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**THE INFORMATION REVOLUTION IS ENABLING NEW  
BUSINESS MODELS THAT ARE TRANSFORMING THE  
BUSINESS AND FINANCIAL WORLDS**

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**MANY NEW BUSINESS MODELS ARE ARISING**

Advances in IT are enabling a wide variety of new business models, for the internal organization and functioning of business enterprises and for their external interactions with customers, suppliers, and competitors. These models come in many different forms. Typical features include the following:<sup>1</sup>

- A much greater focus on the customer, becoming the dominant factor in business today, and on competition, fundamental to the development and progress of a business enterprise.<sup>2</sup>
- Competition dynamics that are often nonlinear, where small initial differences between competing products or services can lead to large divergences in final market position. (When this occurs, it is frequently a result of network externalities, including demand-side economies of scale and positive feedback.)<sup>3</sup>
- A customer service approach to developing everything, in which businesses are driven by information from the real, customer world, not the internal company world, and the entire product cycle (including development, production, marketing, and sales) is closely integrated and much more quickly responsive to market changes than hitherto, leading to what some have termed real-time, event-driven business enterprises.<sup>4</sup>

- Products and services customized for small groups of customers, and sometimes even for individual customers, with differential, value-based pricing (rather than the previous cost-based pricing).<sup>5,6</sup>
- Globalization, in all its manifestations, so that companies increasingly think of themselves as operating on a global stage, rather than a regional or national stage, regarding their suppliers and vendors, customers, and competitors, as well as the location of their design, development, production, marketing, and sales operations.<sup>7</sup>
- A redefinition of basic business functions, with new paradigms for products, services, delivery, support, and pricing.<sup>8</sup>

These new business models are transforming the business and financial worlds. Internally, they are changing the architectural organization of companies—often from vertical integration to horizontal networks. Externally, they are creating new modes of supply chain management and customer relationship management, coupling companies much more tightly to their suppliers and customers. Taken together, these internal and external changes are speeding up business information cycles and decision processes, rendering companies that undergo these changes much more responsive to changing competitive situations and customer needs, with products and services tailored to and differentiated for small groups of customers—and often even individual customers.

### **Electronic Commerce Is Becoming Increasingly Important**

Many, if not most, of these new business models feature one form or another of electronic commerce, which is rising in importance as a major form of economic activity. E-commerce is bringing with it accompanying changes in the nature and structure of markets and the elimination of a wide variety of middlemen heretofore facilitating economic transitions.<sup>9</sup>

The initial stages of e-commerce adoption usually focus on cost reduction via increased efficiencies and effectiveness within existing business models. Later stages of e-commerce adoption frequently

involve revolutionary changes in the business models, often initiated by new, entrepreneurial companies.<sup>10</sup>

E-commerce can be business-to-consumer (B2C) or business-to-business (B2B); B2B transactions at present far exceed B2C (including government-to-citizen) transactions. Today it is estimated that only 2 percent of global B2C and B2B transactions take place online, but this is projected by some to grow to almost 20 percent by 2005.<sup>11</sup> North America currently leads in the dollar volume of e-commerce transactions, with Europe and the Asia-Pacific region moving up rapidly and other parts of the world following along behind.<sup>12</sup>

An ever-increasing use of e-commerce is expected to be one of the dominant features of the information world.<sup>13</sup>

### **IT-Driven Changes Are Furthest Along in the Financial World**

Financial markets have been going electronic for the past quarter-century. The birth of the Web has resulted in a dramatic increase in both the speed and the breadth of change. IT-driven changes have transformed the manner in which individual investors manage their finances, the business models used by financial intermediaries and other financial service organizations, and the organization and implementation of financial markets.<sup>14</sup>

This process, in which individual investors, financial intermediaries and service organizations, and financial markets are all going online, is continually reducing transaction costs and moving the current system toward a more efficient financial market. North America and Europe are furthest along in this process, with parts of the Asia-Pacific region following close behind.<sup>15</sup>

These IT-driven changes in the financial world include both dis-intermediation and re-intermediation: a reduction in the number of traditional intermediaries (dis-intermediation) and an emergence of new, more-efficient intermediaries with modified organizational and functional structures (re-intermediation).<sup>16</sup> Taken together, this dis-intermediation and re-intermediation are bringing about a profound transformation in the institutional structure of global financial markets, with consequences that will affect a wide range of business communities all over the world.

### **Much of This Leading-Edge, IT-Enabled Business Activity Is Concentrated in Geographic “Clusters”**

As noted above, the later stages of e-commerce adoption often involve revolutionary changes in the business models. This requires skills in innovation and business change. Based on recent experience, such skills are more likely to be found in “clusters”—geographic concentrations of interconnected companies and institutions in a particular field—than spread more or less evenly throughout a nation.<sup>17,18</sup> The presence of such IT business clusters in nations around the world is becoming a common feature of the IT-transformed business and financial world.

### **“Creative Destruction” Is a Common Feature of These Business and Financial Transformations**

A frequent accompaniment of these IT-driven changes in the business and financial world is “creative destruction”—the elimination of older and less-efficient products and services and their replacement with new, more-efficient ones. This creative destruction of old products and services is often, but not always, accompanied by the economic eclipse of the companies producing them.<sup>19</sup> This creative destruction process is playing a central role in the development and application of information technology in the U.S. business and financial community. Other regions of the world, however, may be able to shape their information revolution course in a different way, limiting the degree of creative destruction.<sup>20</sup>

### **Information Work and Information Workers Are Becoming Increasingly Important**

Much has been written about the rise in “information work” and “information workers.”<sup>21</sup> This is becoming an ever-increasing fraction of economic activity and the overall workforce in many nations, as their business and financial worlds undergo the transformations discussed here. Over time, this will free many businesses in “knowledge industries” to relocate to new areas more suited to information work than to manufacturing work, which in turn will affect where people live.<sup>22</sup>

This rise in information work will also affect the education required of people, both initially and over their careers. Regarding the latter (i.e., life-long learning), education today in the developed world is based on the assumption that what is learned in the first part of life will satisfy long-term knowledge needs. But the information revolution has made for much shorter knowledge life cycles than in the past, resulting in the need for continuous learning just to keep pace with the moving state of the art in most professional domains. Over time, this should have significant impact on educational establishments throughout much of the world.

### **This IT-Enabled Business and Financial Revolution Will Be Ongoing for Some Time**

These IT-enabled changes in the business and financial world have been under way for some time, quickening in the past decade.<sup>23</sup> They are furthest along in North America, closely followed by Europe and parts of the Asia-Pacific region. But even in North America, and even more so in other parts of the world, much more is still to come. For the foreseeable future, an unending series of new IT developments will continually drive this ongoing revolution in the business and financial world, along both current and new paths.

### **Recent Developments May Temporarily Slow the Pace of These Transformations in the Business and Financial World and Affect Their Near-Term Character, but Not Their Ultimate Magnitude and Importance**

The dot-com crash, which is largely over now, and the telecom implosion, which is still under way, have muted much of the hype that accompanied the information revolution a few years ago.<sup>24</sup> These two events have certainly slowed down the rate of investment in new IT-related businesses and, consequently, the pace of the transformations discussed above.<sup>25</sup>

However, if history is any guide, this slowdown is likely to be only temporary. Similar investment “bubbles” have been a feature of the early stages of other transformational technologies. Once each of these initial bubbles collapsed, a period of restrained activity ensued, followed, in almost all cases, by a resumption of growth in the new

technology-driven industries along more stable and enduring directions.<sup>26,27</sup> We expect IT-related industries to follow this same path over the next one to two decades.<sup>28</sup>

The events of September 11, 2001, are another matter. These events could bring a heightened awareness of cyberspace security issues, as concern regarding future terrorist attacks expands beyond using hijacked aircraft as guided missiles to include a broader range of attack mechanisms and targets, including cyberspace-mediated attacks on business and financial targets.

This could lead to an increased emphasis on security considerations in the design, implementation, and operation of new IT systems serving the business community.<sup>29</sup> This would affect the near-term character of some IT-driven transformations in the business world but not the ultimate magnitude and importance of those transformations.

### **These Transformations in the Business and Financial World Are Changing the Playing Field for Governments and Societies**

These IT-enabled changes in the business and financial world are in turn changing the underlying economic environment in which governments operate and societies function, thereby raising new governmental and societal challenges. We discuss these challenges, including the demands of “electronic government,” or “e-government,” in the next two chapters.

### **NOTES**

<sup>1</sup>These new business models were discussed, in general terms, at the November 1999 RAND information revolution conference. (See Hundley et al., 2000, pp. 28–32.)

<sup>2</sup>In the relationship between firms and their customers, the information revolution has shifted the balance of power toward the customer. Consumers today can search the Internet for products, compare prices, and find review information. The Internet is being turned into what some economists would call a “perfect” competitive market, with ever-lower transaction costs for an ever-increasing number of products and services as time goes on. (See, for example, Fan et al., 2002, pp. 12–19.)

<sup>3</sup>With many information products and services, their value to each individual user is often proportional to the number of other users—so that their overall value is proportional to the square of the number of users (Metcalfe’s Law). When this occurs, the greater the number of users, the greater the attraction of the product or service to additional users (demand-side economies of scale). This leads to a situation where products or services with a larger market share gain an even greater share and those with a smaller market share are driven to a still smaller share (positive feedback). (See Shapiro and Varian, 1999, particularly pp. 173–225, for a discussion of these and other economic features of the information economy.)

<sup>4</sup>Siegele (2002) describes the likely characteristics of such real-time, event-driven business enterprises, using material originally developed by Ranadivé (1999).

<sup>5</sup>Advances in IT make it possible for companies to maintain databases on the buying habits and preferences of individual customers. When this information is combined with modern, IT-enabled supply- and production-chain management systems, products and services can be tailored for small groups of those customers, and sometimes even for individual customers. Toffler (1970) introduced the term “mass customization” to describe this phenomenon, which he predicted would develop over time; NAS/CSTB (1994) describes its emergence in the early 1990s; and *BusinessWeek* (2002a) provides a look at the current state of this trend.

<sup>6</sup>Many if not most information products are costly to *produce* (the first time) but cheap to *reproduce*. Further, once the first copy of an information product has been produced, most costs are sunk and cannot be recovered. Economists would say that the production of information goods involves *high fixed costs* but *low marginal costs*. When the marginal costs for additional units are very low, if not near zero, cost-based pricing (based on those marginal costs) does not lead to a sustainable business model. Rather, value-based pricing, based on the value to the individual (or group) customer, is more appropriate. The key to achieving and maintaining such value-based pricing is product differentiation. Shapiro and Varian (1999, particularly pp. 19–51) discuss the pricing of information goods in some detail, including consideration of market structures for information goods, first-mover advantages (which do not always occur), and personalized and group pricing.

<sup>7</sup>Engardio, Bernstein, and Kripalani (2003) give a recent picture of how the outsourcing and “offshoring” associated with globalization are moving IT-related or enabled jobs around the world.

<sup>8</sup>Shapiro and Varian (1999) give a detailed discussion of these new paradigms for products, services, delivery, support, and pricing in the information economy.

<sup>9</sup>Symonds (1999) surveys the state of business-to-business e-commerce around the world as of June 1999; Peet (2000) surveys the state of business-to-consumer e-commerce as of February 2000. Fan et al. (2002) focus on the impact of e-commerce on financial markets. Kraemer, Dedrick, and Dunkle (2002) survey how some 2,000 relatively technologically more advanced businesses in 10 countries—Brazil, China, Denmark, France, Germany, Japan, Mexico, Singapore, Taiwan, and the United States—are using e-commerce as of 2002.

<sup>10</sup>These stages of e-commerce were defined during the discussions at the November 1999 RAND information revolution conference. (See Hundley et al., 2000, p. 27.)

<sup>11</sup>Oakes (2002) gives the following projections for the percentage of business transacted electronically:

Region	2000	2001	2002	2003	2004	2005
North America	4%	6%	11%	14%	17%	20%
Europe	1%	2%	4%	7%	13%	20%
Asia Pacific	1%	2%	4%	7%	12%	18%
Latin America	1%	2%	4%	7%	12%	20%
Eastern Europe	0%	1%	2%	3%	6%	10%
Rest of world	0%	1%	1%	3%	5%	9%
<b>Global e-commerce</b>	<b>2%</b>	<b>3%</b>	<b>6%</b>	<b>9%</b>	<b>14%</b>	<b>19%</b>

<sup>12</sup>Oakes (2002) gives the following projections for the global volume of e-commerce in billions of dollars:

Region	2000	2001	2002	2003	2004	2005	5-year annual growth rate, 1999–2004
<b>Global e-commerce</b>	<b>1,231</b>	<b>2,251</b>	<b>4,363</b>	<b>6,581</b>	<b>9,852</b>	<b>14,191</b>	<b>63%</b>
North America	826	1,429	2,727	3,456	4,287	5,232	45%
Europe	178	372	760	1,479	2,662	4,298	89%
Asia Pacific	166	329	638	1,192	2,080	3,283	82%
Latin America	48	96	187	355	637	1,048	85%
Eastern Europe	7	15	29	56	103	182	90%
Rest of world	6	11	22	43	82	150	93%

<sup>13</sup>As Liebowitz (2002), especially pp. 58–95, has pointed out in his analysis of the economics of B2C e-commerce, this should work well for some but not all consumer products. He identifies the characteristics of consumer products that are likely to determine whether or not they can be sold profitably over the Internet and lists the types of products that should be most compatible with full-fledged e-commerce—which he calls e-retailing, or “e-tailing”—and those products likely to be poor candidates for sale over the Internet.

<sup>14</sup>Fan et al. (2002) discuss these IT-driven changes in the financial world in detail.

<sup>15</sup>This process is sensitive to public opinions or concerns that may exist in various countries (e.g., consumer confidence in IT-mediated financial transactions) and the closer connections between international markets and economies that exist today.

<sup>16</sup>The emergence of IT-driven dis-intermediation and re-intermediation are described in NAS/CSTB (1994). Their current state in the financial world are discussed in Fan et al. (2002, pp. 8–9).

<sup>17</sup>See Porter (1998) for a discussion of the dynamics of such clusters. Micklethwait and Wooldridge (2000), pp. 210–214, describe some of the characteristics of successful IT business clusters. Kotkin (2000) describes how they are changing the economic and social geography of the United States. Fairlamb and Edmondson (2000) identify a number of such clusters in Europe. Hillner (2000) identifies 46 such geographic clusters of IT activity around the world. She terms these geographic “hubs” rather than “business clusters,” but the meaning is the same. UNDP (2001, p. 45) also contains a listing of Hillner’s clusters, terming them “global hubs of technological innovation.”

<sup>18</sup>This is not a new phenomenon. The industrial revolution started in similar clusters in England.

<sup>19</sup>See Schumpeter (1942), particularly pp. 81–86, for the original statement of the “creative destruction” thesis. Grove (1996) and Christensen (1997) present two of the most recent expositions of Schumpeterian creative destruction.

<sup>20</sup>Many Europeans are hoping to proceed in this fashion; only time will tell if this is a real possibility. (See the discussion in Hundley et al., 2001.)

<sup>21</sup>Peter Drucker was one of the first to write extensively regarding information work and information workers; he termed them “knowledge workers.” (See, for example, Drucker 1989, 1993.) Reich (1991) postulated that three broad categories of work are emerging: routine production services, in-person services, and symbolic-analytic services. The latter category, constituting “information work,” represents an ever-increasing fraction of the whole in many nations.

<sup>22</sup>This process is already well along in the United States, as predicted by Reich (1991) and described in Kotkin (2000).

<sup>23</sup>The recent dot-com crash and telecom implosion have slowed the pace of these changes somewhat in some sectors of the business and financial world. We view this as only a temporary phenomenon.

<sup>24</sup>*BusinessWeek* (2001) provides an overview of the dot-com crash; *The Economist* (2002b) describes the business and financial crisis in the global telecommunications industry in recent years.

<sup>25</sup>The monthly “Cash Flow” column in the magazine *Red Herring* tracks the rate of investment, by venture capitalists and others, in new IT-related businesses, both in the United States and around the world. The data presented in this column over time clearly show the marked drawdown in such investments since the venture capital investment peak in 2000.

<sup>26</sup>The railroad boom and bust in the 1870s is a classic example of this phenomenon. In the early 1870s, railroads drove economic expansion in the United States and created wealth much like telecom and Internet investment did in the 1990s. According to Davis (2002):

Intercontinental railroads turned the U.S. into a unified market from coast to coast. Retailers expanded to supply immigrants building the tracks. Land values soared along the routes. Cargo that had taken weeks to travel by boat and wagon moved in days, a speed-up as revolutionary as the one that networked computers brought in the 1990s.

The railroad era was riddled with miscalculation and speculation, with the speculators growing rich—temporarily. In 1873, everything collapsed. Again according to Davis:

An over extended railroad financier . . . declared bankruptcy, setting off a panic on Wall Street. The New York Stock Exchange closed for 10 days. A fifth of the railroads filed for bankruptcy. The stocks sank by a third between the end of 1873 and the middle of 1877.

But then things turned around. Returning to Davis:

But then the railroads once again powered an expansion. . . . By 1880, technological gains, including mightier locomotives and better signal systems, were reducing shipping costs for manufacturers and department stores. The 1881 arrival of refrigerated rail cars helped create a national meatpacking industry. Montgomery Ward turned to railroads to deliver catalogs and fill orders. As demand surged, mothballed railroads came back into service, and more were built. Railroad stocks revived.

This resumption of growth in railroad-related industries proved to be stable and enduring, paving the way for several decades of U.S. economic growth. (See Davis, 2002, for a longer discussion of the 1870s railroad bubble, its collapse, and the subsequent resumption of long-term technology-driven growth.)

<sup>27</sup>Spar (2001) describes similar phases of early euphoria, a subsequent investment bust and industry consolidation, a period of restrained activity, and then the resumption of enduring growth, during the early stages of the telegraph, radio, and television industries.

<sup>28</sup>*BusinessWeek* (2001) provides a vision of how IT-related industries will recover from their current malaise and continue to transform the business and financial world—in its words, “unevenly and in stages.”

<sup>29</sup>In response to market forces, up until now functionality has almost always been given much greater weight than security in the design of new IT systems and networks and their subsequent implementation and operation. This has led to a situation where security vulnerabilities are commonplace, security incidents are a frequent occurrence, and the business community—except for the financial services industry—has treated these incidents as a “cost of doing business.” (PCIPB, 2002, gives an overview of the state of security, and insecurity, in cyberspace today, as well as an outline of the things that the business community, as well as other users of cyberspace [e.g., government, higher education, individual home users], need to do to secure cyberspace.)