Whatever happened to the New Economy?

McKinsey Global Institute

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McKinsey Global Institute

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The institute's staff members are drawn primarily from McKinsey's consultants. They serve 6- to 12-month assignments and then return to client work. MGI also commissions leading academics to participate in its research. The institute's director is Diana Farrell, a McKinsey partner. MGI has locations in Washington, DC and San Francisco, California.

PREFACE

"Whatever happened to the New Economy?" distills insights from more than two years of MGI research on the relationship between information technology (IT) and labor productivity. Technology is one of the most important forces at work in the global economy and information technology is increasingly built into most aspects of modern economic activity. This paper is unusual for MGI in that it brings together key insights from various reports to generate a unique perspective on technology and what the so-called "new economy" is and is not. The release of "Whatever happened to the New Economy" is part of the fulfillment of the McKinsey Global Institute's (MGI's) mission to help global leaders: (1) understand the forces transforming the global economy, (2) improve the performance of their corporations, and (3) work for better national and international policies.

This paper builds on three separate MGI reports. In October 2001, MGI's first US productivity growth report[1] found that IT was only one of several factors at work in the acceleration of US productivity during the mid-1990s, but that it did enable some of the managerial innovations that generated rapid growth. In October 2002, MGI's report on French and German productivity growth[2] highlighted the role of business and technology innovations in driving productivity growth, and the external environmental differences that helped explain differences in the ability of different countries to diffuse innovations or leverage their benefits to scale. Finally, in November 2002, MGI's second report on US productivity growth during the 1990s[3] examined the characteristics of IT applications that had the greatest impact on productivity, concluding that they were generally tailored to sector-specific business processes, deployed in a sequence that built capabilities over time, and co-evolved with managerial and technical innovation incrementally.

These three reports were the result of fruitful collaboration between MGI and various practices and offices, including specifically McKinsey's High Tech Practice (both US reports), French and German offices (the France/Germany report), the Business Technology Office (the second US report) and the sector practices for the sectors studied in each case. The first US report was conducted under the direction of Bill Lewis (MGI's founding director), Mike Nevens, Lenny Mendonca, and Vincent Palmade, with the assistance of Greg Hughes and James Manyika. The France/Germany report was carried out under the direction of Heino Faßbender, Eric Labaye, Vincent Palmade, and myself. The second US

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1 MGI "US Productivity Growth 1995-2000, Understanding the Contribution of Information Technology Relative to Other Factors," released October 2001.

2 MGI "Reaching Higher Productivity Growth in France and Germany," released October 2002.

3 MGI "How IT Enables Productivity Growth: The US experience across three sectors in the 1990s," released November 2002.

report was also conducted under my direction, along with Lenny Mendonca, Mike Nevens, James Manyika, Shyam Lal, and Roger Roberts.

In addition, our work benefited tremendously from in-depth discussions with an external advisory board. The committee members for the first US report were Robert Solow—MIT, chairman; Barry Bosworth, Brookings Institution; Ted Hall, retired McKinsey partner; and Jack Triplett, Brookings Institution. The committee members for the France/Germany report were Olivier Blanchard, MIT; Martin Baily, Institute for International Economics; Hans Gersbach, University of Hedidelberg; Monika Schnitzer, University of Munich; Robert Solow, MIT; and Jean Tirole, University of Toulouse. Martin Baily also played a principal advisory role on the second US report.

Baudouin Regout and Allen Webb (first US report), Thomas Kneip and Stephan Kriesel (France/Germany report), and Terra Terwilliger (second US report) were responsible for the day-to-day management of the individual projects. Allen Webb led the development of this paper cutting across all three reports. More than 25 other McKinsey consultants comprised the dedicated working teams that carried out the research. These consultants, while too numerous to list here, were critical to the successful completion of the reports, and are credited by name in each report.

Throughout these projects we also benefited from the unique worldwide perspectives and knowledge that McKinsey consultants brought to bear on the industries researched in our case studies. Their knowledge is a product of intensive work with clients and a deep investment in understanding the structure, dynamics, and performance of industries to support client work. McKinsey sector leaders provided valuable input to our case studies and reviewed our results. McKinsey's research and information specialists provided timely response and critical information under trying deadlines. Finally, we appreciate the warm response, useful information, and insight we received from numerous interviews with corporate executives, industry associations, government officials, and others. We thank all those who gave us their time and help.

Before concluding, I would like to emphasize that this work is independent and has not been commissioned or sponsored in any way by any business, government, or other institution.

Diana Farrell
Director of the McKinsey Global Institute
November 2002

INTRODUCTION

The shift from embrace to repudiation of a "new economy" has been rapid and dramatic. Before the NASDAQ bubble burst, assertions abounded that information technology and the Internet were "changing everything." Today, with the technology sector mired in a deep slump, hyperbole has given way to despair. The truth, of course, lies somewhere in between. But where?

Defining the "new economy" is a helpful starting point in determining where reality resides. An economic definition is, "faster productivity growth fueled by investments in information technology hardware and software." During the boom, new economy proponents highlighted the acceleration of labor productivity growth rates in the United States (from 1.4% during 1973-1995, to 2.4% from 1995 to 2000). US productivity growth has continued to be relatively strong during the current economic downturn (rising at 1.8% during 2001 and at even faster rates, so far, during 2002). But nominal IT investment rates, which had surged from historical levels of 8-10% to 15% during 1995-2000, slipped into negative territory during 2001, and continue to languish.

These facts could support a variety of positions in the new economy debate. Continued strong US performance during the IT spending slowdown might indicate the absence of a strong relationship between IT and labor productivity, or simply that firms are continuing to benefit from the large stock of IT capital they have already accumulated. Clouding the picture further is the performance of rich industrial countries in Western Europe such as France and Germany, which invested less in IT than the US during the 1990s, and experienced relatively slower productivity growth, after decades of growing more rapidly than the US. This performance reversal could reflect something fundamental about how firms in the three countries were using IT, or simply the exhaustion of readily available catch-up opportunities in France and Germany.

For over two years, the McKinsey Global Institute (MGI) has scrutinized the relationship between IT and labor productivity growth in the US, France, and Germany. In three separate reports, the latest of which, "How IT Enables Productivity Growth," is being released in November, 2002, simultaneously with this paper, MGI has emphasized that managerial innovation is the key driver of productivity improvement, that IT can play an important role in enabling such innovation, and that IT is not a panacea. Rather, creative management teams employ IT, along with other tools and investments, to develop product, process, and service innovations, and to leverage economies of scale. Firms, sectors, and countries adopt innovations unevenly; the rate at which advances diffuse helps explain aggregate productivity performance. These findings have held constant across the US, France, and Germany. While they might, upon their initial airing in 2001, have sounded cautionary to new economy proponents, in the context of today's technology bust they seem downright rosy.

MGI's broad findings have remained consistent, but the depth of research supporting them has increased enormously. Not only has MGI expanded its geographic coverage (to include France and Germany), but it has also intensified within several US sectors its investigation of exactly where, when, and how IT does enable the managerial innovation that drives productivity growth. (See Box for details on MGI's full body of research.) This deeper research base lends additional support to the view MGI expressed in October, 2001, that many of the post-1995 productivity improvements achieved in the US were structural in nature, and would be sustained—a view that has been borne out by productivity performance over the last year.

Taken as a whole, MGI's work shows that the new economy was quite badly misconstrued in the past, and that recent reports of its demise have been greatly exaggerated. Our intent in this paper is to correct past misunderstandings by setting forth four perspectives on IT and labor productivity.

¶ **Robust but mixed productivity performance in the US, France, and Germany.** The US, France, and Germany all experienced fairly robust productivity growth during the 1990s. Uniquely, the US productivity growth rate accelerated after 1995. In all three countries, performance varied widely across sectors. The IT-producing sectors contributed disproportionately to US growth, and more external/regulatory barriers to innovation and growth remain in France and Germany than in the US.

¶ **No simple, positive correlation between IT and productivity.** IT is not a silver bullet able to singlehandedly drive productivity improvement. At the economy-wide level, MGI found no correlation between jumps in productivity, and jumps in IT intensity. Moreover, our sector studies revealed specific instances where IT failed to raise productivity.

¶ **Business and technology innovation are the key drivers of productivity growth.** MGI's case studies of 20 industries in the US, France, and Germany reveal that business and technology innovations have been the engine of productivity growth in all three countries. IT frequently played a critical enabling role by providing creative management teams with a powerful tool they could use to innovate and leverage economies of scale. The rate at which innovations diffuse, and the extent to which they are fully leveraged to scale, both within and across sectors, help explain productivity performance.

¶ **Effective IT applications share three characteristics.** IT applications have their greatest impact when they are tailored to sector-specific business processes, deployed in a sequence that builds capabilities over time, and co-evolved with managerial and technical innovation incrementally.

The implication of these findings is that businesses and governments seeking to make the most of IT do not need an "IT agenda." Rather, users of IT need an "innovation agenda" that involves IT. Vendors of IT need an "enabling agenda" designed to tailor their products and value propositions to the key business processes and performance levers of specific customer segments. Finally, governments need a "competition agenda" that drives firms to develop and leverage innovations, and those innovations to diffuse.

BOX

MGI's body of research on IT and labor productivity

The conclusions in this paper rest upon an enormous body of research. Since mid-2000, MGI, in conjunction with McKinsey's High Tech Practice, Business Technology Office, and French and German offices, has intensively studied the relationship between IT and labor productivity. MGI has tackled this topic through three separate studies:

¶ **US productivity growth, 1995-2000.** From September, 2000, to October, 2001, MGI sought to determine what caused the 1995-2000 acceleration in US labor productivity growth and, in particular, what role IT played in it. MGI's conclusion was that productivity acceleration was concentrated in six sectors. Within those sectors, innovation, regulatory changes and demand factors played key causal roles. Heightened competitive intensity was a crucial catalyst through which these factors acted, and IT was one of many operational factors contributing to the jump. MGI released this report in October, 2001.

¶ **Reaching higher productivity growth in France and Germany.** In October 2001, MGI turned to Europe in search of the key drivers of and barriers to productivity growth during the 1990s in France and Germany, especially in comparison to the US. In particular, MGI sought to determine the role of IT. The conclusion was that, as in the US, business and technology innovation were the engines of productivity growth in France and Germany during the 1990s. Differences in the regulatory environment and domestic demand help explain differences in the ability to diffuse innovations or leverage their benefits to scale, leading to significant differences in productivity performance between countries. MGI released this report in October, 2002.

¶ **How IT enables productivity growth.** The conclusion of "US Productivity Growth, 1995-2000," that IT was one of many factors contributing to the US productivity acceleration, begged an important question: How exactly did IT enable the managerial innovation that drove productivity growth in the US during the 1990s, and by what process? MGI tackled this question in the spring of 2002, and concluded that IT applications that had high impact generally were tailored to sector-specific business processes and linked to key performance levers, deployed in a sequence that built capabilities over time, and co-evolved with managerial and technical innovation. MGI released this report in November, 2002.

MGI's conclusions in each of these studies rest on a unique fact base: detailed case studies of 20 industries (8 in the US, 6 in Germany, and 6 in France). Although these case studies began with industry-level government productivity statistics, MGI's researchers also drew heavily upon McKinsey's sector-specific industry expertise, measured productivity performance using alternate data sources, and conducted discussions with executives at firms important to our case studies. This detailed, micro-level analysis enabled MGI to develop a perspective on what influenced productivity performance and what was the role of IT in the sectors studied. We believe that this view from the trenches and our access to industry experts makes the contribution of this analysis distinctive.

ROBUST BUT MIXED PRODUCTIVITY PERFORMANCE IN THE US, FRANCE, AND GERMANY

The US, France, and Germany all experienced fairly robust labor productivity growth during the 1990s (Exhibit 1). Uniquely, the US productivity growth rate accelerated after 1995, reversing a trend of faster French and German growth that had persisted for decades. Consequently, French and German catch-up to US productivity levels has stopped, and the US continues to have higher labor productivity levels in most economic sectors. These trends mark the point of departure for MGI's work. For the purposes of this discussion on the relationship between IT and labor productivity, four points bear mentioning:

Widespread, and uneven growth in the US

Forty-three of 58 US sectors, representing 73% of GDP, experienced positive productivity growth in the 1990s (Exhibit 2). However, the productivity gains were not distributed evenly across these 43 sectors. In fact, six sectors of the economy, comprising 32% of GDP, contributed 66% of the gross productivity gains experienced in the US economy, and 76% of net productivity growth (after subtracting out negatively contributing sectors). The sectors were semiconductors, wholesale, securities, retail, computer assembly, and telecom.[1] These same six sectors were responsible for most of the US' post-1995 productivity acceleration.[2]

The implication for this discussion is two-fold. First, the widespread, positive productivity gains experienced by the US reflect a dynamic environment in which a deep group of sectors and firms were making consistent operational improvements. Second, the concentrated nature of the economy-wide gains indicates that economies do not change monolithically. Rather, shifts in the behavior and performance of a relatively small set of sectors and firms can play a major role in driving national economic outcomes. In short, the core explanation for a country's performance lies in the stories of its individual sectors.

Mixed French and German productivity performance

While overall French and German productivity growth lagged that in the US after 1995, this was not a result of across-the-board underperformance. Indeed, as Exhibit 3 highlights, some French and German sectors studied by MGI (e.g., fixed and mobile telecom, road freight, and banking) grew considerably faster than their counterparts in the US, while others (e.g., electricity generation, food retail, and

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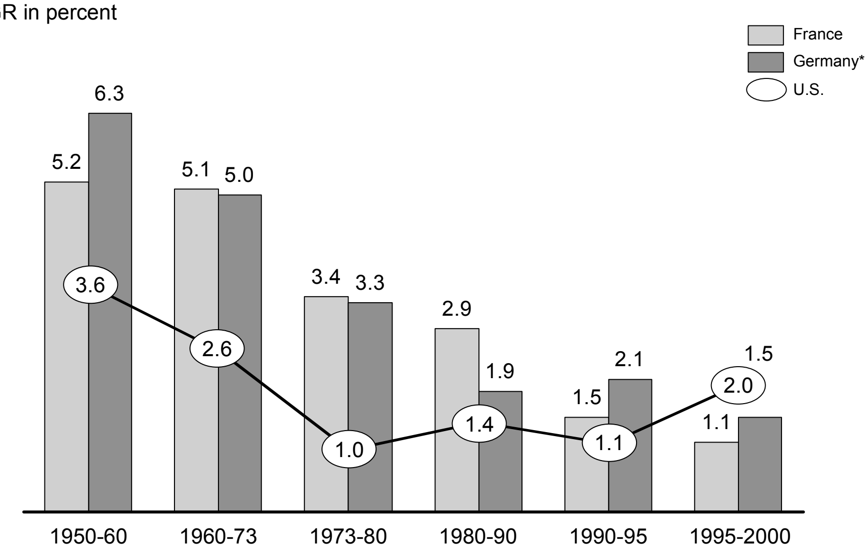
1 Semiconductors and computer assembly are the segments of electronics and industrial machinery and equipment, respectively, that drove productivity growth in those sectors. See MGI's report, "US productivity growth, 1995-2000," for details.

2 The six sectors contributed 99% of net, economywide acceleration and 74% of gross acceleration.

Exhibit 1

COMPARISON OF LABOR PRODUCTIVITY GROWTH RATES, 1950-2000

CAGR in percent



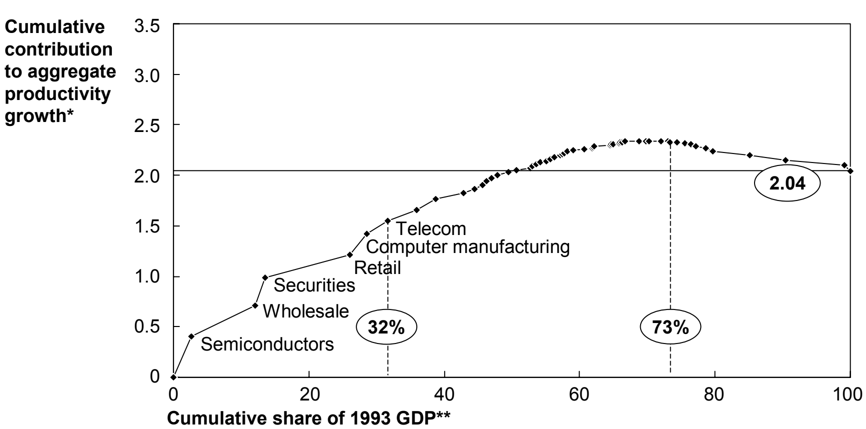
* Until 1989 only West Germany; the year 1990 was omitted due to variances attributable to reunification

Source: Groningen University and The Conference Board: GGDC total economy database, 2002

Exhibit 2

U.S. PRODUCTIVITY GROWTH IN THE 1990S WAS CONCENTRATED IN 6 SECTORS, THOUGH MOST EXPERIENCED GAINS

Percent



* CAGR from 1993-2000; does not include farm and government sectors; real estate and holdings contribution evenly divided among sectors excluding the top 6

** GDP does not include farm, government, holdings, and real estate sectors

Note: MGI's U.S. Productivity Growth report identified semiconductors and computer manufacturing as the predominant (by contribution to growth) subsectors of electronic machinery and industrial machinery, thus the sector and the corresponding subsector are used interchangeably in this chart

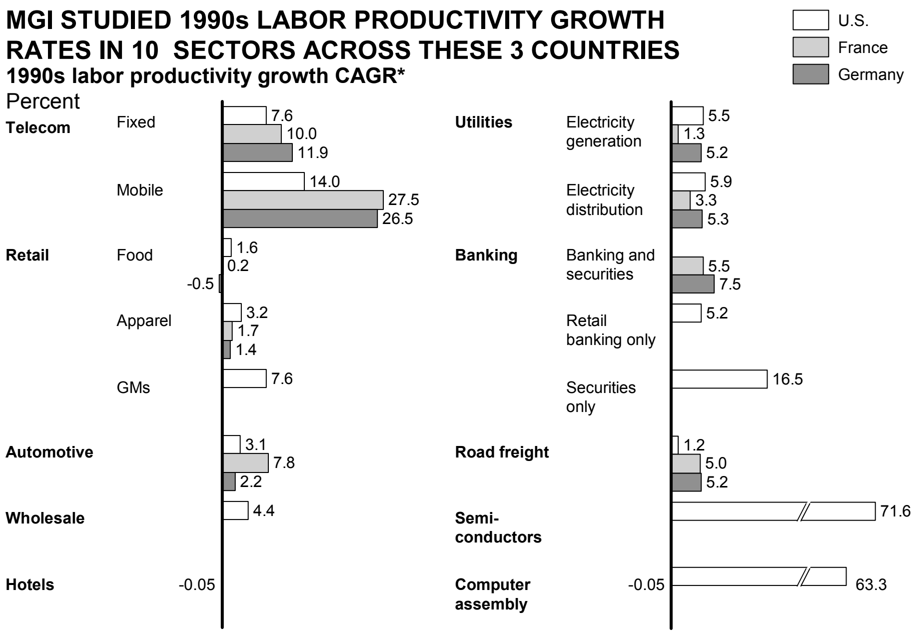
Source: Bureau of Economic Analysis; MGI analysis

Exhibit 3

MGI STUDIED 1990s LABOR PRODUCTIVITY GROWTH RATES IN 10 SECTORS ACROSS THESE 3 COUNTRIES

1990s labor productivity growth CAGR*

Percent



* Telecom and road freight 1992-2000; automotive and utilities 1992-1999; banking 1994-2000; retail, wholesale, hotels, retail banking only, securities only, semiconductors and computer assembly 1993-2000

Source: MGI; BEA

apparel retail) grew more slowly. Importantly, the productivity *level* of nearly all these sectors remains below that of the US. Moreover, no relationship appears to exist between the degree of over- or under-performance in terms of growth during the 1990s, and the sector's productivity level vis-à-vis the US (Exhibit 4). The causes of divergent sector performance, therefore, are unlikely to lie in across-the-board explanations such as the amount of "catch-up" opportunity available to the sector.

Larger IT producing sectors in the US

The IT producing sectors (excluding telecom) are considerably larger in the US (2.3% of GDP) than in France and Germany (1.3% and 1.5%, respectively) (Exhibit 5). If telecom is included, the IT producing sectors contributed more than a third of overall productivity growth in the US (Exhibit 6). Moreover, roughly one-third of the difference between US and French/German growth rates during the 1990s resulted from the larger contribution of the US IT producing sectors.

However, it is important to note that the IT producing sectors were not the key drivers of the post-1995 performance divergence between the US, on the one hand, and France, and Germany, on the other. As Exhibit 5 reveals, the incremental, post-1995 contribution of the US IT producing sectors vs. those in France can only have been roughly 0.1% (Exhibit 5).

Regulation and other external factors impact performance

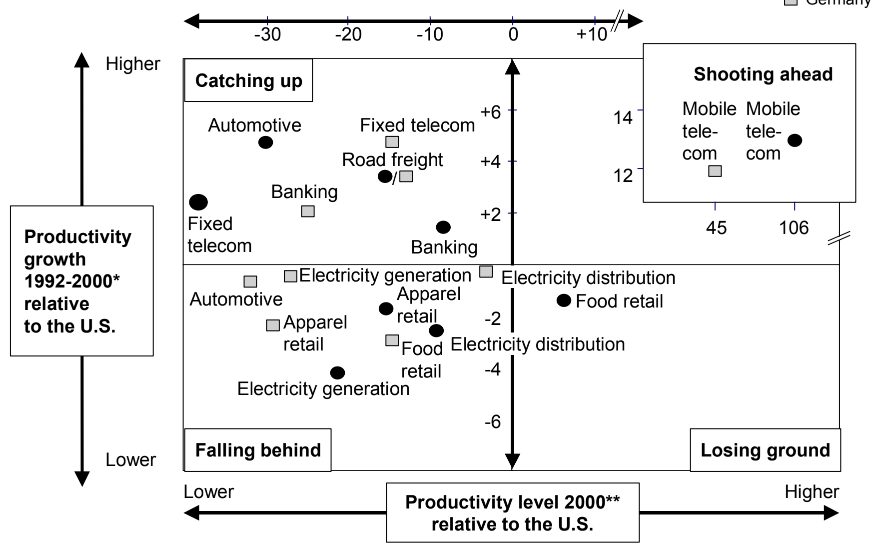
It is impossible to understand differences between US, French, and German performance without investigating the external factors at work in each country. While vigorous competition and regulatory change contributed to productivity growth in all three countries, fewer external barriers to innovation and growth appear to have existed in the US, which help explain that country's stronger performance after 1995. (See Appendix, "How regulation and other external factors impacted performance," for a richer discussion.)

Competition and regulatory improvement spur growth

Intense competition and regulatory improvement frequently spurred productivity growth and the diffusion of business and technology innovation in the US, France, and Germany. Sector-specific examples abound, only a few of which are enumerated here. For example, new SEC rules promoting lower spread trading regimes led to price declines, higher trading volumes, and productivity improvement for the US securities sector. Productivity in the US mobile telecom sector benefited from the auction of additional spectrum, which led to increased competition, price declines, higher usage levels, and improved performance. French and German mobile telecom grew even faster because some of the regional US providers were sub-scale, indicating room for further performance-enhancing regulatory change in the US. In Europe, the liberalization of the fixed-line

Exhibit 4

FRENCH AND GERMAN PRODUCTIVITY PERFORMANCE RELATIVE TO THE U.S.

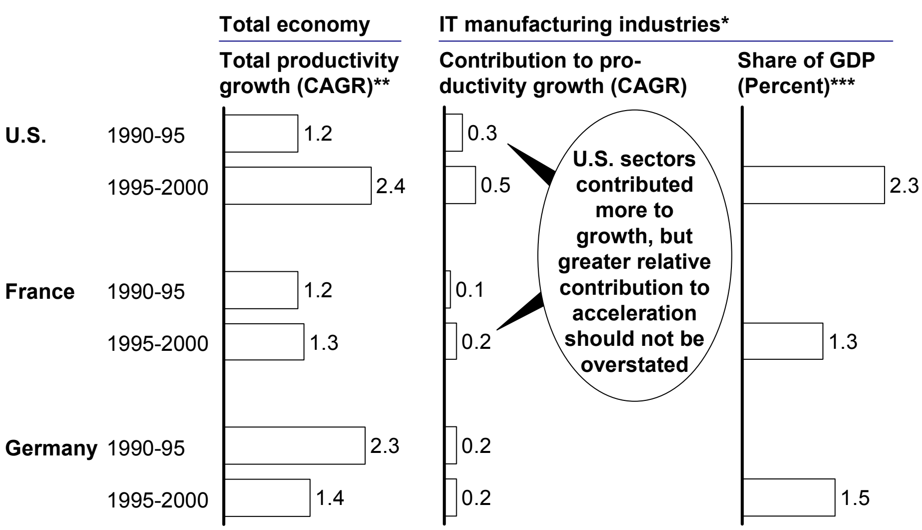


* Automotive and utilities 1992-99; banking 1994-2000, retail 1993-2000
** 1999 for automotive and utilities

Source: MGI analysis

Exhibit 5

CONTRIBUTION TO GROWTH BY IT MANUFACTURING INDUSTRIES



* IT manufacturing industries defined as office, accounting, and computing machinery; insulated wire and cable; radio, television, and communication equipment; medical appl. and appl. for measurement, etc.
** Numbers are different from exhibit 1 as they are based on persons employed in production, not hours worked; in addition some adjustments were made by the authors of the analysis cited to ensure comparable accounting of IT
*** 1999 for France and Germany; 2000 for the U.S.

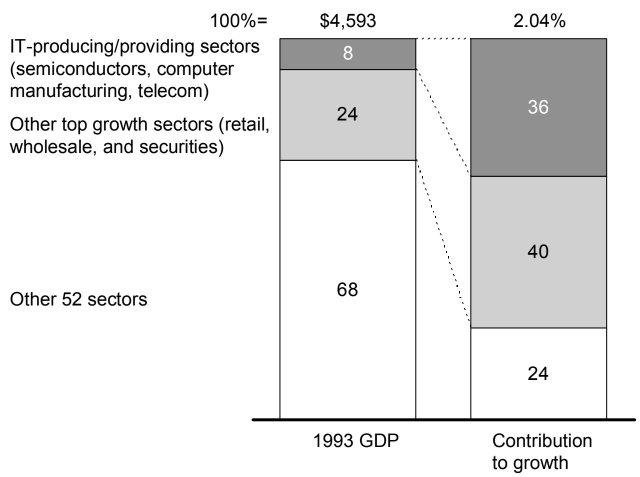
Source: Van Ark, Bart; Inklaar, Robert; McGuckin, Robert H.: "Changing Gear: Productivity, ICT and Service Industries: Europe and the United States" 2002

Exhibit 6

IT-PRODUCING SECTORS CONTRIBUTED DISPROPORTIONATELY TO PRODUCTIVITY GROWTH IN THE U.S.

1993-2000 CAGR

Percent; $ Billions



Note: Farms, real estate, holdings, and government excluded from GDP calculations; contributions from these sectors to growth distributed among sectors excluding top 6

Source: Bureau of Economic Analysis; MGI analysis telecom business forced incumbents to improve their operational performance, leading to a steep workforce reduction at Deutsche Telekom and, to a lesser extent, at France Telecom. Similarly, the gradual removal of import quotas for Japanese cars threatened the profitability of French auto makers, who reacted by implementing best practice operational processes.

Remaining external barriers to growth

In spite of these success stories, more external barriers to innovation and growth appear to remain in Europe than in the US, which likely contributes to persistent productivity differentials. Three key differences exist across the US, France, and Germany. The first are regulatory differences, which are often closely linked with the second, differences in corporate governance. Third are differences in demand. The discussion that follows focuses on regulatory and corporate governance differences.[3]

More regulatory restrictions on products, services, distribution, and prices exist in Europe than in the US, impacting the degree of competitive intensity, the rate at which innovation diffuses, and likely the size of the productivity gap between the US and Europe. For example, French hypermarkets have established a very strong market position and are effectively protected from innovative competitors by zoning laws. Traditional, less productive stores are also protected, and the modernization of the format landscape has slowed down. While French food retailers still lead international comparisons, they started to lose ground in terms of labor productivity during the course of the 1990s.

Competition was also distorted in the German banking sector, where small, state-owned and cooperative banks were, because of their ownership structure, prevented from building sufficient scale, and were not exposed to shareholder pressure from capital markets. The resulting fragmentation put the German banking sector at a significant productivity disadvantage compared to France and the US (Exhibit 7). These barriers remain and continue to impact corporate governance. Governance issues also exist in other sectors. For example, many more top retailers are publicly traded in the US than in France and Germany (Exhibit 8). The more private nature of the sector has impeded retail consolidation in Germany.

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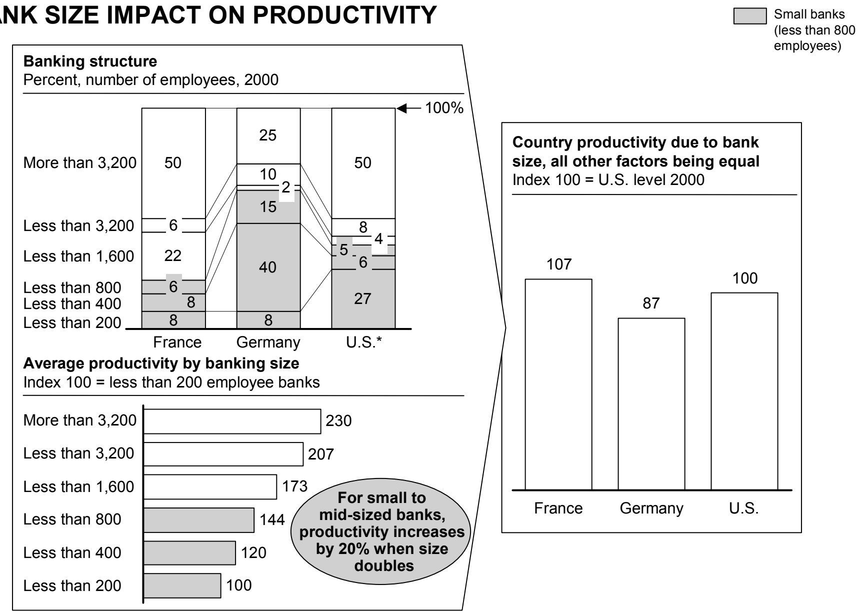
3 See Appendix and "Reaching higher productivity growth in France and Germany" for detailed treatment of demand differences, which are not addressed here to simplify the discussion.

Exhibit 7

BANK SIZE IMPACT ON PRODUCTIVITY



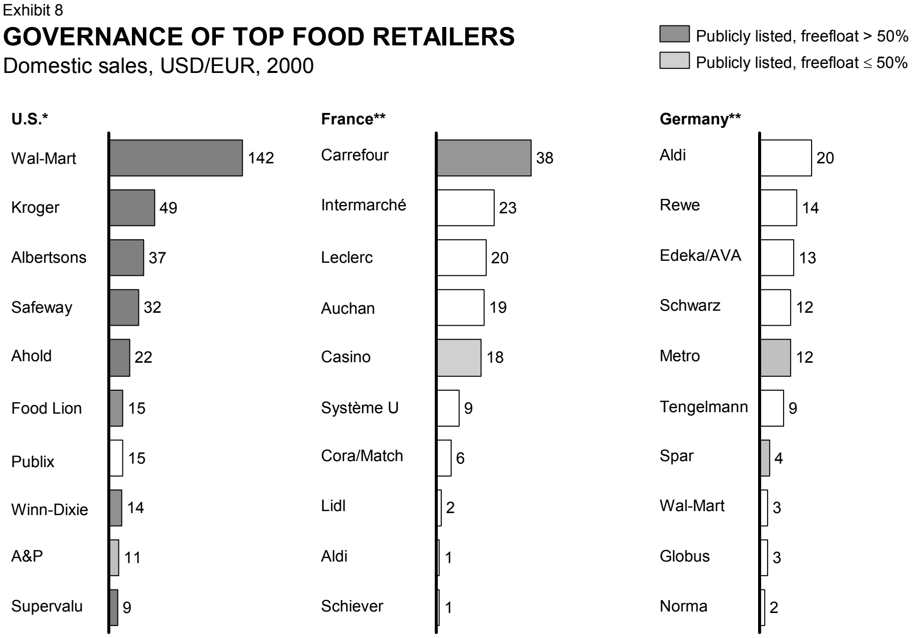
* 1997

Source: National bank associations; BLS; MGI analysis

Exhibit 8

GOVERNANCE OF TOP FOOD RETAILERS

Domestic sales, USD/EUR, 2000



* Net sales

** Gross sales

Source: Progressive Grocer, M+M Eurodata; Hoovers'; company information

France and Germany are not alone in suffering from external barriers to growth. Two US sectors that have experienced rapid productivity growth in recent years—mobile telecom and retail banking—could grow even faster with regulatory changes. (See Appendix for details.) Nonetheless, the US appears to be generally less heavily regulated than France and Germany, and this has likely influenced its relative, aggregate productivity performance.

NO SIMPLE, POSITIVE CORRELATION BETWEEN IT AND PRODUCTIVITY

IT is not a silver bullet able to singlehandedly drive productivity improvement. Indeed, at the economy-wide level, MGI found no correlation between jumps in the productivity growth rates of US sectors after 1995, and jumps in their IT intensity growth rates (Exhibit 9). Where cross-country comparisons are possible, there also does not seem to be a direct link between IT spending and relative labor productivity. In the retail banking sector, for example, French banks spend more on IT per unit of output than their counterparts in the US, yet suffer from lower labor productivity levels (Exhibit 10).

Simple correlations, of course, cannot definitively prove either causality, or the absence thereof. MGI's case study findings comprise a unique fact base shedding additional light on these complex relationships. At the sector level, numerous examples exist of IT investments whose productivity and/or profitability returns have been disappointing. For example, in French and German road freight, data exchange with customers, barcoding and scanning, and online freight exchanges have required large investments and generated fewer productivity benefits than in the US (Exhibit 11). Similarly, cross-sell rates in retail banking remain largely unchanged, despite significant investments in IT directed toward CRM and direct marketing (Exhibit 12). IT is not a panacea. Its impact depends upon the degree to which it enables the managerial innovation that ultimately drives productivity improvement.

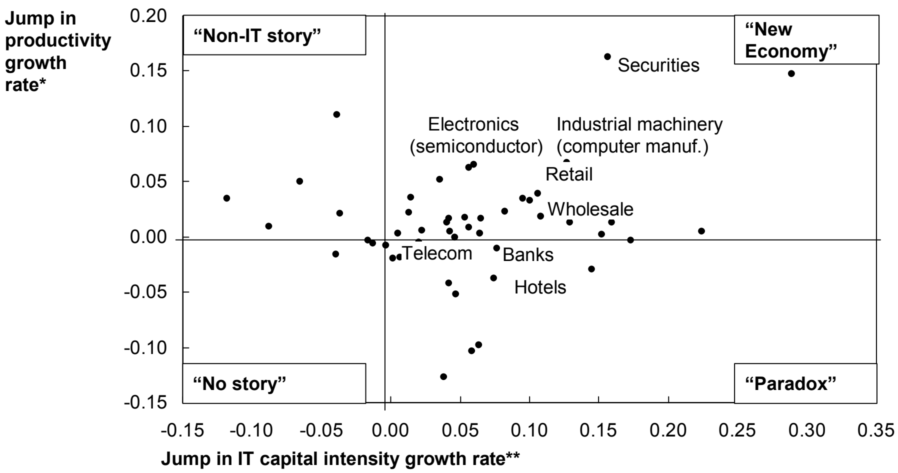
BUSINESS AND TECHNOLOGY INNOVATION ARE THE KEY DRIVERS OF PRODUCTIVITY GROWTH

MGI's case studies of 20 industries in the US, France, and Germany reveal that business and technology innovations have been the engine of productivity growth in all three countries. Productivity-enhancing innovations have come in the form of new products and services, such as mobile telephony, or in the form of business processes, such as further progress in back-office automation in retail banking. Innovative products and services have helped companies to shift sales to higher value goods, while best practice business processes improved operational performance. Both effects have led to improved productivity (Exhibit 13). During the 1990s, many of the new business innovations involved the application of information technology.

Exhibit 9

IT WAS NOT A SILVER BULLET; THERE WAS NO CORRELATION BETWEEN PRODUCTIVITY JUMP AND IT INTENSITY JUMP IN THE U.S.

CAGR, Percent



* Jump in real value-added per persons engaged in production (PEP) growth rate between 1987-95 and 1995-2000

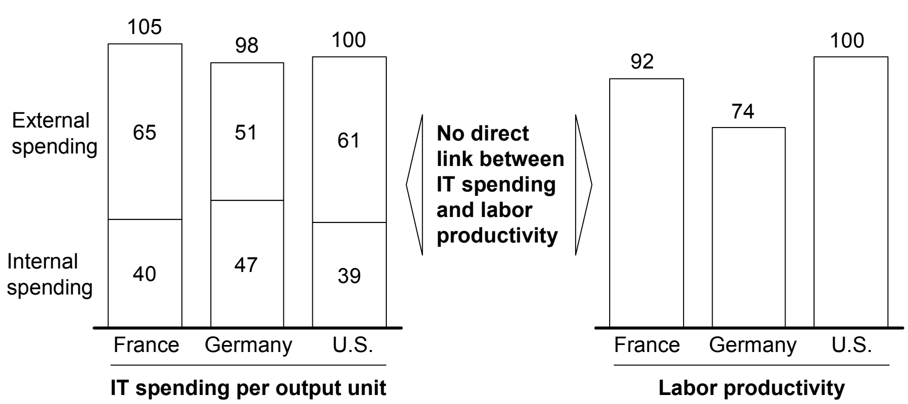
** Jump in real IT capital stock per PEP growth rate between 1987-95 and 1995-2000

Source: Bureau of Economic Analysis; MGI analysis

Exhibit 10

IT SPENDING* PER OUTPUT AND LABOR PRODUCTIVITY IN RETAIL BANKING – 2000

Index 100 = U.S. level 2000



* PPP-adjusted

Source: IDC; Tower Group; OECD; MGI analysis

Exhibit 11

GOALS AND IMPACT OF IT IN FRENCH AND GERMAN ROAD FREIGHT

ESTIMATE

● High impact
◑ Moderate impact
○ Little or no impact

Goals	IT initiatives	Total spending	Effect on productivity* Labor	Effect on productivity* Capital	Evaluation of overinvestment/ future potential	Impact in the U.S. during 90s
Operational excellence	• Data exchange with customers	◑	○	○	• Investments necessary to fulfill customer requirements, however, orders still keyed in manually	◑
	• Network optimization and dispatching	◑	◕	◕	• Most large players implemented it with positive impact, but not yet throughout their whole network	●
	• Barcoding and scanning	●	◔	◔	• Significant investments during end of 90s, high future potential	●
New products, services, or businesses	• On-line freight exchanges	●	◔	◔	• Possible area of overinvestment, as most start-ups failed	◑
	• Online T&T services	◑	◔	◔	• Offered only in LTL; little impact on productivity as most customers not willing to pay	◔
Exceptional events	• Integration of acquired companies	●	◔	◔	• Significant investments, high future potential	N/A
Maintenance	• Upgrading of existing IT systems	◑	◔	◔	• Investments in back-office software, e.g., SAP module; little impact on productivity	N/A
Regulatory requirements	• Implementation of trip recorders	◑	○	○	• Investments by drivers to comply legislation; not used in improving productivity	N/A

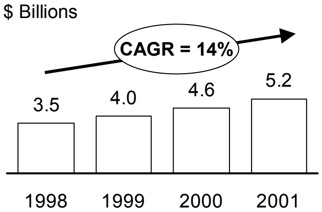
* Gross productivity increase; cost of IT investment not included

Source: Expert interviews; MGI analysis

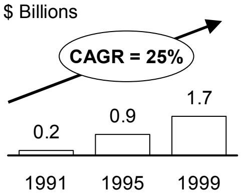
Exhibit 12

RETAIL BANKING CROSS-SELL RATES REMAIN LARGELY UNCHANGED DESPITE SIGNIFICANT INVESTMENTS IN TECHNOLOGY AND DIRECT MARKETING

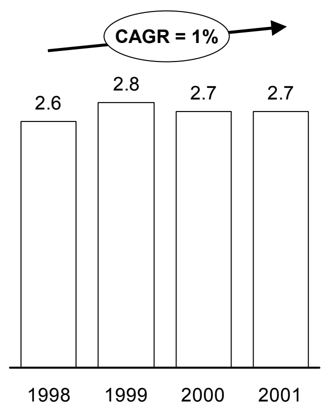
CRM IT spending by U.S. retail banks, 1998-2001
$ Billions



Direct marketing spending by U.S. retail banks* (assets >$5 billion), 1991-99
$ Billions



Average number of products held at primary bank, by household, 1998-2001

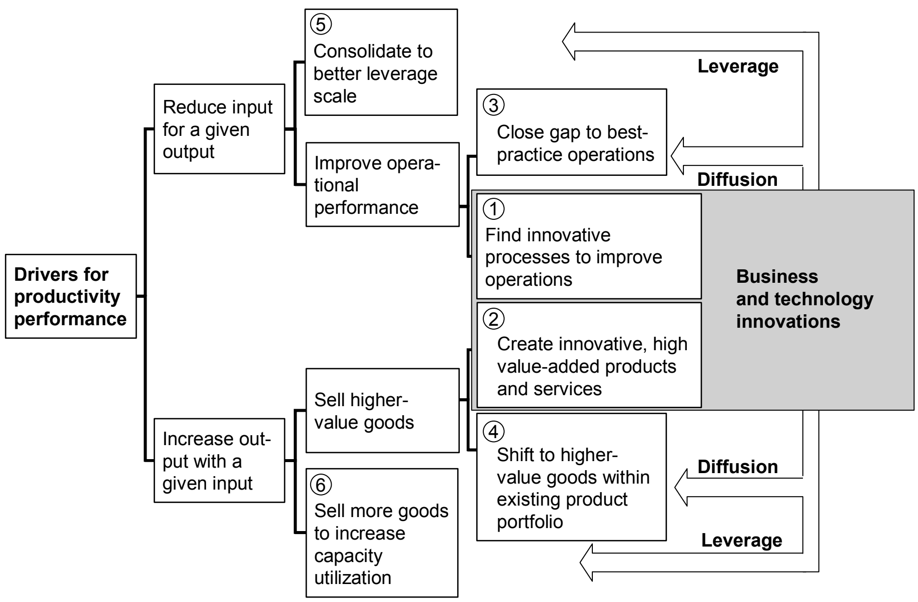


* Direct marketing includes direct mail literature, lists, postage, stuffers, and telemarketing

Source: Performance Solutions International (PSI) (2001); Tower Group (2001); ABA/BMA Bank Marketing Surveys (1992-2000)

Exhibit 13

PRODUCTIVITY PERFORMANCE DRIVERS



Source: MGI analysis

Innovation itself is only a partial explanation for economy-wide productivity performance. The diffusion of innovation (through replication by other firms and sectors) heightens the impact of product, process, or service improvements made by an individual firm or sector. Finally, even when diffusion is complete, the ability of firms to leverage innovations (particularly those based on IT) depends upon the firms achieving sufficient scale. At the sector level, the rapid development, diffusion, and leverage of innovation is likely to bring measurable productivity benefits. For individual firms, of course, there is no guarantee gains from successful innovations will not be rapidly competed away by fast followers.

The discussion that follows highlights prominent examples of innovation, diffusion, and leverage across the US, France, and Germany. (See Exhibit 14 for a summary of key examples.) Where appropriate, it also describes the role of IT in enabling the innovation or its diffusion/leverage.

Business and technology innovations

Firms in the US, France, and Germany innovated both by finding new ways to improve operations, and by creating new, high-value added goods. The retail banking and securities sectors in all three countries, and the wholesale sector in the US, are powerful examples of operational innovations:

¶ **Retail banking and securities.** New technologies gave rise to further back-office automation, and new sales channels such as online banking, online trading, and call centers. These new channels permitted significant labor savings (Exhibit 15). In French and German retail banking, for example, new types of back office automation and new sales channels, combined with the shift toward electronic payment formats, were the source of up to half of the productivity growth. In the US securities industry, the emergence of online channels permitted the sector to process explosive trading volume growth without adding the traders (comprising roughly 10% of sector employment) who would otherwise have been necessary. The adoption rate of online banking was much lower than that of online trading in all three countries, which kept the impact of online banking significantly below that of online trading.

¶ **US Wholesaling.** Warehouse automation technology in distribution centers contributed significantly to productivity growth in the US wholesaling sector. Relatively simple hardware (barcodes, scanners, picking machines, and other material handling equipment), combined with software (warehouse management systems for inventory control and tracking), allowed wholesalers to partially automate the flow of goods. The most dramatic impact of these systems was on the productivity of the picking, packing, and shipping workforce, which traditionally constituted about 40 percent of the labor force in distribution centers (Exhibit 16).

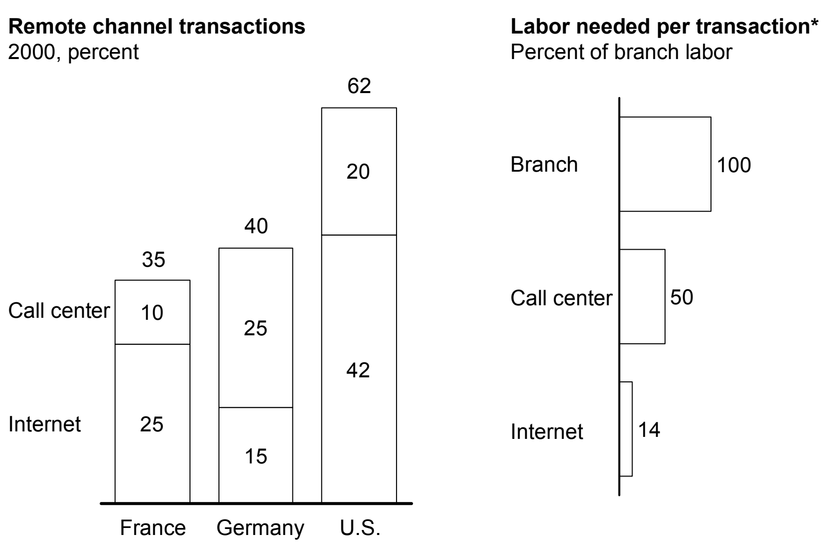
Exhibit 14

PRODUCTIVITY PERFORMANCE LEVERS AND EXAMPLES

	Productivity levers	Examples
Develop innovation	1. Find innovative processes to improve operations	• Emergence of on-line banking and brokerage in retail banking and securities • Warehouse automation in wholesale • Modular architecture in computer assembly
	2. Create innovative, high value-added products and services	• Emergence of mobile telephony • New generations of semiconductors • Assembly and sales of higher value components in U.S. PC manufacturing sector
Diffuse innovation	3. Close gap to best-practice operations	• Adoption of lean production methods by French automotive OEMs • Operational improvements in French/German fixed telecom • Increased load factors in European road freight • Supply chain management catch-up by Wal-Mart's followers (Target, Sears, K-Mart) in retail GMS • Operational improvements in German utility industry
	4. Shift to higher-value goods within existing product portfolio	• Substitution to higher value goods in U.S. apparel retail • Increased sales of high-value SUVs in U.S.automotive sector • Shift to more convenient service formats in retail banking (from tellers to ATMs, etc.) • ISDN in German fixed telecom
Leverage innovation	5. Consolidate to better leverage scale	• Consolidation of clerical/administrative functions in retail banking • Consolidation of road freight industry • Consolidation of U.S. wholesale pharmaceutical industry
	6. Sell more goods to increase capacity utilization	• Increased transaction processing in retail banking (e.g., account balances) • Reduced stockouts in retail (through supply chain optimization)

Exhibit 15

ON-LINE BROKERAGE – POPULARITY AND LABOR NEEDED

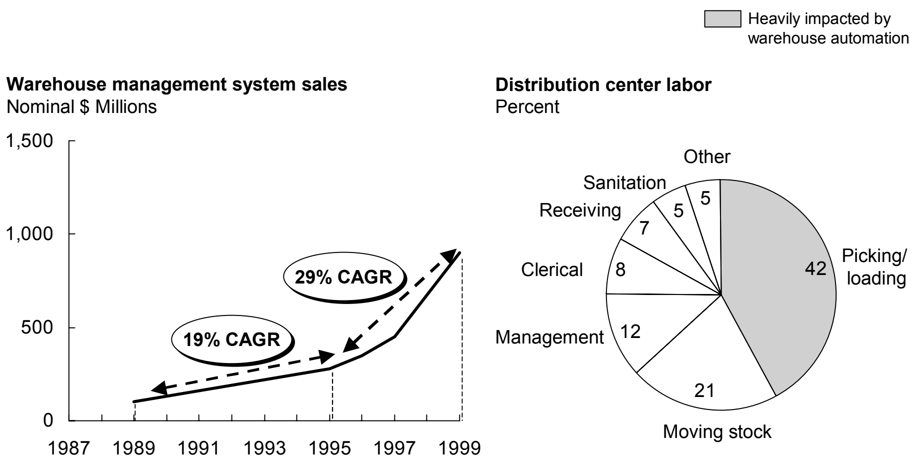


* Estimates using cost data by channel, 100 = EUR 1.10

Source: IDC; JP Morgan; MGI analysis

Exhibit 16

WAREHOUSE AUTOMATION IN THE U.S. REDUCED THE LARGEST LABOR COST CATEGORY



Source: AMR Research; NWDA

In addition to enabling process improvements, IT also played a key role in the creation of new, high-value goods and services. This was particularly the case for the mobile telecom and semiconductor sectors.

¶ **Mobile telecommunications services.** The success of mobile communication technology created a whole new business segment and shaped the productivity performance of the industry in all three countries (Exhibit 17). Mobile telecom came into its own during the 1990s because technical innovations increased capacity, driving price reductions, usage jumps, and ultimately productivity jumps. A key innovation was digital cellular equipment based on new standards (e.g., CDMA, TDMA, D-AMPS) that allowed service providers to use spectrum more efficiently. These new technologies, along with operation support systems, made large contributions to mobile telecom growth, and in so doing to the performance of the telecom sector as a whole (Exhibit 18).

¶ **US Semiconductors.** The US semiconductor industry experienced exponential, measured productivity growth (Exhibit 19) due to rapid improvements in microprocessor performance. Performance improvement was necessary to meet the demand for more powerful PCs capable of running ever-more demanding software. IT, in concert with improved material and process technologies, allowed firms to respond to the increases in demand from the PC industry (Exhibit 20). Specifically, IT applications such as Electronic Design Automation (EDA) tools, process control software embedded in fabrication equipment, and yield optimization software for testing and inspection equipment enabled design and manufacturing process improvements (Exhibit 21).

Diffusion of innovation

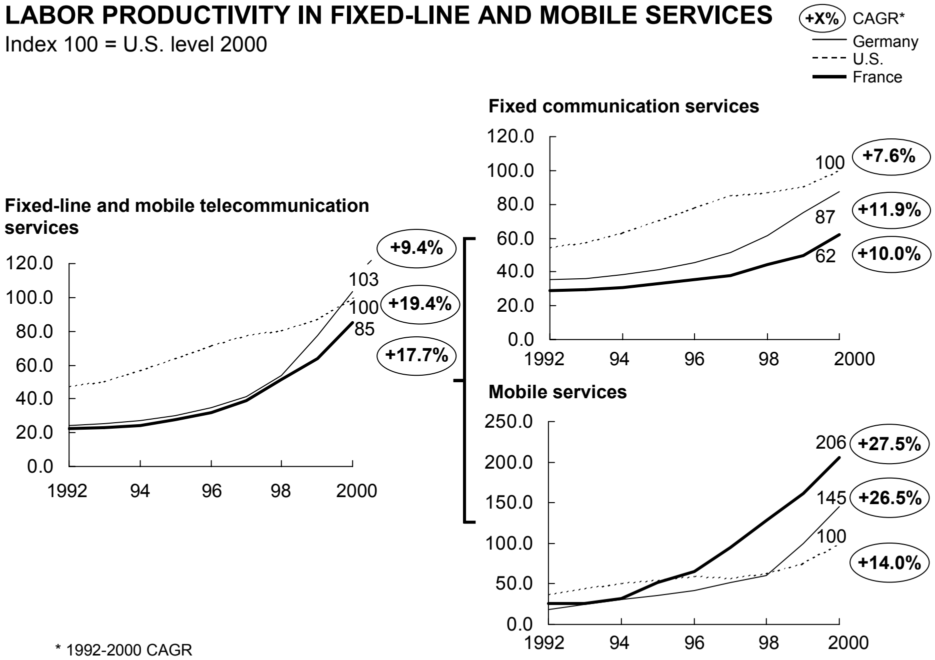
Some innovative business processes diffused with great effect across the borders of firms and countries during the 1990s. The processes themselves were not new, and did not rest upon the innovative use of emerging technologies. However, IT facilitated the application of the processes in some instances. Two prominent examples of this sort of diffusion were in the French automotive industry and the retail sector.

¶ **French automotive.** French OEMs implemented best practice processes such as lean manufacturing, improved procurement, and design simplifications that were already established in other markets. This helped them boost labor productivity significantly in the late 1990s, and contributed to the dramatic productivity growth rate differences between France (14.7 percent) and Germany (1.5 percent) between 1996 and 1999 (Exhibit 22). Lean manufacturing emerged during the 1970s as a result of innovations by Japanese OEMs such as Toyota, and did not initially

Exhibit 17

LABOR PRODUCTIVITY IN FIXED-LINE AND MOBILE SERVICES

Index 100 = U.S. level 2000



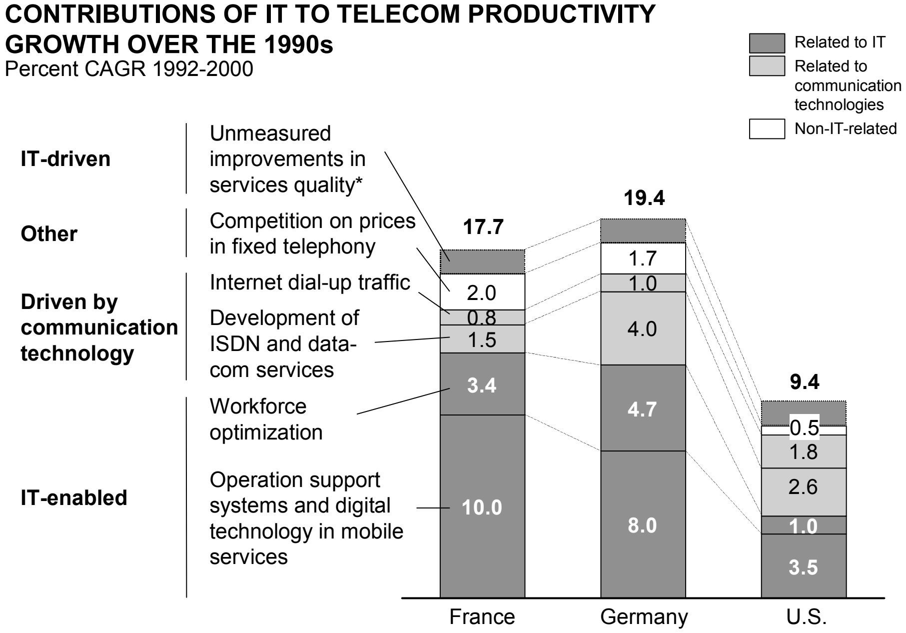
* 1992-2000 CAGR

Source: FCC; NECA; CTIA; RegTP; ART; ITU; OECD; Gartner/Dataquest; annual reports; operators' websites; MGI analysis

Exhibit 18

CONTRIBUTIONS OF IT TO TELECOM PRODUCTIVITY GROWTH OVER THE 1990s

Percent CAGR 1992-2000



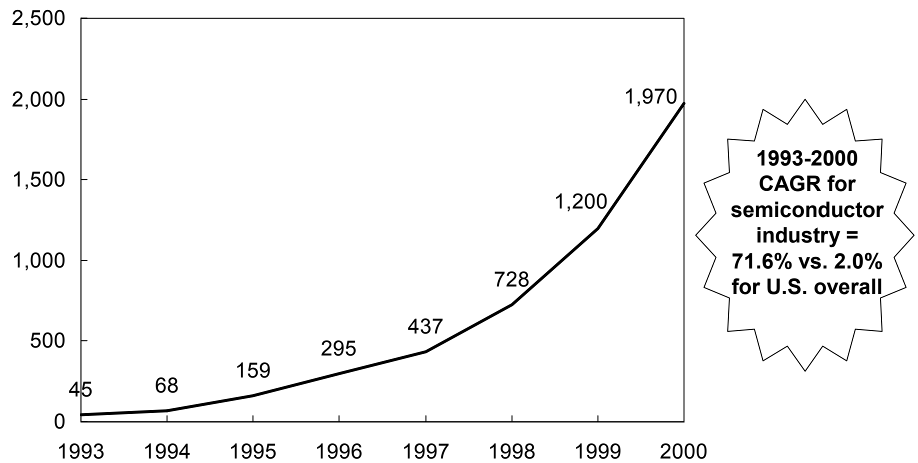
* E.g., decreases in delays for access line provisioning, call-center automation, etc.

Source: MGI analysis

Exhibit 19

U.S. SEMICONDUCTOR SECTOR EXPERIENCED EXPONENTIAL LABOR PRODUCTIVITY GROWTH IN 1990S

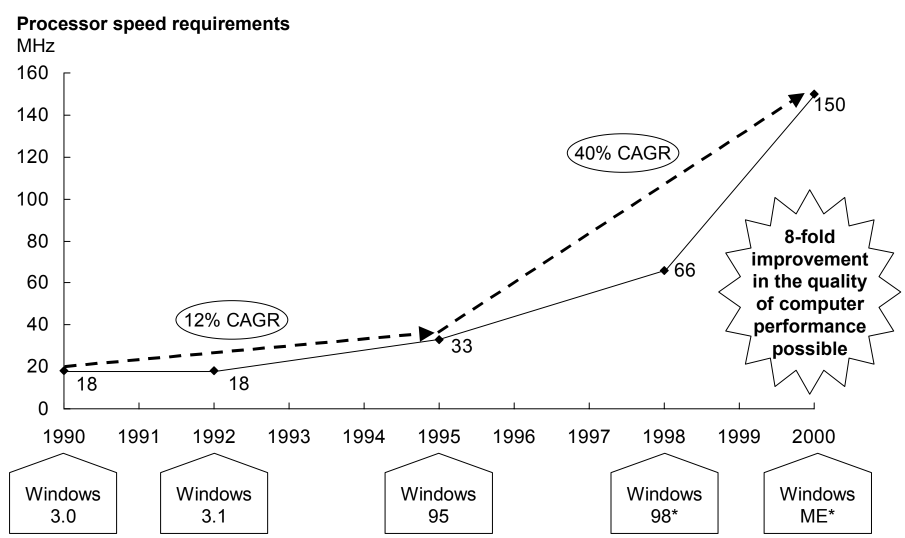
Thousands of chained (1996) dollars per PEP



Source: National Bureau of Economic Research; Bureau of Labor Statistics; Census of Manufacturers

Exhibit 20

IMPROVEMENTS IN SEMICONDUCTOR OUTPUT WERE INSTRUMENTAL IN ACCELERATING PERFORMANCE OF MODERN COMPUTERS



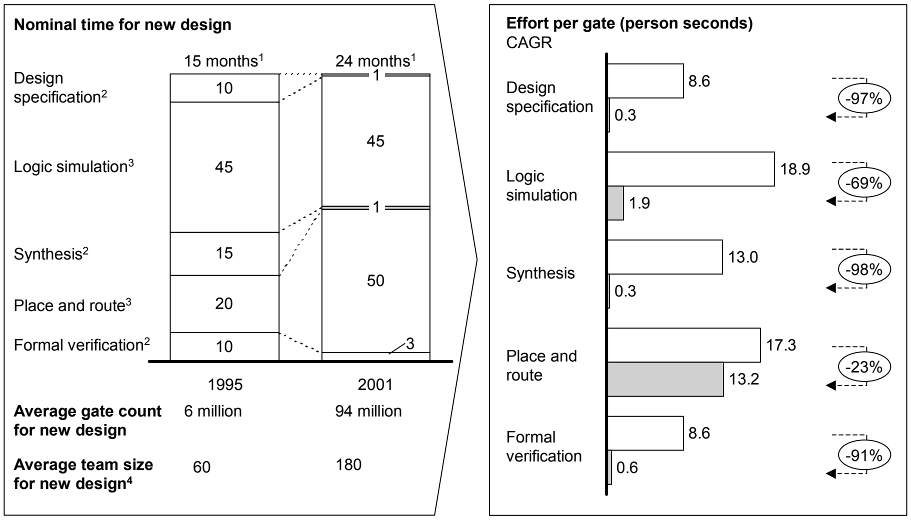
* Second edition

Source: Microsoft; Datapro; MGI analysis

Exhibit 21

EDA TOOLS HELPED REDUCE “REAL” DESIGN TIME IN THE SEMICONDUCTOR SECTOR

ASIC EXAMPLE
1995
2001



1 Average time for new design based on prevalent process technology (250 nm in 1995, 130 nm in 2001)
2 Computing effort (e.g., computer time spent to calculate power consumption) scales roughly linearly with gate count
3 Computing effort (e.g., computer time spent in checking for timing violations) scales nonlinearly with gate count
4 Design team sizes have tripled in the past 10 years

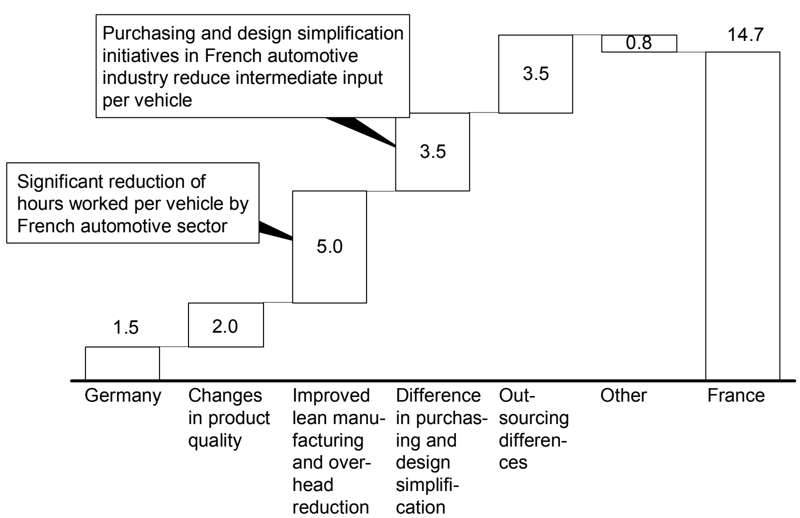
Source: MGI interviews; McClean Report

Exhibit 22

AUTOMOTIVE LABOR PRODUCTIVITY GROWTH – FRANCE vs. GERMANY

CAGR 1996-99

ESTIMATE



Source: INSEE; Statistisches Bundesamt; MGI analysis rest upon IT systems. However, the procurement and supply processes, which are core to lean production, benefit today from improved forecasting systems, and these certainly facilitated French adoption of lean practices (Exhibit 23). More generally, MGI's investigation of automotive IT initiatives and results in the sector revealed that several systems aimed at operational excellence led to significant improvements in labor productivity, capital productivity, and/or profitability (Exhibit 24).

¶ **Retail.** The diffusion of process and service innovation played a key role in the general merchandising (GMS) segment of retail in the US. Pressure from and market share gains by Wal-Mart's successful, innovative business model pushed down margins and yielded productivity-enhancing efforts by competing firms, encouraging the rapid diffusion of best practices (Exhibit 25). The Wal-Mart innovation relied on scale, innovative formats, an efficient logistical chain, and IT solutions such as EDI (electronic data interchange), RF gun scanning and, to a lesser degree, electronic supply chain management. Followers such as Target, Meijers, and Kohl's adopted a formula and format very similar to Wal-Mart's. More generally, across all three countries, IT enabled key operational improvements that diffused at different rates across different retail subsectors. US retailers spent proportionately more on IT (Exhibit 26), and this impacted relative diffusion rates.

Leverage of innovation

In some instances, firms in the US, France, and Germany leveraged innovations by consolidating and achieving sufficient scale. IT frequently enabled the productivity benefits achieved during this process. Two prominent examples of such leverage occurred in the retail banking sector, and in French and German road freight.

¶ **Retail banking.** Banks in all three countries consolidated, reducing the need for clerical and administrative personnel. In the US, for example, these labor pools shrunk from 68 to 63 percent of employment in the sector, even as overall employment shrank and transaction volume increased 50% (Exhibit 27). IT played a major role through automation, and scale enablement.

¶ **French and German road freight.** These sectors experienced rapid productivity growth during the 1990s. Although deregulation lagged the US, when it occurred it did yield consolidation, leading to increased capacity utilization. IT played an enabling role by helping carriers optimize their trucking networks (Exhibit 28), though its penetration and impact lagged that in the US. (See Appendix for details.)

Exhibit 23

APPLICATIONS OF IT ALONG THE AUTOMOTIVE PROCESS CHAIN

	Product development	Procurement and supply	Manufacturing and logistics	Sales and distribution
	Enterprise resource planning (ERP) backbone			
Information and communication technology	• Computer-aided engineering (CAx) • Product data management (PDM) • Digital mock-up (DMU) • Simulation techniques	• Online B2B marketplace • Forecasting systems	• Manufacturing execution systems (MES) • Material resource planning (MRP) • Supply chain management systems • Quality management systems (QMS)	• Dealer management systems (DMS) • Customer relationship management (CRM)

- Increased importance of IT along whole value chain
- Increased need for integration of different IT systems

Source: MGI analysis

Exhibit 24

GOALS AND OBSERVED IMPACT OF IT IN AUTOMOTIVE

● High impact
○ No impact

Main goals	IT initiatives	Increase in productivity* – Labor	Increase in productivity* – Capital	Increase or stabilization of profitability*	Evaluation of possible overinvestment and future potential
Operational excellence	• E-procurement	◔		◑	• Only small overinvestment as labor savings not always realized and processes partly unchanged, especially for PDM. Future potential remaining
	• Simulation techniques in R&D	●	◕	◑	
	• CAx	●	◕	◑	
	• PDM for data exchange	◑	◔	◔	
	• ERP	◔	◔	◔	
	• MRP	◑	◑	◕	
	• Scheduling software/systems	◑	◑	◕	
Effectiveness of marketing/ sales force	• Online presence for marketing			◔	
	• Online car configurator	○		◔	• Future potential if linked with other initiatives (e.g., build-to-order)
	• CRM	◔		○	
New products, services and business	• Build-to-order (network marketing, manufacturing and sales)	◔	◔	◑	• Only a few OEMs have implemented high future potential with synergies for different process steps
	• Expansion of after-sales services	○	○	◕	
Renovation	• PC upgrade	◔		◔	• Medium overinvestment for PC upgrades probable as benefits not quantified
	• Software upgrades (CAx)	◑	◑	◑	• Only minor overinvestments possible at CAx upgrades as new releases introduced valuable new functionalities
Regulatory requirements	• Y2K				• Overinvestment possible as scope not carefully managed, requirements could be fulfilled with less effort, no future potential

* Cost of IT investment not included

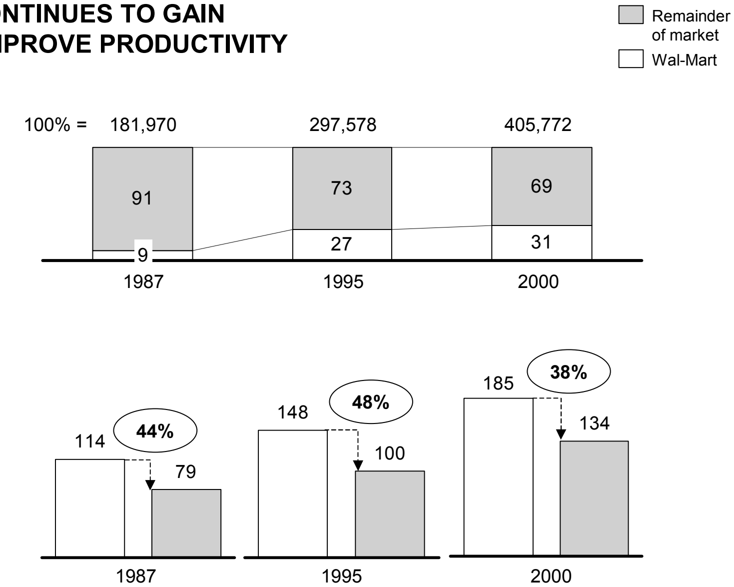
Source: Expert interviews; MGI analysis

Exhibit 25

WAL-MART CONTINUES TO GAIN SHARE AND IMPROVE PRODUCTIVITY

Sales share
Percent,
nominal $ Millions

Productivity levels
Indexed to 1995 remainder of the market = 100



Source: BEA; U.S.Census Bureau; 10Ks; annual reports; MGI analysis

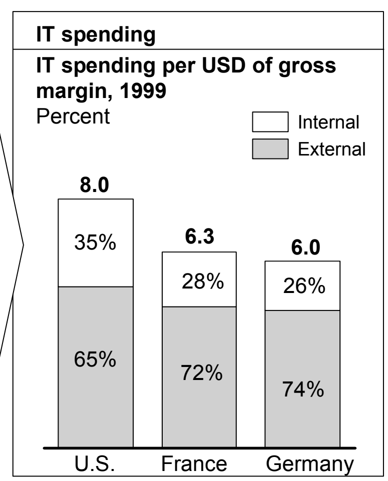
Exhibit 26

IT USAGE IN RETAIL

● IT only
◑ IT and managerial innovation
○ Managerial innovation

Drivers of process innovation

Process improvements*	Enabler
• Vendor extranet	●
• EDI	●
• Mobile inventory tracking devices	●
• Vendor-managed items	◑
• Vendor scorecard	◑
• Cross-docking	◑
• Standardized labeling	◑
• Labor scheduling systems	◑
• Joint category management	○
• Cross-training of employees	○



* Selection
Source: Gartner; PAC; MGI analysis

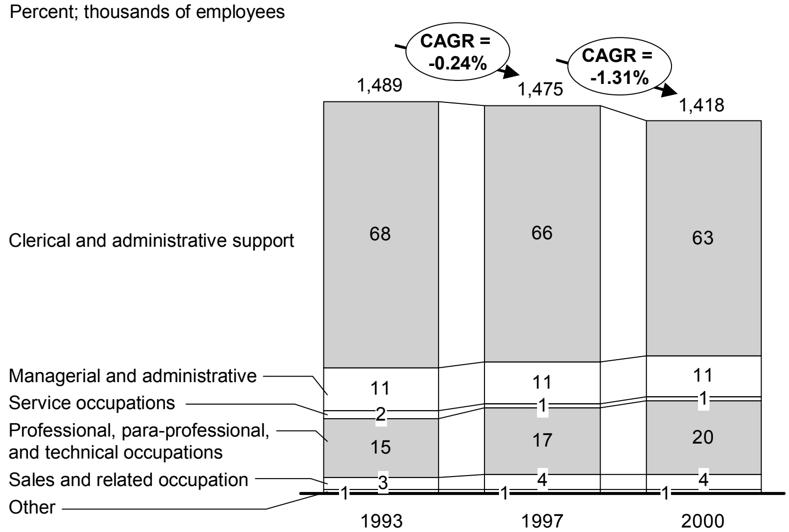
Exhibit 27

RETAIL BANKING MERGERS ENABLED OVERALL WORKFORCE REDUCTIONS, WITH SHIFTS IN LABOR POOLS

Largest shifts

Occupational categories in commercial banking, 1993-2000*

Percent; thousands of employees



* Includes occupations classified under SIC 602 by BLS for commercial banks

Source: BLS; MGI analysis

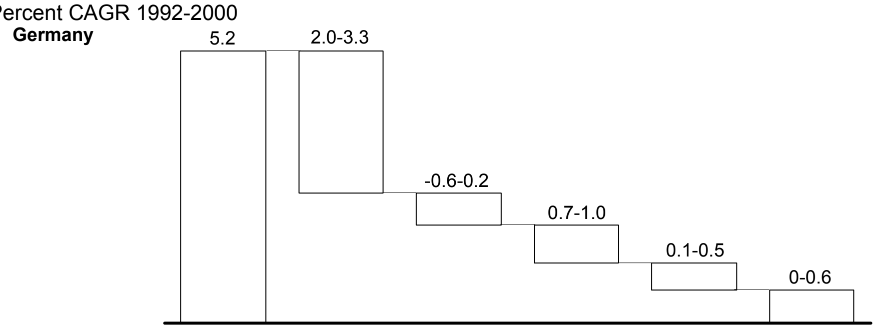
Exhibit 28

IT'S CONTRIBUTION TO ROAD FREIGHT PRODUCTIVITY GROWTH IN FRANCE AND GERMANY

ESTIMATE

IT contribution

Percent CAGR 1992-2000



Contribution by operational factor	Total growth	Change in average capacity of trucks	Change in capacity utilization	Change in average speed	Change in productive time	Change in output mix*
France	5.0	2.0-3.3	-0.6-0.2	0.3-0.7	0.7-1.2	0-0.6
Contribution of IT	0.8-1.2	0	0.6-0.7	0	0.1-0.4	0.1

IT contribution to total productivity growth is approx. 20%

* Increasing share of time-definite and expedited shipments

Source: MGI analysis

An appropriate industry or demand structure is critical to fully leveraging potential benefits. Where they are absent, optimal consolidation may not occur, leading to slower relative productivity growth, as experienced by the US mobile telecom subsector.

This discussion of innovation's development, diffusion, and leverage has emphasized IT's enabling role without specifying the circumstances in which it is likely to play that role most effectively. Understanding those circumstances is of critical importance to users of IT seeking to maximize their benefits, and to vendors seeking to maximize the impact of their products. The discussion that follows describes the characteristics shared by high impact IT applications.

THREE CHARACTERISTICS SHARED BY EFFECTIVE IT APPLICATIONS

The IT applications that had high impact generally shared three common characteristics. In particular, they were tailored to sector-specific business processes, deployed in a sequence that built capabilities over time, and co-evolved with managerial and technical innovation. In spite of IT's importance, it is important to recognize that it is only one of several tools and investments that managers use to innovate. The firms most likely to sustain advantages from IT-enabled innovation are those that use their investments to develop and extend other advantages that are not as easily replicated and competed away.

Twenty case studies across the US, France, and German revealed no application-specific pattern regarding where and how IT impacted productivity. No single application emerged as playing a particularly critical role in most or even some sectors. Nor did IT affect similar drivers of productivity growth across sectors. Instead, IT that had a high impact on productivity shared three general characteristics. The applications were:

¶ Tailored to sector-specific business processes and linked to key performance levers,

¶ Deployed in a sequence that built capabilities over time, and

¶ Co-evolved with managerial and technical innovation (i.e., their impact coincided with changes in the business practices and requisite skills of firms).

The discussion that follows explores each of these in turn.

Tailored to sector-specific business processes and linked to key performance levers.

Tailored to sector-specific business processes

IT applications that had a high impact on productivity were frequently tailored to sector-specific business processes. Specifically, the applications both contained a significant amount of knowledge about the underlying business process, and met performance requirements that were rigorous and appropriate to the sector. The retail banking and retail sectors give powerful evidence of this characteristic:

¶ **Retail banking.** In retail banking, IT applications had the most impact when they were focused on sector-specific business processes such as lending, credit card operations, and banking channel operations. IT applications such as credit scoring software and underwriting modules automated various manual steps associated with credit verification and authorization in lending operations. Specifically designed software that used artificial intelligence and neural network technology helped to reduce fraud in credit card operations. Voice Response Units (VRUs) and Computer Telephony Integration (CTI)—while not themselves specific to banking—were often deployed with banking-specific enhancements such as tailored scripting that customized them to a banking environment. These tailored applications impacted both the productivity and the profitability of banks.

¶ **Retail.** The retail sector highlights an even more extreme case of sector-specificity. Overall, applications deployed in distribution/logistics processes, merchandise planning and management, and store operations had the most impact on productivity, but their impact varied considerably by subsector, and applications were often tailored to specific subsector needs.

Moreover, IT applications such as vendor coordination/management systems (Vendor Managed Inventory), Warehouse Management Systems (WMS) and Transportation Management Systems (TMS) were even optimized for the distribution and logistics processes of particular firms within subsectors. In some cases, applications did not take hold because the sector-specific requirements simply could not be met—for example, standard databases were slow to gain traction in retail because they simply could not handle transaction volumes at required performance levels.

By way of contrast, less industry-specific applications generally had less measurable productivity impact. For example, ERP tools generated relatively fewer productivity benefits for French automotive OEMs than applications tailored more specifically to the requirements of the lean processes that were diffusing across the sector during the 1990s.

Linked to key performance levers

An important corollary of sector-specificity is that high-impact IT applications are focused on the key cost and value drivers of the relevant sector or subsector. In cases where this occurred, the impact could be dramatic. The semiconductor and road freight sectors provide strong examples of this characteristic:

¶ **Semiconductors.** Semiconductor firms used IT tools to impact output quality, the most important performance lever for this industry during the 1990s. EDA tools, process control software, and yield optimization solutions were aimed at key performance bottlenecks, such as the level of abstraction at which design took place, ramp and yield times, and the tightness of process specifications.

¶ **Road freight.** In road freight, network optimization tools supported productivity growth. While French and German firms implemented these to some degree as they consolidated, the tools were not implemented to the extent that they were in the US because consolidation started later in Europe. This difference was a contributor to the persistence of a productivity level gap with the US, in spite of rapid French and German growth during the 1990s (Exhibit 29).

Deployed in a sequence that built capabilities over time.

Firms that derived the most benefit and were acknowledged as leading users of IT deployed IT applications by sequentially building capabilities within the organization. This was not a simple matter of increasing and layering IT functionality. Building business capabilities required evolving both IT systems as well as decision and execution systems within the business process. Significant improvements could be obtained from IT enabling a specific business process. However, even greater benefits were available when specific processes were linked together, to optimize the efficiency of the system and enable higher-level decision- making.

Two striking examples occurred in the securities and retail industries:

¶ **Securities.** In the US securities sector, IT systems and capabilities evolved over time. Back-office automation during the 1980s was followed by platform integration in the early 1990s and front-office automation in the late 1990s and beyond (Exhibit 30). Together, these improvements enabled the US securities industry to process the enormous increase in trading volume that occurred after 1995, leading to a substantial improvement in sector productivity performance.

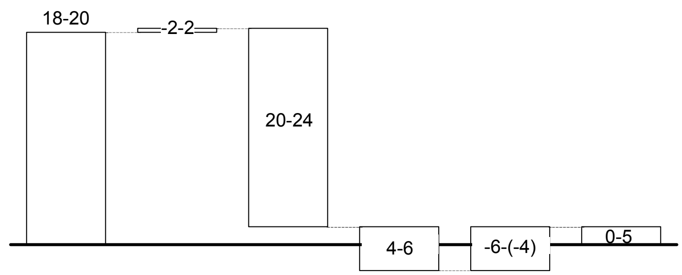
Exhibit 29

IT'S CONTRIBUTION TO PRODUCTIVITY LEVEL DIFFERENCES IN ROAD FREIGHT

ESTIMATE

IT contribution

Percent of U.S. 2000 level



Difference due to operational factor	Total level difference	Average capacity of trucks	Capacity utilization	Average speed	Productive time	Output mix*
Contribution by IT	9 - 13	0	8 - 12	0	0	~ 1

IT accounts for ~ 50% of labor productivity difference between France and Germany vs. the U.S.

* Difference in share of time-definite and expedited shipments

Source: MGI analysis

Exhibit 30

IN THE U.S. SECURITIES INDUSTRY, IT SYSTEMS AND CAPABILITIES EVOLVED OVER TIME

SECURITIES EXAMPLE

	Back-office automation	**Platform integration**	**Front-office automation**
Focus of IT investment	• Isolated back-office automation • Infrastructure automation, e.g., clearance	• Product-focused automation • Integration of back-office functionalities • Integration with front office	• On-line trading for retail; direct link for institutional clients • Straight-through-process (STP) • Automation of inter-dealer markets • Automation of cross-border trading
Key technology	• Mainframe	• Client-server architecture	• Network based technologies
Impact on productivity	• Replace back-office labor with computer • Increase back-office capacity	• Increase capacity for all products • Scalable platform • Continue substituting labor	• Dramatically increase overall capacity • Reducing sales and trading labor
	80s	**Early 90s**	**Late 90s and beyond**

Source: Company interviews; MGI analysis

- ¶ **Retail**. In retail, sequentially building capabilities was particularly important to deriving useful information from data to make better execution decisions. Successful retailers first automated data capture and storage and then used this data to develop enhanced decision-support capabilities in areas like merchandise planning, leading to a "stack" of effective IT investments (Exhibit 31). When retailers tried to deploy more sophisticated applications out of sequence, they were generally not successful.

Co-evolved with managerial and technical innovation.

IT was effective when used in concert with managerial innovation and other advances in technology to change business processes and increase efficiency, or to create new products and services. In retail for example, Wal-Mart evolved its IT capabilities in concert with business innovation targeted at redefining its relationship with suppliers and radically simplifying distribution center logistics. In this incremental way it was better able to provide assortment choice at low prices, and take advantage of new store formats. Other general merchandise retailers followed in evolving their own capabilities and innovations. In retail banking, while JPMorgan Chase initially used imaging technology to automate loan processing and lower costs, it innovated by diffusing the technology to auto dealers, capitalizing on the dealers' ability to attract customers with lower-cost loans (Exhibit 32). Similarly, Citibank applied learnings from the competitive and innovative credit card business to enhance business processes in retail banking and lending operations.

IT's place in the managerial toolkit

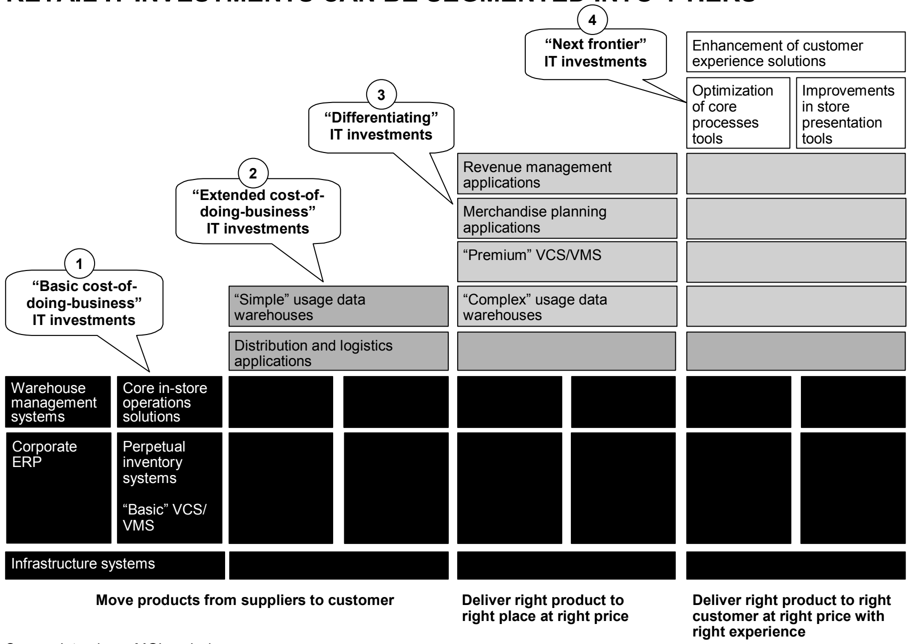
While firms may enjoy productivity and profitability benefits from IT investments, competitive advantage through investment in IT alone is difficult to sustain. As many firms in the sector adopt IT applications, they become "core" or a cost of doing business rather than a source of differentiation. The retail and retail banking sectors provide strong evidence of this phenomenon:

- ¶ **Retail.** In the US retail sector, central office systems, warehouse management and automation systems, and POS upgrades have become core IT investments made by all large firms across the sector. They improve productivity for the whole sector, but are not differentiating for any individual firm.

- ¶ **Retail banking.** In the US, large banks on the more competitive east coast adopted voice response units (VRUs) first. Other, smaller banks began adopting these systems in the mid-1980s, when vendors standardized and dramatically lowed the cost barriers to implementation. By 2001, roughly 90% of large banks and 70% of smaller banks used VRUs.

Exhibit 31

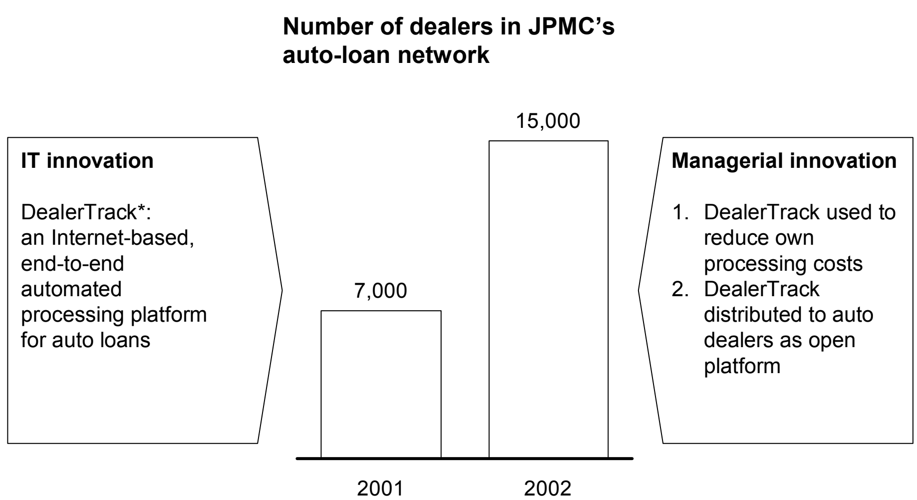
RETAIL IT INVESTMENTS CAN BE SEGMENTED INTO 4 TIERS



Source: Interviews; MGI analysis

Exhibit 32

CO-EVOLUTION OF MANAGERIAL AND TECHNOLOGY INNOVATION IN RETAIL BANKING



* System developed by LabMorgan, a JPMorgan Chase subsidiary

Source: DealerTrack Web site; JPMorgan Chase Web site

The ability of competitors to make the same investment in IT and catch up in productivity determines how quickly IT applications go from differentiating to core. Thus, investments in IT are more likely to remain differentiating if accompanied by significant changes in the business process or other advantages like scale, that are not easily replicated. Players in the retail and retail banking sectors have diverged in their respective abilities to generate sustainable advantages through the use of IT:

¶ **Retail.** In the retail sector, leading firms have been able to capture competitive advantage from their IT systems because they have advanced their IT capabilities well beyond the competition in terms of being able to capture data, analyze the information, and use their supply chain to execute directives on the basis of this information.

¶ **Retail banking.** In the retail banking sector, by contrast, most IT investments are now simply costs of doing business and not differentiating. Strict reporting requirements and the necessity of information flow between banks have meant that banks to some extent have had to develop similar IT capabilities. In addition, the retail banking sector is served by a well-developed vendor community that helps competitors catch up to innovators.

Ultimately, firms can only differentiate themselves once IT-enabled innovation has diffused if the innovation does not depend upon IT alone.

IMPLICATIONS FOR FIRMS AND GOVERNMENTS

The simultaneous surges in IT investment, productivity growth, economic growth, earnings, and stock market valuations in the US in the second half of the 1990s imbued IT with seemingly magical properties. Since then, a subsequent slowdown in IT investment and firm- and economy-level performance indicators has removed much of that sheen. MGI's research over the past two years indicates that there was too much hype about IT during the height of the boom, and too much gloom about it now. We believe our findings provide a valuable compass during today's disorienting economic times. Three core conclusions emerge from the discussion above:

¶ IT is one of the several tools that managers use to innovate, and it must be linked to other investments, capabilities, and strategies.

¶ To generate maximum impact, IT must be tailored to sector-specific business processes, deployed in a sequence that builds capabilities over time, and co-evolved with managerial and technical innovations.

¶ Competitive market conditions reward and facilitate the diffusion of all types of innovation, including IT-enabled innovation.

These conclusions suggest that for users, vendors, and governments to make the most of their IT opportunities, they should not search for an "IT agenda," but rather develop agendas for innovation, enablement, and competition.

"Innovation agenda" for IT users

If IT is one of the several tools that managers use to innovate, and it must be linked to other investments, capabilities, and strategies, then what users of IT critically need is an "innovation agenda" that involves IT. Key elements of this agenda are that companies should:

- Systematically seek opportunities to improve performance across the eight, company level, operational productivity levers (Exhibit 33), ensuring as a starting point the achievement of best practices reached by competitors and analogous firms in other sectors.
- Set IT priorities around systems/applications that are tailored to sector-specific business processes, linked to key performance levers, and able to co-evolve with managerial and technical advances.
- Consider the full spectrum of IT-enabling possibilities, from improving existing new processes, to facilitating new ones, to changing the boundaries of the firm.
- Link the IT function closely with business decision-makers, and manage IT decisions like other business decision
- Build business and IT capabilities simultaneously over time

MGI has explored elements of this agenda for the retail, retail banking, and semiconductor sectors in its report, "How IT enables productivity growth," to which readers interested in more detail should refer.

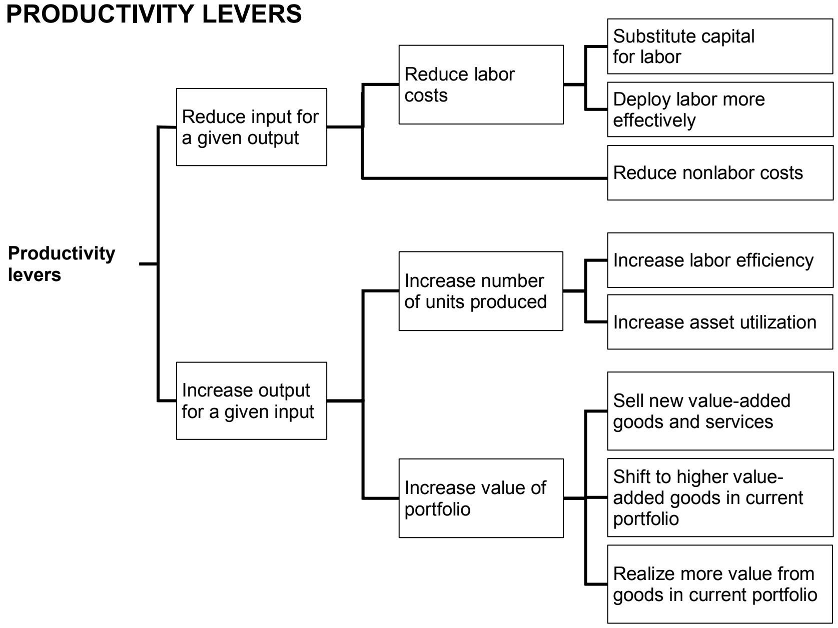
"Enabling agenda" for IT vendors

If IT must be tailored to sector-specific business processes to generate maximum impact, then vendors of IT need an "enabling agenda" designed to tailor their products/value propositions toward key business processes and performance levers of specific customer segments. Key elements of this agenda are that vendors should:

- Target verticals whose productivity levers are closely related to the vendor's products' core capabilities, and tailor products to the levers of those sectors.
- Innovate, and explore opportunities to coinvest with innovators to learn.

Exhibit 33

THERE ARE EIGHT COMPANY-LEVEL OPERATIONAL PRODUCTIVITY LEVERS



Source: MGI analysis

¶ Help customers find value in sunken IT investments.

¶ Advocate pro-competition policies and target verticals in which external environment and/or industry structure changes are taking place, as these can be a signal that IT payoffs lie just ahead.

MGI has explored elements of this agenda in more detail in its report, "How IT enables productivity growth," to which readers interested in greater depth should refer.

"Competition agenda" for governments

If competitive market conditions reward and facilitate the diffusion of all types of innovation, including IT-enabled innovation, then governments need a "competition agenda" that drives firms to develop and leverage innovations, and those innovations to diffuse. Specifically, governments should ensure that they:

¶ Do not view IT separately from the overall business agenda.

¶ Are indifferent to outcomes at the entity level, embracing sector turnover, even to the point of letting large incumbents fail.

¶ Generally minimize product, service, distribution, and price restrictions to maximize the diffusion and leverage of innovation.

¶ Do not confuse the number of competitors with competitive intensity, particularly in large fixed costs sectors, in which regulation must be consistent with sector scale economies to ensure efficiency. (Such optimization, while no easy task, is critical to getting telecom regulation right, which is itself crucial to the future development of IT.)

MGI has explored elements of this agenda for France and Germany in its report, "Reaching higher productivity growth in France and Germany," to which readers interested in more detail should refer.

* * * * *

Acting on these agendas is more difficult than spending more (or less) on IT, emulating successful companies, changing marketing strategies, or fostering high tech growth corridors. Given all MGI has learned about the relationship between IT and labor productivity, though, we believe they are the right agendas, and that acting on them will be the most effective means for firms and governments to create a highly productive, new economy.

Appendix

HOW REGULATION AND OTHER EXTERNAL FACTORS IMPACTED PERFORMANCE

While not the focus of this paper, external, particularly regulatory, factors were of great importance to productivity performance in the US, France, and Germany during the 1990s. The discussion that follows provides additional detail on some of the most significant, sector-specific issues identified in MGI's recent research. Readers with strong interests in these topics should refer to "Reaching higher productivity growth in France and Germany," which addresses the role of external factors in far more detail.

Competition and regulatory improvement spur growth

Intense competition and regulatory improvement frequently spurred growth and the diffusion of business and technology innovation in the US, France, and Germany. Sector-specific examples abound:

¶ **Telecommunications.** Although regulation of the US' mobile telecom industry led to some suboptimal outcomes, particularly vis-à-vis France and Germany, (see below for details), the auction of additional spectrum did lead to increased competition, price declines, higher usage levels, and productivity improvement in mobile telecom. French and German mobile telecom grew even faster because some of the regional US providers were sub-scale, indicating room for further performance-enhancing regulatory change in the US. In Europe, the liberalization of the fixed-line business by opening market access to third parties forced incumbents to improve their operational performance. This led to a steep workforce reduction at Deutsche Telekom and to a lesser extent at France Telecom.

¶ **Securities.** In the US, the entry of online innovators in securities brokerage, coupled with new SEC rules promoting lower spread trading regimes, led to price declines, higher trading volumes, and productivity improvement for the sector.

¶ **Road freight.** Productivity growth in the road freight sector in France and Germany was fueled by the deregulation of European market access, but also by eliminating fixed price lists and the increasing demand for cross-border shipments brought about by the European single market (Exhibits A1 and A2).

Exhibit A1

IMPACT OF DEREGULATION ON GERMAN ROAD FREIGHT PRODUCTIVITY

	Regulated industry	Deregulation			
	Pre-1988	**1989-92**	**1993-94**	**1995-98**	**Impact on productivity**
Capacity restrictions	• Varied by country		• Regulation change for size and weight of trucks	• Harmonization of capacity restrictions	**Increasing average truck size from 17.2 t in 1995 to 20.2 t in 2000**
Tariffs (price lists) and taxes	• Mandatory price lists for domes-tic and inter-national freight transport	• Freedom granted to set prices for international freight transport	• Removal of domestic fixed-price price lists	• Full harmoni-zation of road taxes and VAT	**Productivity improvements after 25-50% price decline from 1993 to 1997**
Market access and cross-border trade	• Domestic traffic confined to domestic haulers • International traffic regulated by bilateral agreements	• Introduction of EU contingents for cabotage • Beginning of European single market in 1992	• Gradual rise of cabotage contingents	• Cabotage com-pletely liberalized • Distinction between local and long-distance traffic abandoned	**Increasing average length of hauls and re-duced paperwork for cross-border shipments**

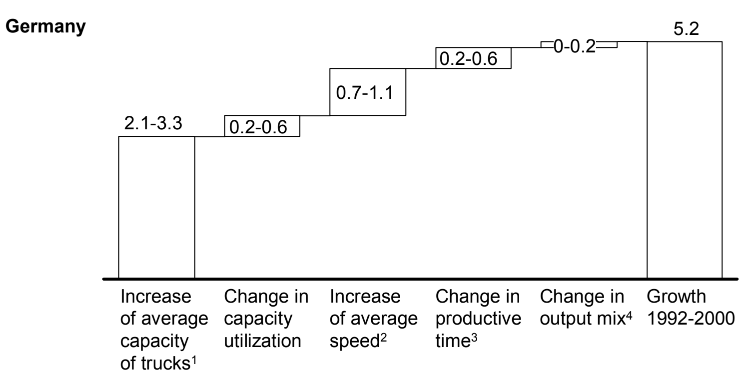
Source: BAG; Aberle; MGI analysis

Exhibit A2

ROAD FREIGHT LABOR PRODUCTIVITY GROWTH, 1992-2000

ESTIMATE

Percent CAGR



France	2.1-3.3	N/A	0.5-0.7	0.7-1.2	0-0.2	5.0

Average length of hauls and IT use impact all operational indicators

1 Estimates based on German data as French data was not available
2 Estimates based on French data as German data was not available
3 Total hours worked by drivers/total hours worked by all employees
4 Productivity gain from higher-value services less additional labor input required

Source: DIW; BAG; DAEI-SES; ONISR; CNR; MGI analysis

- **Automotive.** The gradual removal of import quotas for Japanese cars in combination with stagnating western European markets became a serious threat to the profitability of French OEMs. They reacted by implementing best practice operational processes and thus improved their productivity.
- **Utilities.** The liberalization of the German electricity market led to a fall in wholesale prices and put heavy pressure on power generators, forcing them to improve their historically low productivity levels in order to remain profitable. As a consequence, German power generators reduced their overstaffing and increased their operational efficiency. France did not undergo similar deregulation, and its performance diverged significantly (Exhibit A3).

Remaining external barriers to growth

In spite of these success stories, more external barriers to innovation and growth appear to remain in France and Germany than in the US, which likely contributes to persistent productivity differentials. Three key differences exist across the US and Europe. The first are regulatory differences, which are often closely linked with the second, differences in corporate governance. Third are differences in demand.

Regulatory and corporate governance differences

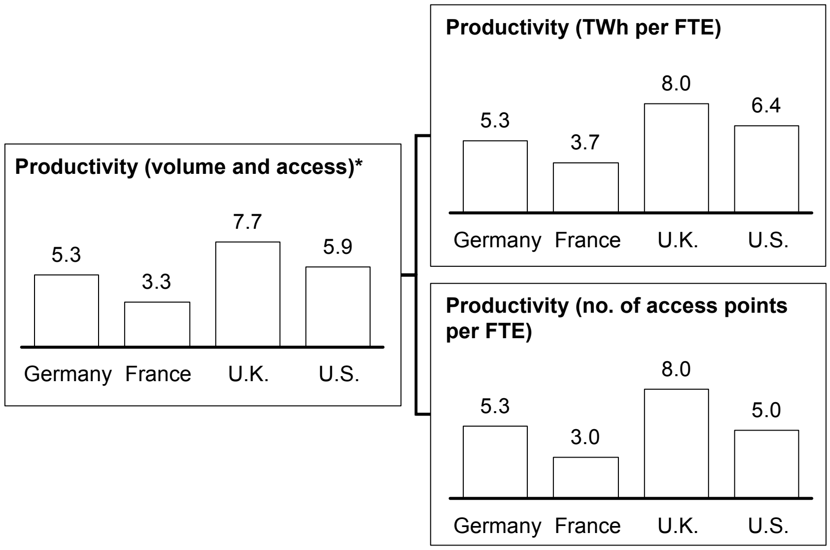
More regulatory restrictions on products, services, distribution, and prices appear to exist in France and Germany than in the US, impacting the degree of competitive intensity, the rate at which innovation diffuses, and likely the size of the productivity gap between the US and the Europe countries. Two examples illustrate the barriers still impeding French and German performance:

- **Retail trade.** In France, hypermarkets have established a very strong market position, and are effectively protected from innovative competitors by zoning laws. Traditional, less productive stores are also protected, and the modernization of the format landscape has been slowed down, as changes have to occur within the existing store network. While still leading the international comparison, French food retailing started to lose ground in terms of labor productivity in the course of the 1990s. Striking format differences also exist in the specialty apparel retail subsector. Exhibit A4 highlights the greater representation of traditional stores in France and Germany than in the US.
- **Retail banking.** Competition is distorted in Germany, where small state-owned and cooperative banks are, because of their ownership structure, prevented from building sufficient scale and are not exposed to shareholder pressure from capital markets. The resulting fragmentation

Exhibit A3

LABOR PRODUCTIVITY GROWTH – ELECTRICITY DISTRIBUTION

CAGR percent, 1992-2000

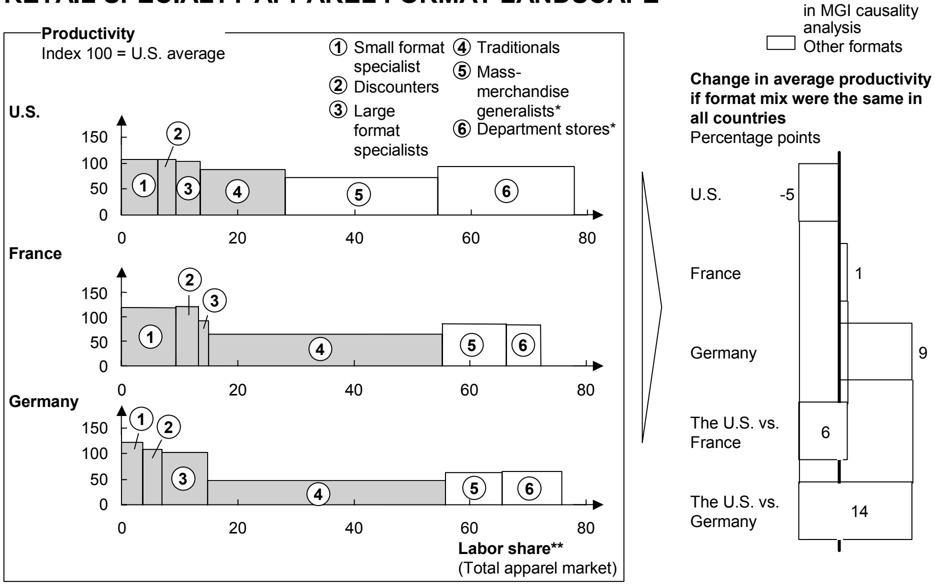


* Weighted 50% productivity (volume), 50% productivity (access)

Source: MGI analysis

Exhibit A4

RETAIL SPECIALTY APPAREL FORMAT LANDSCAPE



* Department stores and mass-merchandise generalists show productivity of total operations

** Labor shares state shares of low productive players higher than market shares

Source: U.S. Census Bureau; Hoovers; Compustat; Chain source guide; Annuaire CTCOE; Diane; Textilwirtschaft; Klartext; Marcus; M+M Euro data; financial reports; MGI analysis puts the German banking sector at significant productivity disadvantage compared to France and the US. These barriers remain and continue to impact corporate governance.

Governance issues also impact other sectors. For example, many more top retailers are publicly traded in the US than in France and Germany.

France and Germany are not alone in suffering from external impediments. Two US sectors that have experienced rapid productivity growth in recent years—mobile telecom and retail banking—could grow even faster with regulatory changes:

¶ **US mobile telecom.** The US mobile telecom segment has experienced productivity growth that is rapid (15% per year during the 1990s), but still considerably less than the 25%+ rates experienced by France and Germany. These differences are commonly attributed to service providers having to apply the Receiving Party Pays policy, the lack of a common technology standard, or the use of analog technology. However, MGI's comparative analysis revealed that these factors drive only a minor fraction of the productivity gap. Rather, the key factor is that despite similar penetration rates, more than 50 mobile providers serve fewer than 200,000 customers each in the US, while in France and Germany, three and four providers respectively, serve an average of about 10 million customers each. This is a direct result of the regional license auctions in the US. Although competitive market forces are at work and consolidation has started in the US, the legacy of this regulatory approach still has a negative effect on productivity and will continue to do so in the coming years (Exhibit A5).

¶ **Retail banking.** The regulation of electronic transfers in the US[1] gives retail banks there an incentive to push check payments rather than introducing a common standard for more efficient paperless payment methods, which has been common in Germany since the 1970s.

In spite of these remaining barriers, the US appears to be generally less heavily regulated than France and Germany. MGI's study of French and German productivity growth in the 1990s highlighted numerous opportunities for reform. Readers with specific interest in regulatory topics should refer to the full report for details.

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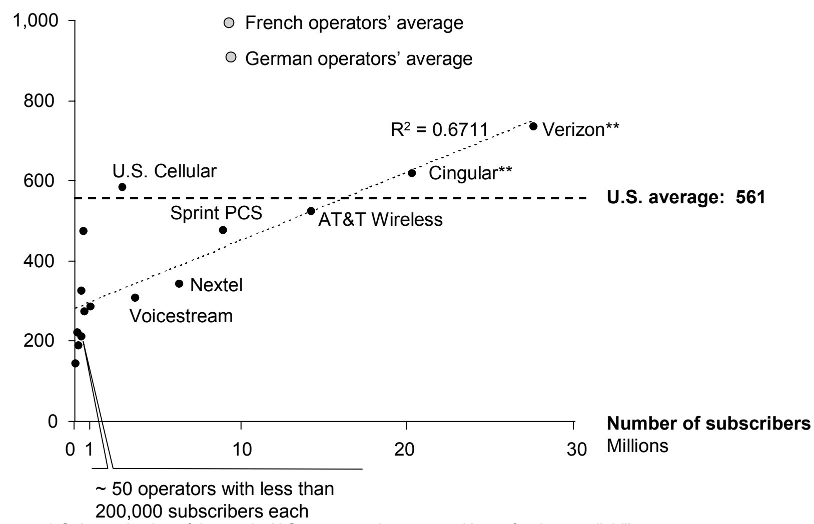
1 Regulation of electronic payments in the US allows retail banks to delay check processing, but mandates electronic payments to be processed within one business day.

Exhibit A5

SUBSCRIBERS PER EMPLOYEE AT TOP 25 U.S. MOBILE TELECOM OPERATORS*

Year-end 2000



* Only a selection of the top 25 U.S. operators is presented here, for data availability reasons

** Based on end 2001 figures, as 2000 data is not available

Source: FCC; Hoovers'; MGI analysis

Demand differences

The US and Europe have also exhibited different demand patterns over the course of the 1990s. Specifically, demand levels in several key sectors have been higher in the US than in France in Germany. The impact of lower demand levels in some cases has been difficulty for French and German firms in achieving efficient scale. In addition, demand preferences have also translated directly to lower value-added productivity growth in select instances. We address each of these in turn.

Sectors with a grid network, in which higher demand leads to higher capacity utilization, are the most prominent examples of demand differences leading to productivity differences. The telecommunications and utilities sectors are traditional examples of this category. But other physical networks, like the branch and ATM network of retail banks, also depend on high capacity utilization. While the impact of these demand differences on sector-specific productivity levels is quite sizeable, the aggregate impact of network-related demand differences is limited because there are so few sectors where productivity depends on the utilization of a fixed network.

¶ **Telecommunications.** The fixed-line network in France and Germany is much less utilized than that in the US. Traffic per line in the US is 2 to 3.5 times the level it is in France and Germany and leads to a 40 percent productivity disadvantage for the European countries (Exhibit A6). Two thirds of this gap is linked to long-distance traffic where prices have reached similar levels in the three countries (Exhibit A7).[2]

¶ **Utilities.** Similarly, the utilization of the power grid in electricity distribution differs significantly across countries. Annual electricity consumption per household in 2000 in the US was more than double that in Germany.[3]

¶ **Retail banking.** Banks also have to provide a nationwide network of branches and ATMs. The productivity of these networks is affected by the capacity utilization, e.g., through the number of transactions. In the US, bank customers conduct significantly more transactions than their German and French counterparts. This lower demand per customer leaves German and French banks at a productivity disadvantage of approximately 6 percent – independent of further scale improvements through consolidation.

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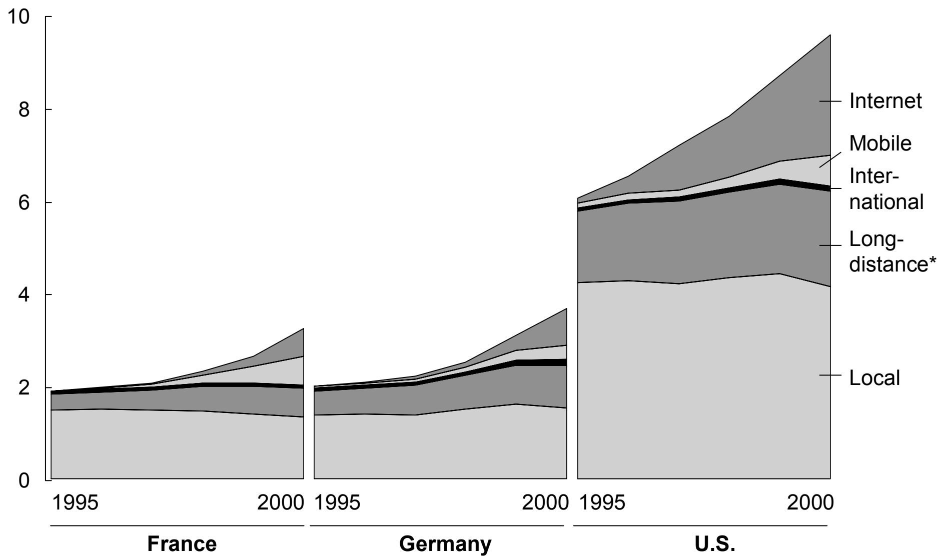
2 The differences in traffic can therefore not be attributed to differences in regulation that lead to higher prices.

3 Besides true demand effects, such as higher income, cultural differences or individual preferences, higher retail prices as a result of taxation may also effect consumption volumes.

Exhibit A6

TOTAL CALL MINUTES IN FRANCE, GERMANY, AND THE U.S. ESTIMATE

Annual outgoing minutes per capita, thousands



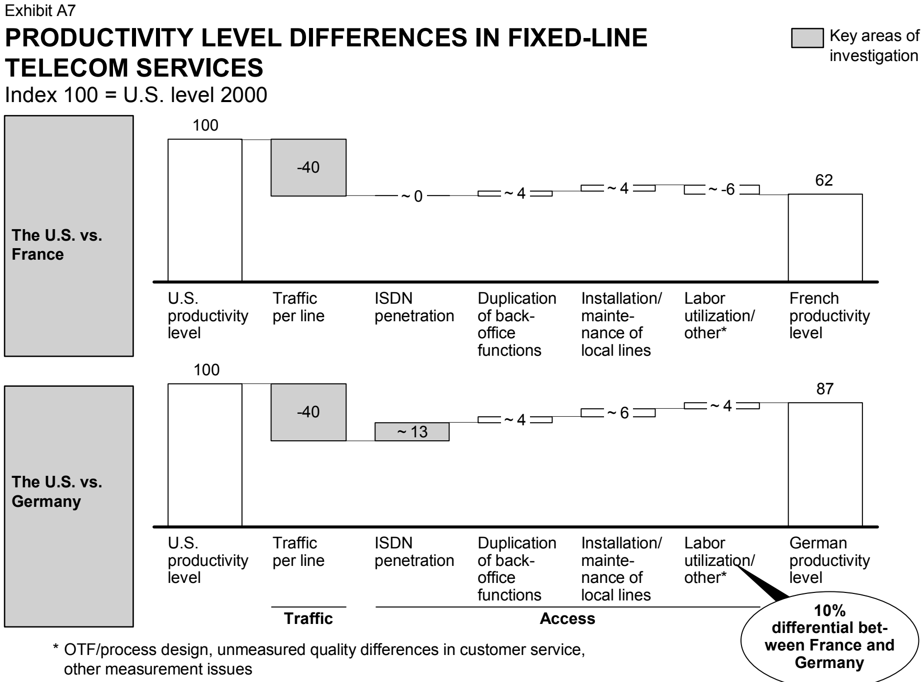
* Including fixed-to-mobile traffic in France and Germany, and intrastate and interstate traffic in the U.S.

Source: RegTP; ART; NECA; FCC; ITU; CTIA; MGI analysis

Exhibit A7

PRODUCTIVITY LEVEL DIFFERENCES IN FIXED-LINE TELECOM SERVICES

Index 100 = U.S. level 2000



* OTF/process design, unmeasured quality differences in customer service, other measurement issues

Source: MGI analysis

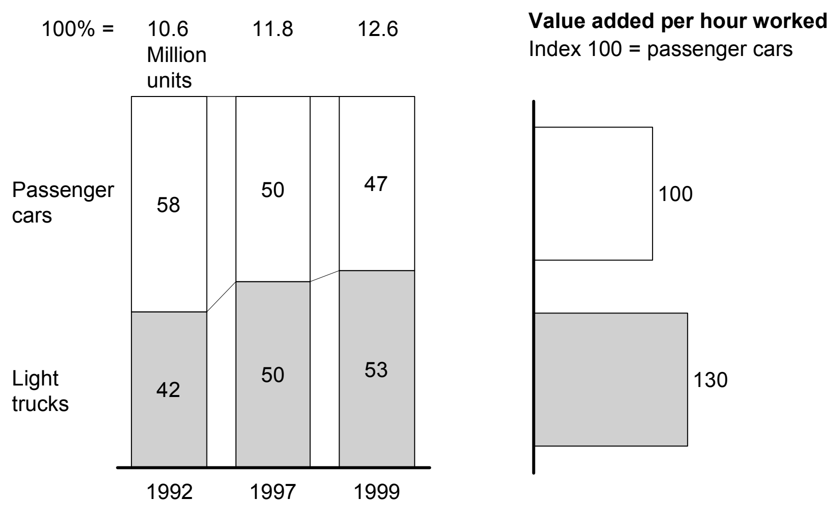
- **Retail trade.** US consumers spend significantly more on brand clothing, explaining a 12 percent productivity advantage for the US specialty apparel retail segment compared to France and Germany.
- **Automotive.** Eleven percentage points of the productivity gap between the US, on the one hand, and France and Germany, on the other, results from differences in demand: the US has benefited from the light truck boom over recent years. These vehicles are easy to manufacture but deliver high value added per hour worked. Today, 50 percent of the vehicles sold in the US fall into this category; while in the two European countries – largely due to the higher taxation of energy consumption – demand is growing for small, sophisticated vehicles that create lower value added per hour worked (Exhibits A8 and A9).
- **Retail banking.** US customers typically carry two to three times greater financial assets and loans than their French and German counterparts. This explains up to 10 percent of the productivity gap between these two countries and the US.

To the extent that these different consumption patterns are linked to individual preferences or structural differences, their effects may cancel out when looking at the aggregate level: higher demand for one kind of good might come at the cost of demand for other goods and services. However, given the US' 30% GDP per capita edge over France and Germany, it is not surprising that individuals in the US consume "more of the same" as well as more expensive goods. These differences may well explain some of the productivity differences on the aggregate level.

Exhibit A8

U.S. LIGHT VEHICLE PRODUCTION, 1992-99

Percent



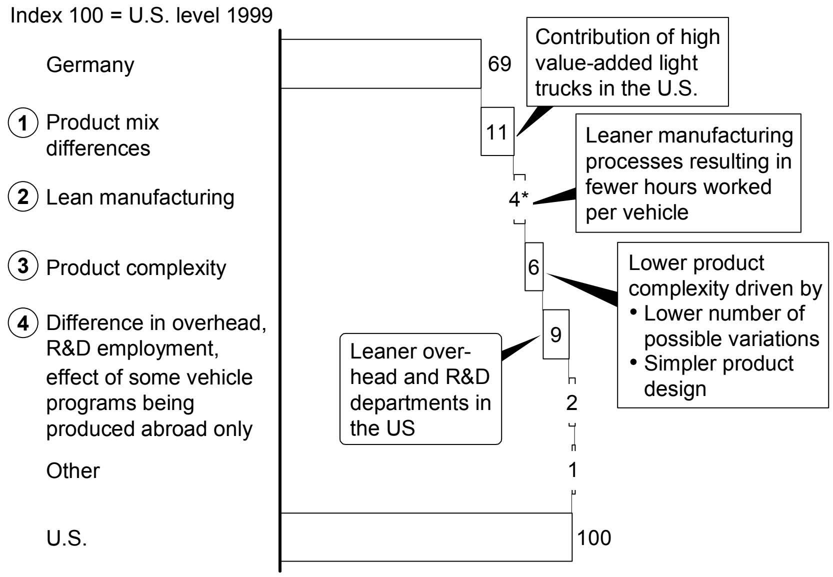
Source: DRI-WEFA; *New York Times*; VDA International Auto Statistics; MGI analysis

Exhibit A9

AUTOMOTIVE LABOR PRODUCTIVITY LEVEL DIFFERENCES – U.S. vs. GERMANY, 1999

ESTIMATE

Index 100 = U.S. level 1999



* Expert estimate

Source: Statistisches Bundesamt; U.S. Census Bureau; MGI analysis