Business Darwinism: Evolve or Dissolve

Adaptive Strategies for the Information Age

ERIC A. MARKS

John Wiley & Sons, Inc.

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This book is dedicated to my father, Lyle Thomas Marks.
His strength, wisdom, and integrity have inspired my life's journey.

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CONTENTS

FOREWORD

The basic premise of the book you are about to read is that business must rethink how it looks at, invests in, and uses information technology in order to deal with and survive constant change. Smart companies may also be able to prosper if they adopt new attitudes about information technology (IT).

Author Eric Marks first began developing his ideas about information technology and its relationship to business, particularly in manufacturing companies, in articles written for *Managing Automation,* the magazine I edit. When he first approached me about his ideas, an immediate intellectual friendship ensued; we were both frustrated with the progress businesses were making with information technology, continually disturbed with worn-out arguments about IT's seeming lack of positive impact on productivity, and generally puzzled with why businesses were mired in applying IT strategically. In two articles which appeared in the summer of 1998, Marks began to lay out the groundwork for "Business Darwinism," advancing his ideas about a new conceptual model or framework that embraced manufacturing operations, IT, and the business overall.

In *Business Darwinism,* Marks sets forth not only the information technology elements of this framework, but also the crucially important business model that must accompany it. Most important, though, he identifies a new value discipline he calls Information Mastery, which is at the heart of a new way of thinking about the business with information, and information technology, at the core.

I believe this book is important because it can help move a very big rock up a very slippery slope. The rock, of course, is conventional wisdom—and I use that phrase, particularly the second word in it, advisedly—about the relationship between IT and business. It is a mind-set that breeds inertia, but one that must progress if we are to unlock the true potential of IT. The slippery slope, perhaps a bit more obscure, is the different dynamics of IT and business cycles and the managerial and organizational dimensions to the business—all of which must be brought into harmony if the new concepts that Marks advances are to succeed.

It would be unfair to underestimate the challenge posed by all of these factors. Certainly, *Business Darwinism* does not shy away from presenting this challenge nor does it shrink from saying what the consequences will be to businesses that fail to meet it. The glass, though, is half full, not half empty, and the rewards that will attend those with the courage, vision, persistence, and execution skills to rise to a higher level of relationship with IT will be rich indeed.

Such a challenge is not only timely and needed in today's business world, but will be, Marks suggests, an ongoing effort that will test the intellectual flexibility as well as organizational stamina of businesses in every industry segment everywhere.

This will be a daunting task for most corporations and a far greater one than they have ever had to grapple with before when it comes to dealing with IT. For the electronic information technology systems whose "brains" are the software creations of human beings, and which are unlike physical labor-saving inventions that defined earlier eras and business, social, and political paradigm shifts, are truly one of the most unique inventions in all human experience.

The software-controlled electronic information system is fundamentally different from physical labor-saving devices such as the cotton gin, the locomotive, or the telephone. Rather than extend the ability of hand motion, leg motion, or the ability to hear and speak across distances, IT systems extend the capabilities of the mind—to think, to organize and disseminate information, to create.

Because these systems are of the mind rather than of the body, they take a lot more effort and time to understand. This is one of the central problems in managing IT today. The fact of the matter is that people simply don't have all that much experience yet with IT systems to truly understand their impact on people, organizations, methods of management, and the fabric of culture that weaves through all. The development of the ENIAC was only about 50 years ago, a short time in the history of human invention and one far more brief than attended the invention and adoption of cars, telephones, and even television. Perhaps more important, the development of the groundbreaking IBM 360, the first electronic computing system to be widely used in businesses, arrived on the scene only about 35 years ago. How can we begin to understand the effects of what has become increasingly complex software systems on equally complex organizational entities such as multinational businesses when the body of experience we must rely on for judgments about those effects is in itself immature?

There are several other factors that compound the experience problem. The first is what I have often referred to in my writings about IT, which have been stimulated by Marks's first two articles in *Managing Automation* and now by *Business Darwinism,* as the Absorption Problem. The mere fact that a corporation buys an IT system and installs it says very little about the extent to which the capabilities of that system are used and by how many people within that business. Getting to know the "mind" of even a relatively simple PC-based software system such as Microsoft Office has proven to be beyond the capabilities of most people who use that system. Imagine what business faces in fully understanding and fully exploiting a so-called enterprise system such as SAP's R/3 software, a system exponentially more complex and rich in functionality than the systems we use as individuals.

Factor in to this equation the notion of frequent and periodic updates to these systems that their inventors delight in continually introducing and providing to users. Unlike adding chapters to a book, which could be read without having to reread the entire book, these changes often permeate a system, restarting the Absorption Problem.

The Absorption Problem is also deeply affected by such associated issues as training and education. Most corporations still don't have ongoing, companywide IT training programs that are woven into the fabric of their cultures. The lack of training, of course, inhibits wider usage of the technology by more people as well as more functionality lying not used or underutilized in those systems. The net effect is to limit the development of the all-important body of experience with the systems.

Our education system, too, still regards IT as a compartmentalized discipline rather than a tool whose full use could more profoundly improve the educational experience. Schools treat IT much like business still views the IS department, along the lines of what Marks calls Industrial Age thinking. Changing the ways that our educational system views IT, particularly at the grammar and secondary school levels, is perhaps the single most important goal all must embrace in the evolution of IT now taking place. Generational change may indeed be the key in our coming to a fuller understanding of IT.

But for now, an equally important factor in the IT challenge facing business is what I have called, in articles in *Managing Automation,* the Alignment Problem. There are two major branches to the Alignment Problem. The first branch has to do with the tension between technology cycles and business cycles. Contrary to some conventional notions, technology does not change and progress at the same speed and pace as business cycles. Even though the venture capital spigot has been severely tightened this year due to the economic downturn, technological innovation continues in many sectors even as the business slowdown worsens and companies hold back on investing in IT.

While the tension is most pronounced during a downturn, even in good times businesses face the continual challenge of marrying and synchronizing IT to business cycles and processes that are often unpredictable and changing. The closer a business can get to aligning the two, the more benefit can be derived from the IT investment, but the alignment is a continual challenge that requires much ongoing effort. Without flexible software architectures that can accommodate change and without adaptable business policies to go with them, a business can end up on the rocky shoals of a failed IT investment. Like the developing body of experience we have with the impact of IT systems on the corporate entity itself, we are also just beginning to understand how to deal with the alignment problem between technology and business cycles.

The other branch of the Alignment Problem is a multidimensional issue having to do with organizational and management factors. Simply thinking about and trying to understand the impact of IT on a company's business processes will not lead to a full understanding of IT's effect on the corporate entity nor will it allow for maximum utilization and exploitation of the technology.

Any time information technology is injected into the corporate entity, the technology has an effect on the entity's organizational structure and the way that

structure is managed. The impact on organizational structure has to do with how work is organized, how people are deployed to accomplish that work, the process by which the work is carried out, how decision making is structured, and how the hierarchy of authority, responsibility, and compensation is organized. Obviously, the more pervasive the technology, the more intense the impact on these characteristics. Equally important, the impact of the technology injection on management has to do with the setting of goals and objectives associated with the technology, policies, and procedures for employing the technology, and overseeing the processes by which the technology is used.

It's important to understand, too, that the technology factor itself has a set of effects associated with it that are distinct from the organizational and management factors. In today's world, it would be rare indeed to find the corporation that did not have some existing technology base or what the IT industry calls legacy systems installed and running, and in many cases running well. Consequently, the injection of new technology, whether it is a customer relationship management system, a web-based ordering system, or a broad-scale enterprise resource management system, will in itself have an impact on the existing technology infrastructure that must be understood if the new investment is to be successfully leveraged.

The key here, though, is that the three factors—technology, organization, and management—are present and inseparable in the calculus of a progressive IT and business framework. Certainly, each factor may take on different and varying weights depending on the particular circumstances of a corporate entity, but in the final analysis all three must be in equilibrium for the technology to succeed, and by succeed I mean to be used to its full potential and advantage.

Discussions of identifying and sustaining competitive advantage with IT often miss the point because of a lack of understanding of this three-factor calculation, which I have called the Theory of Trilateral Alignment. Competitive advantage can be found in how well IT is used. And successful use can only be attained when the whole of the corporate entity, its structure and methods of management, is geared to and aligned with the technology.

Marks is dead-on correct in arguing that business must make the intellectual shift in regarding IT in a new, more intimate way. Having a philosophy of IT that is rooted in Industrial Age concepts is a surefire prescription for underutilization, and even failure, with IT. The language we use to communicate about IT reveals the scope and depth of the problem. Today, IT is widely referred to as a "tool," something mass produced, used to accomplish a task and then stored, much like a wrench, a saw, or a screwdriver is used and then placed in a toolbox.

Surely such conceptualizations reflect the limitations of today's language and vocabulary, but they also reveal a mind-set or attitude that is not holistic with regard to IT and the business. It is rather an Industrial Age notion of compartmentalized and sequential tasks directed to predefined objectives. But this approach,

of course, misunderstands the essence of IT, the extension of the mind. Most businesses need to make the shift to the broader and more natural vision, and most as well need to learn, understand, and adopt disciplines associated with executing Trilateral Alignment. Likewise, most consultancies and research firms in the IT industry need to embrace this new philosophy if they are going to be able to truly help their clients.

The real value that can come from what Marks calls Information Mastery lies in what one great writer called the "undiscovered country." Reducing cost and improving efficiency and productivity will get businesses to first or even second base, but home runs will be scored only when information is exploited in new ways to extend the business or even create new businesses. It is the opening of new realms and dimensions to the business that leverage the power of IT. Like the power of thought itself, can there be any limit to it?

The gating factor—that opens it, limits it, or closes it off—lies in only one area. It lies in the makeup of the mind, or, to put it in hierarchical business terms, within the brain of the business, the person who is managerially in charge. Simply put, leadership will either make or break a business's involvement with IT. If the leadership has a mind-set to focus on efficiency and productivity, then the leadership will most probably achieve those limited and limiting objectives. But in doing so it will have ignored the essence of IT and will not reap the rewards its potential has to offer.

Only enlightened leadership can make the leap to the new philosophy. Only enlightened leadership can approach the business based on a vision of IT as not only woven into the fabric of the business but a business driver itself, as important as new geographic markets and new customers. Only enlightened leadership can create, develop, and sustain a culture in which this new IT philosophy will flourish.

The history of technology strongly suggests that if it can happen, it will happen. Mankind will eventually figure out a way. The philosophy of IT I have discussed here, and which Eric Marks explores in much greater depth in the pages to come, will take root over time. As much as we would like to take credit for these ideas, they are in large part self-evident, as knowable and as inexorable as other forces in nature.

This book, therefore, is a valuable guide to understanding that nature and devising ways to harness its forces. In the end, that may be all we can do. And that may just be enough.

David R. Brousell
Editor-in-Chief
Managing Automation Magazine
New York, October 2001

INTRODUCTION

During the writing of this book, several insights and changes of direction occurred that were unplanned and unanticipated. I began this project intending to author an e-business and information technology (IT) strategy book; however, as I completed the research and the initial chapters, I realized that what I was writing did not provide businesses with the tools needed to adapt themselves to business change. The initial premise of the book was that information plays a strategic and critical role in today's corporations, and therefore the firms that are best able to drive business value with information assets and processes will survive, whereas those that do not will be deselected. Although I had established a clear need for unleashing IT from the management paradigms of the Industrial Age through a new value discipline called Information Mastery, I soon realized that I had written myself into a corner. Corporations need to do more than fix the way the information value is created and managed to help them adapt to their business environment. They need a broader framework for business change based on the evolutionary and biological analogies developed earlier in the book.

At the same time, the business landscape was undergoing rapid change with the economic slump of 2001 following so closely on the heels of the Internet boom and dot-com bust. The sanguine growth predictions of Internet business models were soon proved fraudulent by the business version of natural selection. Firm after firm folded because of fundamental flaws in their business models. That means that these business models were not well adapted to their business landscape. They were unfit in Business Darwinism fitness terms. They were incapable of demonstrating positive results in the four fitness levers we settled on as keys to fitness: (1) revenue, (2) profit, (3) cash flow, and (4) market share. We witnessed business evolution with the sudden emergence of new species of companies based on exciting new e-business models, doing business on the web in ways never imagined before. The sudden and rapid speciation of corporations captured the hearts and minds of executives around the world who were enamored of business models that were capable of creating so many 20-something millionaires in such a short time based on their successful initial public offerings (IPOs). This is why I introduced Stephen Jay Gould's concept of Punctuated Equilibrium to describe this sudden flourishing of new species of businesses and rapid change.

I realized that Darwinian fitness was an appropriate way to characterize corporations, and the fitness levers we settled on seemed to make the most sense for short-term survival of a corporation. Companies that do not perform according to the fitness metrics of revenue, profit, cash flow, and market share will not survive, and they surely will not be able to replicate or transition themselves across a generation of change. These fitness metrics are good enough for Dell Computer,

so they should be good enough for other corporations. The dot-com demise of 2000 and 2001 demonstrated the criticality of business fitness in business evolution. We now know that the business version of natural selection is as absolute as nature's version of natural selection.

At this point, I spent two days scratching my head and pondering what framework or methodology would be useful to help businesses adapt their business models to changes in the business landscape, competitor threats, customer preferences, fundamental technology that affects entire industries, and corporate leadership. I realized that my IT premise was correct and completely valid, but it needed to be augmented by a framework that added corporate structure, organizational design, company and industry value chains, business processes, and all other related *business architecture* components to the *IT architecture* elements of increasingly information-based business models. A *business evolution model* was needed to encompass corporate strategy, information-based business modeling, and four evolutionary activities that any corporation must perform to remain viable—survive, compete, replicate, and adapt. In performing these four activities, a firm must be able to flex its respective business architecture and IT architecture in order to implement the necessary changes to drive better fitness against the fitness metrics mentioned previously. This ongoing process continually assesses the fitness of a firm's business model to the business landscape and adjusts it through business and technology initiatives that support surviving, competing, replicating, and adapting. Business Darwinism, then, provides an overarching framework for corporations to evolve themselves proactively, as well as reactively, to business change.

A brief review of the book's chapters provides readers with the flow and structure of this book:

- Chapter 1 lays the groundwork for a new paradigm of information management. The Principle of Information Darwinism is developed, suggesting that corporations and business leaders must invest in information technology more aggressively to ensure business survival. The executives and companies that do will not only survive, they will thrive. Those that do not will be deselected. A new value discipline of Information Mastery is presented as a critical core capability of any modern organization. Information Mastery is a way of conducting business based on superior use of information in a broader and more strategic sense. The role, organization, processes, and metrics of information are different under the value discipline of Information Mastery. Information is the evolutionary and adaptive machinery of a firm.
- Chapter 2 provides a review of major technology trends over the course of history, beginning with the printing press and ending with the Internet. This abbreviated technology review shows how technology has had a dramatic impact on human history and how innovation complexes can coalesce and

drive a sustained, disruptive wave of massive business and societal change. The Internet is one of these events, much as the printing press was in its time. They are similar in their impact on human civilization in that they broke an information bottleneck and unleashed access to information to the masses. Information, we maintain, is clearly power.

- Chapter 3 develops the evolutionary framework for businesses, equating them to living organisms. We suggest that corporations must conduct four fundamental evolutionary activities—survive, compete, replicate, and, over generations of business change, adapt. We posit four business fitness metrics—revenue, profit, cash flow, and market share—as the most critical measures for corporations to be "fit" and able to transition their business models across a generation of business change. The trajectory of human evolution is equated with the increased use of information to drive corporate evolution. If culture replaced physical evolution in humans, then information is the cultural equivalent for firms. All activities that manage information and knowledge of a firm are those that will augment and, in some cases, replace competing on physical assets alone.
- Chapter 4 traces the development of information technology and information delivery as a formal corporate discipline. From the early computer applications in GE's Louisville facility to the rise of the personal computer (PC), client-server computing, and the Internet, we show how these changes in information technology have strained the organizations that were devised to "manage" the changes. This historical review suggests that today's corporations are still managing information delivery with an Industrial Age management paradigm. Chapter 4 concludes with the idea that the IT results from the last 10 years or so are logical outcomes of managing information delivery from an Industrial Age perspective.
- Chapter 5 explores the notion of IT architecture. We review several leading IT strategists' views and approaches to IT management, IT architecture management, and portfolio management, and then settle on the approach of Weill and Broadbent, which breaks IT into four categories of spending—infrastructure, transactional, informational, and strategic technologies. We then introduce a business evolution framework and integrate these IT categories into it to show how the IT architecture can be "flexed" in response to the needs of the business to incorporate change and facilitate business evolution.
- Chapter 6 presents a discussion of corporate strategy and business modeling. Gary Hamel's compelling business modeling methodology is reviewed and adapted to the discussion of information management. The result is a concept called *information-based business modeling,* which builds information management concepts into the fabric of corporate strategy and the resulting business model. Information-based business modeling eliminates the classic alignment problem that has plagued

corporations managing their businesses with an Industrial Age information management model.

- Chapter 7 extends the discussions of IT architecture and information-based business modeling into a larger context: a model of business evolution. We devise a macro-model of business change based on corporate strategy, an information-based business model, and the ability to successfully implement business initiatives by flexing the business architecture and the IT architecture. We show how the evolutionary activities of a firm—survive, compete, replicate, and adapt—have different objectives and requirements for implementation, but they all involve flexing the business and IT architecture for success.
- Chapter 8 embellishes the business evolution framework with examples. The business evolution model is "worked" to demonstrate how the four evolutionary processes of a corporation—survive, compete, replicate, and adapt—are accomplished by a firm. We describe how survive and compete are core business model activities, with their respective goals for success. We describe how corporate replication *repositions* a firm for its next future, essentially transitioning the firm across a generation of business change, using the business evolution model. Finally, we show how adaptive activities of a firm *preposition* it for multiple futures by adding the corporate variability and agility to respond to multiple unknown outcomes.
- Chapter 9 closes the book with some forward-looking ideas on what the future of IT and business holds. We forecast what the next Golden Age of IT might involve, and we offer ways that corporations can create their own Information Mastery value disciplines customized for their firm in their competitive situation. Finally, several suggestions are made about how corporations can build adaptive processes and capabilities into their fundamental structure and culture. This is the ultimate core competency—the adaptive agility of a corporation in response to environmental change.

Business evolution is not unlike evolution in nature, and the parallels we have developed to help businesses use information to facilitate better fitness resemble those of humans as a species. The business evolution model and information-based business modeling approach have been developed to help companies adapt in their immediate environments, to help reposition them for their next futures, and to help preposition themselves for the unknown, or multiple futures.

This book is about evolution and change. I hope that the story of how I wrote this book serves as a metaphor for what corporations must do to compete and remain viable as business entities. Change is constant in nature and in business. Corporations that can build adaptive capabilities into their culture, their structure and organization, and their information and business processes will truly be the winners based on Business Darwinism. Happy evolution!

1

BUSINESS DARWINISM AND DIGITAL EVOLUTION

Darwin is probably a better guide to business competition than economists are.

—Bruce Henderson,
Boston Consulting Group

When I was young, perhaps 12 or 13 years old, I was fortunate to live on a dairy farm in upstate New York in the Chenango River Valley region. This dairy farm was not unlike many in the area. It ran along the banks of the Chenango River for perhaps three-quarters of a mile as the river flows, with fertile flats replenished by nutrients from upstream, winter and spring floods that covered the land then eventually receded, followed by the growing season for alfalfa, corn, and other feed crops. But our family farm was different from most in one important way: two archaeological sites were located there. Nothing would intrigue me more than walking those fields after the first rainfall following the spring plowing. The rain would wash away the top layer of soil, revealing the secrets of people who occupied that land thousands of years ago. I would find potsherds, flint chips from the manufacture of stone tools, and even the tools themselves, some of them in perfectly preserved condition and others worn and broken. My prehistoric finds included scrapers, knives, mortar and pestle, and pottery, all from the Woodland Era of North American prehistory. This village site was large and was likely occupied year-round.

There was also another archaeological site on our farm, closer to the river than the first, but also different. This site was a small hunting camp, with fire-cracked rock marking a fire pit for cooking and heating, and older-style pottery and stone tools from the Archaic Period, which was roughly 7,000 years B.C. More than nine thousand years ago this particular group of Archaic Indians

camped at this location, repeatedly for several years perhaps, building their campfires and dining from the game they managed to kill on that hunting trip, and telling stories about life and perhaps musing about the future. Who knows? But it surely was fascinating to me to walk along this field, between the rows of corn, picking up the remnants from a time long past, and wondering who they were and what they did here.

It would occur to me that the nameless, faceless inhabitants of this land two thousand years ago did not leave an epitaph. There was no signpost, no gravestone, no historical marker to tell a curious 13-year-old farmer's son what happened here and why the previous inhabitants were no longer here. As I write these paragraphs about business strategy and business change, I am wondering what the epitaph will be for the many new companies that sprang from the venture capitalists' fold only to fall victim to the recent pattern of dot-com failure. What would a corporation's gravestone read if someone were to write an epitaph?

> Here lies the remains of the dot-com known as Nolonger.com, and it was a good firm. It was based on the New Economy formula of "get market share now, worry about profits later." It was based on measures of success where the stock valuation was more important than revenue, cash flow, and profitability. But they did give us free food, provided Ping-Pong tables for after-lunch games, bagels every Monday for breakfast, and generally created a great working atmosphere. If only it had lasted . . .

As I am writing this book, firm after firm is folding. Venture capitalists have turned off the free-flowing faucet of easy funding for many of the firms they spawned as part of the First Wave of e-business. These firms, which were taking advantage of a stock market that valued their New Economy business model, unfortunately did not have viable, market-focused strategies that allowed for sustainable growth in market share, revenues, and profits. The firms that did make it to the initial public offering (IPO) stage and posted enviable stock valuations are now seeing their stock get pounded by the markets and disparaged by the analysts. They are realizing that with no venture capital money, and a revenue stream that barely resembles a trickle, their future is bleak.

They are not alone. This is the state of many firms, both New Economy and Old. The relative condition of New Economy firms versus Old Economy firms may not be entirely comparable, although on the measures of market share, revenue, cash flow, and profitability they are. These metrics determine fundamentally whether a firm has a viable business model and a product or service that the market considers valuable. The First Wave of the New Economy was an experiment. Some made it, but most did not. Some are still trying to make it. Regarding the relative viability of any start-up firm over the last 10 years, many struggled only to eventually shutter their windows. Of course, the venture capitalists like this situation. They prefer a 10 percent success rate in their startups, which helps

ensure that the ideas they fund are unique and different. But this ratio is probably similar to the success rate of start-up businesses historically, regardless of whether they are venture capital funded or not. Like nature and the life-and-death struggles in the wild every day, some companies survive and others do not.

This book is about all corporations. This book draws on evolutionary metaphors to attempt to provide a framework for handling change, which is sorely needed today with the pace of change increasing, the amount of change becoming overwhelming, and the nature of the changes turning unpredictable. Evolutionary processes are at work in the business world, much as they are at work in the natural world. Survival of the fittest applies to the world's corporations as much as it applies to the variety of living organisms in existence today, as well as those long extinct. Darwinian principles can be employed to build an adaptive framework for corporations. This adaptive framework will lead to a set of principles that will ultimately help today's corporations better compete against other firms, but more important, compete against the unknown; compete against change; and compete for a business landscape that is as yet unknown and unknowable.

This book also makes some points that will seem to be tautologies. For example, I will suggest that technology-driven change is forcing companies to adopt more technology as the solution to problems that arose largely as a result of technology changes. Technology changes things, which requires more technology to solve the problems that technology largely enabled. So technology is part of the solution to technology-driven change. For companies, then, the two primary competitors they face in making a living are change, which is accelerating, and their competitors, which are also changing. Technology as an adaptive mechanism provides a pathway to solving both problems, but only in a corporation whose leadership understands the role of technology in enabling corporate strategy.

ADAPTIVE ADVANTAGE: CULTURE

Corporations, by virtue of consisting of human beings, share the evolutionary trajectory of human beings. Humans have distinguished themselves from all other living species in the development of intelligence, or culture, as a primary adaptive mechanism. Culture replaced physical adaptation as the primary evolutionary capability by virtue of the speed, efficiency, and flexibility it provides. Companies evolve and adapt to their surroundings as living organisms do. Above all, the ability to evolve and adapt to the environment—both the immediate conditions and maintaining the ability to adapt to future change—is the ultimate evolutionary advantage. For corporations, the adaptive mechanisms

involve information processing. Corporate replication is the successful copying of corporate culture and corporate DNA, by either growing the existing firm in new directions or using other variation-enhancing strategies such as increased research and development (R&D), mergers and acquisitions, and divisional spinoffs. The information management assets, processes, and capabilities of a firm support all corporate replication activities. In fact, without those elements of the corporate DNA of a firm, its replication processes, as well as its core survival, competing, and adaptive processes would be endangered.

HUMAN VERSUS CORPORATE EVOLUTION

Humans have not changed much physically over the last million years. Two million years ago, *Homo erectus* domesticated fire, used language to communicate, and crafted weapons; 500,000 years ago, *Homo sapiens* emerged. They were distinguished by their ability to create technology as demonstrated by increased innovation and progressive sophistication of their tool-making. Ninety thousand years ago, *Homo sapiens sapiens,* our immediate ancestors, emerged. Again, physically, we have not changed significantly over these timeframes; however, we have continued to adapt, acclimate, and thrive in our environment; interact with other cultures; and adapt to new climates and geographies. This is because as a species we have learned, through cultural adaptation as opposed to physical adaptation, to survive in varying geographies and climates and to respond to unforeseen changes in the conditions around us.

Now, to be accurate, cultural evolution does not replace genetic evolution. It does, however, augment survivability and adaptive responses to environmental changes in a more efficient manner, and it does represent a body of accumulated knowledge of the species. In that manner, then, culture is similar to the DNA contents of an individual or the genome of a species. As Matt Ridley[1] observes, our genes represent our 4-billion-year biography as a biological lineage, the cumulative documentation of all the changes to the human gene sequence as captured by the species. Human culture works within the generational timeframe, whereas genetic evolution, being a function of reproduction, works across many generations and, ultimately, over millions of years. The ability to augment the rate of change of the species with behavioral adaptations is a tremendous evolutionary advantage. This explains why human beings are an ecological success as a species, perhaps the most successful ever. Humans are the most abundant animal on Earth, with some 6 billion of us populating virtually every possible habitat, and representing some 300 million tons of biomass.[2] As a species, we would not be as successful without the information-processing capabilities that culture represents.

Culture in humans can be compared to information technology for corporations. These are "software-like" adaptive mechanisms that allow for flexible responses to unforeseen changes. They allow responses in timeframes that are much faster (e.g., web speed) than geologic and evolutionary time fences, which are measured in hundreds of thousands, even millions of years. As much as DNA is a digital code for the development of an individual of a species, information technology (IT) is the digital strategy that will allow corporations to craft their ability to survive in the New Economy. The ability of firms to harvest information and drive their business based on information will separate the winners from the losers in the New Economy. Strategic use of IT will be a key adaptive mechanism for all firms in the coming years, but especially so for global corporations in all industries.

INFORMATION: A KEY ADAPTIVE MECHANISM

Information is the primary adaptive mechanism for global corporations to survive and compete in the Information Economy. The ability of global manufacturers to harness information *firmwide* in *every* operation—to harvest knowledge and turn it into competitive advantage—will be the primary source of competitive advantage for firms intent on winning in the new millennium. Information technology must be a central theme of any modern business strategy today. Firms that do not subscribe to this view will not be around in the long term. The strategic value of information—as well as the corporate assets that store, manipulate, analyze, print, and present information about the business, the customers, and the products and services provided to the customers—is increasing.

Corporations are undergoing a fitful transition from their Industrial Age mode of operation to an Information Age of operation. Some are doing so faster than their competitors, and they will survive. Recognizing the need for the change has not been easy, nor will the transition be smooth. The changes required to be an Information Age corporation are many and varied because of the differences between managing physical assets, such as factories, machines, and inventory, and managing bits and bytes, or information. Information is a different economic medium than physical goods, as Evans and Wurster point out in their fascinating book, *Blown to Bits*. They note that the objects of strategy, things such as business structures, supply chains, customer and supplier relationships, and even entire industries, are held together by a kind of "glue." That glue, according to Evans and Wurster, is information.[3] Information is different. It is bits and bytes, ones and zeros, as opposed to atoms and molecules, the world of physical products, machines and equipment, buildings and

manufacturing plants. Exhibit 1.1 shows how information is a business driver in today's information-based economy.

Information "makes a vastly disproportionate contribution to competitive advantage," according to Evans and Wurster.[4] Information, as well as the assets and processes for managing it, provides the fabric for the boundaries, stability, organizational structure, and ultimately the competitive advantage of corporations and industries. In fact, for many companies not typically classified as members of the "information industries," their mastery of information distinguishes their performance from that of their competitors. "Every business is an information business," according to Evans and Wurster.[5] Whether the business is manufacturing or a typical services industry, it is indelibly shaped by its ability to manage information in various ways. Slywotsky and Morrison define a digital business as the following:

> One in which strategic options have been transformed—and significantly broadened—by the use of digital technologies. Under this definition, it's not enough to have a great Web site or a wired workforce or neat software that helps run a factory. A digital business uses digital technologies to devise entirely new value propositions for customers and for the company's own talent; to invent new methods of creating and capturing profits; and, ultimately, to pursue the true goal of strategic differentiation: uniqueness.[6]

Information strategies expand the range of business options a company can employ in executing its business strategy, as well as being critical for the *execution*

- Information is of strategic value to a firm.
- Information technology has a new role in the corporation of the New Economy. The role is strategic, not tactical, and the responsibilities are enormous.
- Information assets have surpassed physical assets in strategic value to the firm.
- The secret is to find ways to unleash the informational value embedded in the corporation. This means identifying, inventorying, assessing the value, and packaging information content into sources of value for new customers, new suppliers, new markets, new products, and new industries.
- Products are increasingly being bundled with information, which adds additional value to products.
- Information services are being "productized," continuing to demonstrate the increased value of various forms of information.
- Information Technology is no longer a support organization. It is now a strategic organization.
- Information is an economic driver. It has added productivity, jobs, and growth to the world economy at a phenomenal rate.

Exhibit 1.1 Information as a Business Driver

of the strategy and tactics. Clearly, then, managing information today is more critical to a company's survival than maintaining the same IT objectives of the past.

The mastery of information-based business models is different because information is a different type of competitive play. As noted by Evans and Wurster, the economics of physical entities versus information is different.[7] When a physical thing is sold, the seller no longer can claim ownership, but when an idea, a book, or a song is sold, the seller still technically "owns" it through copyright protection, and therefore the piece of information can be sold repeatedly. Information can be copied at nearly zero cost forever, as opposed to physical things, which require manufacturing facilities, machinery and equipment, specially trained personnel, and the materials and components to manufacture the physical goods.[8] Information has limitless boundaries and can be transmitted quickly and easily across networks. Physical things can be large and bulky, and require packaging for transportation. Some things in the physical world have diminishing returns, such as farmland, which does not double in productivity despite doubling the labor or fertilizer applied to it. Other physical entities, such as factories and "economy-of-scale" production settings, are subject to increasing returns by virtue of having lower unit costs per quantity made (e.g., big factories have lower unit costs than smaller factories). Information, however, has perfectly increasing returns. Money spent to learn something once allows one to reuse that knowledge at zero additional cost indefinitely. Slywotsky and Morrison amplify this notion:

> Managing atoms is manipulation of physical assets: stockpiling inventory, shipping products, buying equipment, installing machinery, building factories. Managing bits is manipulation of information: gathering, analyzing, modeling, sorting, sharing, and replicating data.[9]

The economics of information requires imperfect markets, or asymmetries of information. The value of information resides in limiting access to information such that rents can be charged for access. If access is not limited or restricted, the information is worthless. If access is restricted, then the information is a monopoly.[10] As many authors have observed, managing atoms compared to managing bits is a different game. There are fundamental differences between them. The technology review in Chapter 2 shows how the printing press released the value of information from the book container in the 1400s. Similarly, the Internet and related information technologies are continuing this trend but on a far grander scale. The bond between the medium and the message, the product and the information about the product, the physical value chain and the information flowing bidirectionally through that value chain, has been shattered. The boundless nature of information-based businesses relies on the ability to transform value equations from those of physical infrastructure and

physical products to those of information infrastructure, product and process data, and metadata.

PRINCIPLE OF INFORMATION DARWINISM

In the transition to an Information Age economy from an Industrial Age economy, the strategic management of information becomes an all-important differentiator. The strategies and skills required to manage an information-based business model are different from those required to manage an Industrial Age business model. The metrics are different, the inputs and outputs are different, and the valuation of assets is different. In fact, the valuation of "value" is different with information-based business models and processes. During this transitional period and for the foreseeable future, one principle will dominate the business landscape—the Principle of Information Darwinism. This principle states:

> Firms that invest in information technology (IT) as a strategic resource for the future will survive. Those that do not will perish. Executives who invest in IT as one of their primary strategic levers will thrive. Those who do not will be deselected.

The Principle of Information Darwinism is the business equivalent of natural selection. The "filter" that will sort the survivors from the failures is the degree to which these firms have positioned themselves around the fundamental capabilities of harnessing information and driving value from it. The firms that have the information management capabilities required of the Information Age will succeed over those that do not. The business environment of the Information Age will select those firms that can harness and exploit information to survive, to compete, and to adapt to business change. Before breaking down the Principle of Information Darwinism into its components, a few concepts must be clarified.

First, the Principle of Information Darwinism does not espouse reckless spending on IT just for fun. Rather, it promotes a more strategic view of information as an asset, as a value driver of the New Economy, as something increasingly valued by customers—both internal and external to the firm. This requires a new and broader definition of the role and objectives of information management. It requires new metrics of success based on contribution to the success of the business, not in terms of how well the budget was managed. In our treatment of IT, we do not limit our discussion to how IT has been used and applied to business problems in the past. Information Darwinism seeks to define IT and assets as a much deeper and more fundamental element of competing in today's high-charged business environment. So when IT is discussed,

we are referring to the typical IT management capabilities of a firm, but we are also significantly broadening our treatment of information management to include information and knowledge assets of all types, including the accumulated paper in file cabinets, the blueprints hanging in vaults in engineering departments of manufacturing firms, and any documentation of a firm's history, its customers, and its values, culture, and norms. This information also includes the mobile knowledge repositories in the minds of knowledge workers. We consider all of these elements of a firm as information assets, and firms must learn how to harness and derive value from them all.

Second, the Principle of Information Darwinism does not consider IT strategy to be a separate activity from business strategy. In fact, increasingly, if information management is not woven into the essence of today's business strategy, as well as into the goals, objectives, and activities that operationalize strategy, then that firm will be severely handicapped. This concept is similar to the recent realization that e-business is, after all, business. The two are inseparable and rightfully so. We seek to unify business strategy and IT strategies as increasingly the same fundamental exercise. This idea is similar to what Slywotsky and Morrison advocate by the term "Digital Business Design" in their book *How Digital Is Your Business?*[11] Businesses of the Next Wave will embed information capabilities into all core business processes to deliver superior value to all customers. There will be an IT organization, and there will be a chief information officer (CIO), but the CIO will be a business leader of the next generation of world-class firms. The CIO will provide thought leadership on how to run a business using information as a core value driver, not using IT systems to support core business processes. Information will be so integrally bundled with products and services of the firm, as well as with the processes that produce and deliver products and services, that thinking of IT separate from them will be impossible. Information and products will be the yin and yang of a firm. No products and services will exist without information, and no information will exist without products and services. Information in this scenario will be valued much differently than it was as a function of the IT organization.

Finally, the Principle of Information Darwinism expands and modifies the role of information management from the Industrial Age view of IT as something to be controlled and managed as a support organization to a view of IT as a critical component of all business operations, with a role in driving revenue growth, customer acquisition and retention, cost savings and operating efficiencies, innovation processes, and all other business functions. The CIO's function will be an operations role, not a support role. The users of IT will be more sophisticated as the Internet and technology become more pervasive in everyday human lives. Therefore, as the users become more information enabled and information capable, leading firms will be in a position to create