of had he bought the securities directly. A closed-end bond fund is easy to value: one simply takes the total income of the fund and the market value of the securities it holds and divides by the number of shares held by investors to establish the yield and price per share.

Consider, now, the New Technological Corporation in its guise as a covert closed-end bond fund. Since the market has not yet distinguished the New Technological Corporation from high-technology corporations, it

is far from realising that a significant fraction of the earnings of a New Technological Corporation come from its holdings of short-term fixed-income debt instruments. Consequently, the contribution to earnings from the company's financial assets are multiplied by the price/earnings ratio appropriate to a high technology company and so reflected in the stock price. At this writing, Autodesk, Inc. trades at a price/earnings ratio of 22, and short term interest rates of about 8% translate into a price/earnings ratio of 12.5 for short term debt. Therefore, each dollar Autodesk earns from its retained financial assets is valued 1.75 times higher than the same dollar earned by a closed-end bond fund. If this doesn't justify the word "scam", you must at least concede that it's an awfully kind compensation to bestow upon New Technological Corporations in recognition of the difficulties they face.

Pay dividends?

The most conventional course for a company generating earnings above those needed for reinvestment in the business is to simply pay them out to the shareholders in the form of dividends: as Midnight Oil puts it, "It belongs to them—let's give it back". Tax policy in the United States, combined with a tradition of high-technology companies not declaring dividends, has made dividend payments unusual among small, high-growth companies. The financial situation of a New Technological Corporation warrants revisiting whether dividends should play a role in the disposition of its earnings.

The issues involved in dividend payment draw on all of the Themes introduced above, plus tax policy, the current and expected state of the economy, the composition of the company's investor population, the relationship of founders to the company, and many of these matters interact in difficult-to-understand ways. The following discussion of dividend strategy is unavoidably lengthy and involved. Its relative length compared to the treatment of other potential dispositions of earnings should not be taken as an endorsement of adopting a dividend policy. Instead, it indicates how complicated the decision to pay dividends may be.

Why not dividends?

Why on Earth should an investor object to receiving income from his stock? Let's review why dividends have fallen out of favour. First and foremost is the notorious "double taxation of dividends", a fixture of United States tax policy for decades. Dividends paid by a corporation to its shareholders are not deductible from the company's corporate income tax, whereas interest payments to bondholders are fully deductible. Dividends constitute taxable income for the recipient, so the original corporate earnings are taxed twice: first at the corporate tax rate before the dividend is paid, then again at the shareholder's tax rate.[8]

Let's consider the ultimate disposition of a dollar of sales collected by a company. We'll assume the company pays a marginal tax rate (federal plus state) of 40% and that the investor holding the company's stock or bonds is an individual also taxed at a 40% marginal rate. If the company takes the dollar and reinvests it in the business by spending it, for example, on an expense item such as payroll or rent, the entire dollar is deductible and hence is applied to the benefit of the company. Of course the dollar, by being spent, is no longer a dollar of earnings reported by the company; publicly held companies expected to report rising earnings and stable margins must balance spending additional dollars against the earnings expectations of the market. Increasing spending also assumes that the expenditures will increase the value of the company. As we have seen, increased spending does not contribute to the position of a New Technological Corporation as reliably as for more capital-intensive businesses, except if the company can obtain a better market position by increasing marketing and sales expenditures.

Is interest more interesting?

If the company has assumed a significant debt burden, the dollar can be applied to debt service (interest payments). Since interest payments are deductible, the company pays no corporate income tax on the dollar,

[8] There is a special gimmick that reduces double taxation of preferred stock dividends paid to corporations, but that isn't applicable to the dividends on common stock we're discussing here.

which flows directly to the bondholder. The bondholder must pay tax on the interest he receives, and ends up with $0.60 after tax. Since interest payments are an expense, funds used to meet them are not part of the company's earnings so all the considerations about earnings expectations apply to interest payments as well. While assuming debt is an efficient way to transfer company revenues to holders of its securities and, as we have seen in the case of Leveraged Buy Outs, are used explicitly to that end to rectify the situation where a company cannot reinvest earnings at debt market yields or better, in general debt only makes sense in cases where one needs the capital borrowed. In a business with little need for capital, taking on debt makes no business sense except as part of a takeover defence or subterfuge to return pre-tax earnings. It is unlikely in the extreme that the securities market would welcome a large junk bond offering from a cash-rich, non-capital-intensive business with no need for the proceeds of the offering. In addition, debt carries with it all the risks of debt leverage, foremost among them the risk of bankruptcy in the event of inability to service the debt. Since this negates the key strong point of a New Technological Corporation, its technological leverage without debt, it would seem a highly unadvisable course.

If the sales dollar is neither spent on the operations of the business nor paid in interest, it becomes a dollar of pre-tax earnings. First in line, of course, is the tax man, who lops off his 40% for the Common Good. The remaining 60¢ becomes after-tax earnings, reported to the shareholders in the next operating statement. If the company simply retains the income and invests it in money-market instruments, it simply adds to the company's cash pile which is the beneficial property of the shareholders. Earnings from the cash hoard are, as noted above, aggregated with earnings from operations and may, if things don't get too far out of line and nobody notices what is happening, be reflected in the stock price at a P/E befitting a high technology company rather than a Treasury Bill.

The cost of double taxation

If the company chooses to pay out the earnings as a dividend, the shareholder gets a check for 60¢, the earnings that remain after corporate income tax. The dividend check being taxable income, the shareholder must pay 24¢ (40% of 60¢) of tax on the dividend, leaving 36¢ of the original dollar earned by the company. Although these numbers will vary depending upon the tax rates paid by the company and the investor, it's clear that with taxes taking 64% of every dollar, operating a company in order to pay revenues out as dividends is a far more effective way of transferring wealth to the government, which ends up with 64¢ from each dollar, than to the shareholder, who's left with 36¢.

Viewed in this light, even to contemplate paying dividends may seem the purest lunacy. There are, however, a few more facts to consider. If a business can neither spend its earnings productively (or must generate after-tax earnings to satisfy market expectations), nor has a need for debt which would transfer before-tax earnings to bondholders, payment of corporate income tax is unavoidable. Once the earnings have been booked only two alternatives remain: add them to the company's working capital pool or pay them out. Once the company has amassed working capital adequate for its needs, the shareholders begin to become restive. They demand, and rightfully so, "If you can't think of anything to do with the money other than buy Treasury Bills, why don't you give it back and let us decide how to invest it?". After all, once earnings are reported, payment of corporate income tax is a foregone conclusion. The shareholder does not look at the fraction of pre-tax earnings retained; he sees the after-tax earnings per share reported by the company, multiplies that by his holdings, and begins to think how nice it would be to find a check for that sum in his mailbox, notwithstanding the need to pay taxes on it.

Dividends as an equaliser

Mature companies in stable businesses pay dividends because they have become entities whose purpose is generating earnings for their shareholders. Utilities provide the purest examples of such companies. A shareholder in Pacific Gas & Electric, for example, currently receives an 8% return on his investment in PG&E stock. Why buy a stock that yields less than a Treasury Bill (and on whose dividends you have to pay state tax, unlike a Treasury Bill)? Because the stock can be expected to grow as the demand for electricity in Califor-

nia grows. While collecting income comparable to the T-Bill, you stand to profit from an investment likely to grow at a rate comparable to that of the economy of California, historically a pretty good bet.

Now that you're thinking in terms of balancing immediate rewards in the form of dividends and deferred capital gains from appreciation of stock if a company is successful, several other strategies seek your attention. Over there is a guy in a blue suit hawking IBM stock, "You can take home a yield of 3.6% off the top, and buy in to the most successful stock in history, with a record of 15% compounded sales and earnings growth...". A fella in a plaid jacket and yellow shoes screams, "People gotta eat! General Mills will pay you 3.7% and deliver growth as reliable as breakfast". In the back of the room, behind the nickel slots, are disheveled mute characters wearing signs around their necks. "Who are they?", you ask. They are the stocks that pay no dividends, but each sign ends with the phrase "*huge* capital gains, *real soon* now".

Dividends can be seen as equalising the valuation of companies at different stages of maturity. Ford Motor Company cannot possibly promise you sales and earnings growth, starting from its share of a mature market, equal to that of Digital Datawhack, but it can pay you a solid 4.7% on your money while promising serious capital gains and dividend increases if Ford products gain increasing market share.

To decide whether dividends make sense for a New Technological Corporation and if so, at what level, we must decide where the shape of its business places it on the industry maturity curve: the key determinant of dividend policy when dividends are viewed as leveling the risk-reward tradeoff among stocks by paying earnings to an investor in equities with less potential for capital appreciation. However, since tax policy is so intertwined with the decision to pay dividends, we must first examine two additional tax considerations.

Tax-exempt investors: the privileged many

Since the first tax bite was taken from the dollar of sales at the point the company decided to report it as earnings instead of spending it, the only tax that affects the decision whether to retain after-tax earnings or pay dividends is the tax paid by the recipient of the dividend. The majority of the stock of most high technology companies and, by their inclusion in that group, New Technological Corporations, is held by institutions. Many of these institutions pay no taxes either because they are tax-exempt, as are most pension funds, or by virtue of returning all earnings beneficially to their shareholders, as do most mutual funds. An institutional tax-exempt shareholder in a company with high earnings may view dividend payments in a very different light than an individual investor. The professional fund manager who invests in a company is basically paid to return yields greater than those achievable from Treasury Bills. If a company he invests in cannot think of anything more productive do with its earnings than buy Treasury Bills, he has every right and reason to insist that profits be returned to him for investment at the higher yields his investors hired him to obtain. In addition, whether managing a diversified fund or a narrow industry-indexed fund, the portfolio manager desires a "pure play" in the main business of the companies he selects for his portfolio. It's not clear where a "combined personal computer software manufacturer and money market fund" fits into the picture.[9]

Capricious Congress

Tax policy is not a constant factor investors can include in their calculations. The 1980's have seen dramatic shifts in the tax system. Each change has shifted the marginal rewards of various investment strategies and has thereby engendered a redeployment of assets into those instruments with the greatest after-tax yield. One of the largest items on the policy-making agenda at this writing is changes, probably in the tax system, to come to terms with the "takeover binge". This can take many forms; two obvious approaches are foremost. If anti-takeover legislation attempts to limit the deductibility of interest on debt issued to finance acquisitions, there

[9]The elimination of "pure plays" and the consequent inability to discern the expectations for investments from economic forecasts may be at the heart of the undervaluation of closed-end equity funds and conglomerates, and therefore the phenomenon of the liquidation value of a conglomerate exceeding its composite stock valuation. The contribution of this factor to the 1980's takeover boom may reward scrutiny.

will be little impact on the issue of earnings allocation by a New Technological Corporation. If, however, the disparity between return of corporate earnings to shareholders and bondholders is addressed by measures that eliminate or substantially reduce the double taxation of dividends, the disincentives to dividend payments will be removed and the market will, in all probability, assign a greater value to dividends which will be reflected in appreciation of stocks which pay dividends.

It behooves the management of a New Technological Corporation whose secure earnings could easily sustain substantial dividend payments to monitor changes in policy which affect the economic incentives governing dividends and adjust the strategy of their companies accordingly.

The dividend treadmill

Dividends are "declared" when a company examines its earnings and decides how much to pay out as dividends. Regardless of whether dividends are called "regular" or "special", whether they are declared quarterly, semi-annually, or annually, in fact the sum paid is totally at the discretion of the management and directors of the corporation. This makes dividends much more attractive than interest payments to a management worried about hard times: you can stop paying dividends whenever you need to, but if you miss an interest payment on a bond, you're bankrupt.

Once a company has adopted a policy of regular dividend payments, however, the expectations of the market set limits on management's theoretically complete discretion to set dividends. If an investor has purchased stock in the expectation of receiving $500 a year in income and one fine day the company announces that it's cutting the dividend in half because it needs to retain the cash to build a new Airship Foundry, the investor is not going to be pleased. Suddenly his income has been halved, and the company is going to spend the money on something that may not return value to him for several years, if ever. His natural reaction is to sell the stock and do something else with the money. When many people do this at the same time, the price of the stock gets clobbered and it may take years to recover. Not only has the stock returned unreliable earnings, it has marked itself as prone to capricious changes in dividends, so investors are unlikely to pay as much for whatever income it provides as they'll pay for income from companies which have never suspended or cut their dividends (and there are companies whose record for increasing dividends extends over a century).

Thus, by paying dividends a company creates the expectation that the dividends will continue to flow. Management places itself on a dividend treadmill where failure to meet expectations will result in a sharp fall in the company's stock price. If future earnings cannot sustain the dividend and the company is forced to skip or reduce the payment, the stock will be triply hammered: first in reaction to the earnings themselves, then by disappointing investors who had expected the dividend payment, and finally by establishing a record for unreliable payment of dividends.

In the case of a New Technological Corporation, at least as long as it is grouped with "high-tech" companies, it is not clear that the additional risk to the stock price from missing a dividend is a serious problem. High technology companies merit very high price/earnings ratios based on expectations of rapid and reliable quarterly growth in sales and earnings. The penalties exacted in stock devaluation when a high technology company "disappoints the market" by earning less than the analysts expected are so large that the additional consequences of reducing or eliminating a dividend may not be significant.

The operating margins of a New Technological Corporation are so high that it can sustain a major drop in sales and still generate enough earnings to meet a dividend payment, simply by choosing to pay a larger percentage of earnings as dividends during the sales slump (since the company has no obvious way to reinvest retained earnings, why not meet the dividend?). Also, since a New Technological Corporation is not capital-intensive, the exigencies of its business are unlikely to require retaining earnings for capital spending projects as often happens in high-technology businesses (for example, a semiconductor manufacturer may need to construct an expensive new fabrication plant to remain competitive in its central market). In fact, a reliable dividend payment which results in rising yield as the company's stock declines due to disappointing sales or earnings, or

simply because the overall market is declining, can act to moderate stock price swings, as investors who might otherwise sell choose to hold the stock, collect the dividends, and wait for better times. Further, as the stock declines it becomes more attractive to income-oriented investors whose purchases act to stem price erosion resulting from sales by those investing for capital gains.

Dividends and founder-ownership

Because New Technological Corporations tend to be built around a single (or small number of) fundamental ideas and since the technological leverage of this idea allowed the company to grow without large infusions of capital which would dilute the ownership interests of the founders and early equity investors, a New Technological Corporation is far more likely than most companies to retain, at maturity, a significant ownership percentage by founders.

Founders of such a company will have seen their original investment multiplied thousands to millions of times; they will have attained substantial wealth through appreciation of their original stock holdings. However, as one founder of Autodesk puts it, "They don't take stock at Burger King". So in order to diversify holdings to prevent all of one's wealth being concentrated in a single company—even to see any cash at all from appreciated stock, one must sell stock on the open market. Clearly, any sane founder can be expected to sell some portion of his stock to achieve diversification he can sleep with, but after that point founders often find themselves faced with balancing the desire to retain most of their stock holdings, both to continue to exert influence on the destiny of the company and because they believe the stock a superb long-term investment, and the inclination to sell a portion of their holdings and put the proceeds into income-generating securities.

It is clearly in the interest of any business for founders to retain a significant ownership position. Not only does the company benefit from having a substantial portion of its stock owned by people with an intimate understanding of the company's history and strategy, the founders' stock, being unlikely to be sold capriciously or tendered in a hostile takeover, provides price stability and gives management more freedom to act in the best interests of the company than it would have were all the stock in the hands of institutional investors concerned only with the next quarter's earnings. In a New Technological Corporation where the founders may include some of the Wild Talents whose efforts led to the success of the company, the rationale for maintaining their close involvement is even more obvious.

Adopting a policy of regular dividend payments can significantly reduce the founders' dilemma regarding their stock holdings. Even a modest dividend can generate annual income for founders comparable to the proceeds from the sale of the fraction of their holdings typically liquidated in a year by founders, and much greater than the income yielded by investing those proceeds. Dividends create an incentive for founders to retain their holdings in the belief that the company's future will result in their continued appreciation, without thereby foregoing current income from the capital invested in the venture.

Will income be king again?

Fashions in investments change with time. For most of history, income was the major rationale of investing. Some observers of the economic scene suggest we may be entering a period where the recent fascination with capital gains, inflation hedges, and leveraged speculations will give way to a renewed interest in instruments which generate reliable and substantial income. No economic logic is foolproof, and even the most persuasive argument can be negated by tomorrow's change in tax policy or next week's stock market crash, but the possibility of a general change in the valuation of income is worth considering. How might this happen?

First, the general trend in interest rates has been down ever since they hit historic highs in 1980. If rates continue to fall, as many believe they will, rates on debt instruments may approach and possibly fall below, yields on dividend-bearing stocks (as they have been for most of economic history). If dividend paying stocks become the highest yielding investments, they will become the focus of those seeking income.

Second, tax reform has eliminated the preferential treatment accorded capital gains (in other words, apprecia-

tion of stock) compared to income earned from interest or dividends. Investors who previously sought ways to avoid income and realise deferred capital gains to reduce the tax bite no longer have any reason to do so. (Of course, this may change, and proposals to restore the preferential treatment of capital gains are in the air at this writing.)

Third, ours is the age of debt. Debt is growing exponentially, and takeovers are in many cases eliminating equity and replacing it with debt. As the debt market further dwarfs the equity market, debt—income producing investments—becomes the centrepiece of the investment world.

Fourth, there are many reasons to believe that a severe recession is in the offing. A recession and the bear market for equities which usually attends it causes severe depreciation in the value of equities. In such a period, secure and stable income assumes greater value than capital gains, since most capital assets are falling in value.

To the extent that these factors are significant, and the assertion they will increase the relative value of income is valid, the argument for paying dividends is strengthened. Confirmation of these trends would be indicated by a relative increase in value of dividend-paying stocks over comparable stocks which retain earnings.

Mature before its years?

Dividends are usually associated with "mature" companies, whatever that means. What does "mature" mean anyway, and what might constitute maturity for a New Technological Corporation?

Most companies pass through a struggling start-up phase, a period of rapid growth, and an extended maturity characterised by relatively stable sales and earnings. This life cycle usually follows the development of the industry in which the company operates: from not being recognised at all, through exponential growth in a market with unknown total size, to saturation and growth thereafter at rates limited by the overall growth of the market (usually constrained by demographic or economic factors) and the company's share of that market, won or lost at the expense of its competitors. Earnings performance also evolves through these phases: during start-up the company loses money, its losses funded by the original investors. If it succeeds and begins to grow rapidly, it becomes profitable but reinvests all of its earnings in the business to fund its rapid growth and not forfeit portions of the market to competitors who are also growing rapidly. In the third phase the company cannot grow measurably faster by reinvesting its earnings, so it often chooses to pay dividends to its shareholders.

A New Technological Corporation can be expected to follow this pattern of development, but the presence of technological leverage results in a very different earnings profile as it moves from stage to stage. After surviving the start-up phase, a New Technological Corporation begins to generate earnings at a very high rate of return. Because little capital investment is needed during its period of rapid growth, there is little need to reinvest earnings and they are simply retained. After the company's product reaches market saturation, earnings may actually decline as the percentage of sales the company devotes to sales and marketing increases to maintain and expand its market share.

Autodesk's start-up phase ran from April of 1982 through January of 1983, when positive cash flow was achieved. Autodesk is still in the rapid growth phase and, characteristic of that phase, cannot predict when saturation will occur.[10] If AutoCAD reaches saturation and Autodesk does not by that time have another product in the rapid growth phase, Autodesk's revenues will thereafter grow at about the rate of the CAD industry as a whole, between 20% and 35% per year.

Since New Technological Corporations generate earnings during their rapid growth phase which equal or exceed those of mature conventional companies and have little need to reinvest them, one might say that a New Technological Corporation matures early. Its financial maturity is perhaps defined best by having retained all the working capital it needs as an adversity hedge rather than by having saturated its market. This early maturity may justify payment of dividends earlier

[10] An industry analyst predicted in 1983 that we would saturate the market at around 12,000 units. We have shipped more than ten times that number to date, with no indication of saturation.

in the company's life cycle than would be appropriate for conventional companies.

Dividends: a complicated choice

As should now be clear, the issues involved in dividend policy are as complicated as they are profound. What is essential is that the management of a New Technological Corporation reach its decision regarding dividends, whether to pay them or not, with a firm understanding of how the differences between their New Technological Corporation and other companies affect the economic fundamentals and strategic consequences of their decision.

A strategic partnership?

One obvious approach for a company plagued by excessive near-term earnings and a dearth of reinvestment options is to harness itself, by merger with, acquisition of, or substantial investment in a company with a complementary "shape": an enterprise with substantial near-term capital investment requirements and out-year payoff substantially greater than compounded money market returns on the earnings of the New Technological Corporation. Unfortunately, this approach does not seem workable.

First, in an era where short-term interest rates exceed the earnings of mature industry-leading companies, the only investments with the potential to materially better those yields bear high risks to the capital invested. If the New Technological Corporation invests its earnings in such ventures, it risks the wrath of its shareholders for "starting a venture capital fund with their earnings" rather than paying them out as dividends. To the extent that its investments succeed, it dilutes the "pure play" aspect of its stock and becomes instead a composite investment which experience indicates will be valued by the market at less than the sum of the assets that compose it. Finally, there is no reason to believe that the managers of a New Technological Corporation will succeed in identifying promising ventures in which to invest—after all, they readily acknowledge they cannot even reliably predict which products of their own company will succeed.

Therefore, however attractive hypothetical composite balance sheets may appear, partnership with a capital-intense business appears a strategy which will cause vilification of management and shareholder unrest if attempted, collapse of the New Technological Corporation's unique advantages and stock price if it fails, and undervaluation and consequent vulnerability to takeover and break-up if it succeeds.

Make acquisitions?

Is there a rationale for consolidation among New Technological Corporations? In other words, should a New Technological Corporation attempt to grow by acquisition of other companies? Since a New Technological Corporation accumulates a large pool of cash and since its stock bears a high price/earnings multiple, it has the financial muscle to go on the acquisitions trail. Let's see if that strategy makes financial sense and, if so, what kinds of acquisitions should be on the shopping list.

Buying technology

Since a New Technological Corporation exists as a result of technological leverage, the most obvious thing for it to buy is more technology. Buying technology through acquisitions means looking for products in their development or early marketing phases which can be acquired, complete with the Wild Talents who developed them, and incorporated into the company's product line. Since acquisitions at this stage in a product's history tend to be relatively inexpensive, the decisions involved in making such an acquisition tend to focus on how well the product and people fit with the acquiring company, evaluation of the quality and potential of the product, and a buy versus make calculation of the fairness of the price.

If technology and products can be purchased at a price comparable to in-house development or the price premium paid for them is justified by time saved in getting to market, such acquisitions clearly make sense. Most acquisition activities will fall into this category, but since the absolute sums involved are modest, these

transactions will have little impact on the overall financial structure of the company.

Consolidation among New Technological Corporations

Rather than acquire an incomplete product or one with little market testing, a New Technological Corporation may look at its cash hoard and market capitalisation and go looking for companies like itself, already on their growth curve, but small enough to acquire and digest. Conversely, one day management may awake to discover that they are being approached with an acquisition offer from a New Technological Corporation senior to them in the financial world. Do such deals make sense? What happens when you put two New Technological Corporations together? You get... a bigger one. Since all New Technological Corporations will tend to have the same shape, the numbers are likely to be proportionately the same, and therefore it is unlikely that the shape of one company will differ much from another.

To determine whether an acquisition makes sense, then, the companies must look beyond the aggregates to the events. If one company brings the other access to distribution (such as a network of skilled dealers, local sales offices, or a major account sales force), technology applicable to the other company's product line (for example, a personal computer database company buying a company specialising in micro to mainframe links), or market dominance in another niche (a PC word processing leader buying the maker of the most popular Macintosh word processing program), then the acquisition can be evaluated simply by studying the technological leverage of the combined companies.

Because New Technological Corporations depend so heavily upon Wild Talents, successful consolidations among them will tend to be friendly mergers. A hostile takeover that results in loss of the Wild Talents responsible for the success of the takeover target will very likely be a Pyrrhic victory for the acquirer.

Acquisitions of conventional companies

Should a New Technological Corporation use its high multiple stock to diversify its industry position by buying companies with other shapes in different industries? It certainly can; few companies have the financial power of a New Technological Corporation in an acquisition. But should it? Probably not. As discussed in terms of "strategic partnerships" above, when a New Technological Corporation consolidates its results with a company with a different shape the sum is almost always less attractive financially. If the acquired company had equal or better margins or capital structure, it would be a New Technological Corporation, not something else.

Managements of New Technological Corporations are, however, well justified in looking over their shoulders at frequent intervals to see if conventional companies are beginning to regard them with envious eyes and slowly, surely, drawing plans against them. As the properties of New Technological Corporations become increasingly apparent, they may come to be regarded as the most attractive of all potential takeover targets. Their liquid assets are enough to pay for a significant part of the acquisition; their large cash flow can cover a large debt load, and their minimal capital equipment and physical plant permits easy integration into another organisation.

The disadvantages in acquiring a New Technological Corporation lie in the premium price one pays for its earnings and its dependence on Wild Talents who can pocket the acquirer's cash and walk out the door if not treated well. These factors suggest that hostile takeovers of New Technological Corporations are unlikely or, at least, unwise.

Variation 3: Competitive strategies

> "You may not be interested in strategy, but strategy is interested in you."
>
> — Trotsky

The unusual fundamentals of a New Technological Corporation suggest several ways in which it can turn its unique attributes into advantages when competing with conventional companies. The following sections briefly

sketch some competitive moves that exploit a New Technological Corporation's strengths.

Spending information, not cash

Since a New Technological Corporation's products acquire high retail value by the addition of information to inexpensive raw materials, whenever finished goods can be exchanged at retail price (or even at significant discounts from it) for products and services of other companies, the New Technological Corporation can spend technological leverage as if it were cash: in other words, it can print money.

Incentive programs, contests, exchanges for hardware, co-operative advertising programs: any way at all to use product rather than cash places the New Technological Corporation at a tremendous advantage over any conventional competitor whose cost of goods (most likely involving hardware) is much higher and who derives much less gain from such transactions and may not be able to afford them at all on the scale undertaken by New Technological Corporations.

Cheap development: expensive reaction

The rapid product development cycle and low cost to market of the New Technological Corporation may be turned against conventional competitors who can be forced to spend proportionally far more of their resources to respond. Even though only a fraction of the product introductions by a New Technological Corporation may be ultimately successful, if responding to them consumes resources that competitors might otherwise have spent on effective head-to-head competition, the company may still benefit substantially.

Conversely, nimble and inexpensive reaction can help a New Technological Corporation negate or minimise the impact of product introductions which cost a hardware-dependent competitor much more time and capital to deploy, and upon which, therefore, the competitor is much more dependent for survival in the marketplace.

Low margin product introductions

By exploiting its minuscule cost of goods, a New Technological Corporation can introduce new products at extremely low prices and still generate substantial earnings during their start-up phases. These low launch prices either force competitors to lose money attempting to respond at a similar price or deter them from entering the market at all, leaving the New Technological Corporation free to move the product up-market by adding functionality at additional cost as the product establishes itself as the standard in the market.

Riding out hard times

A strong cash position and freedom from debt allow a New Technological Corporation to ride out a recession, or even a depression, that creates severe hardships for competitors who operate on much thinner margins. By being able to afford a long-term view, the New Technological Corporation can use hard times to position itself for leadership in the next expansionary phase by continuing R&D and product development while most competitors retrench, by keeping its team together while adversaries are devastated by lay-offs (and recruiting the best people they lay off), and by bottom-feeding for complementary acquisition bargains when nobody else has the cash to buy and everybody else needs to sell to raise cash.

Dividends and the strategy of denial

Adopting an aggressive dividend policy may actually result in denying competitors access to capital. If a New Technological Corporation, by paying dividends, causes relative revaluation of its stock among its industry group peers, conventional competitors whose earnings cannot sustain comparable dividends will undergo relative depreciation. The New Technological Corporation can then use its more valuable stock to acquire technologies, bestowing additional leverage on itself, more cheaply than can its competitors, since their stock is valued less by the market.

Conclusions and recommendations

The decisions involved in running any business are complex enough and have such profound consequences for employees, investors, and customers that to make cut and dried prescriptions is glib at best and irresponsible and destructive at worst. In the process of thinking about the issues that face Autodesk, and in discussions about specific decisions we have made and must make, I have come to the conclusion that I proceed from principles and assumptions about the nature of our business and company that are unusual and at variance with the consensus view of the software industry.

Some of these principles date back to the organisation of the company and before: the idea of developing multiple products and test-marketing, and the effrontery of attempting to start a company with virtually no financial capital were reflections of my belief in technological leverage, although I didn't call it that until last week. My concern with details, technological opportunities, and bottlenecks stems from belief in what I now refer to as "quantum economics". What I present here is as close an approximation as I can put on paper to the way I think about the issues that affect Autodesk. If the paper is complicated, it is because the issues interact with one another in subtle ways. If the paper seems repetitive, it is because it isn't enough to read about these issues and nod agreement or disagreement: you have to be able to pick them up, turn them around in your mind, see how they fit together, and comprehend how other matters interact with them. In writing this paper I have clarified and made explicit many beliefs I had employed intuitively before. I hope I can transmit enough of the principles I use to think about Autodesk's options, opportunities, and strategies that you can share my conclusions, dispute them on the grounds I used to arrive at them, or reject them with an understanding of the flaws in my reasoning.

Strategy is a lonely business; you never know enough to be confident about any decision and you never know if you're right until it's too late to change your mind. To plot any strategy, you must first know the terrain. If you accept the concept of the New Technological Corporation, then the first thing its management should realise is that they're running one. Proceeding from that realisation, and the fact that their company is therefore very different from most of the companies it competes with and from most stocks considered comparable by analysts, management can begin to examine specific decisions and strategic choices to make the most of the unique advantages conferred by being a member of a new generation of companies: perhaps the first to realise that fact and act to exploit it.

If the management of a New Technological Corporation, fully aware of its financial and competitive strengths, deploys those advantages to the company's benefit, their enterprise will in all likelihood not just be unique, but uniquely successful in the long term.