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## **Intellectual Capital and Value Creation: A Review**

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### **INTRODUCTION**

A company's potential for creating value through the management of human and organizational resources and relationships has been increasingly emphasized recently. While the realization of that potential in the form of long-term shareholder value remains critical, there has been a marked shift in emphasis toward the "intangible value drivers" in place today that will position the firm for value realization tomorrow. A key element of this shift concerns the identification of value-based measures (financial and nonfinancial) for use by both managers inside the firm and investors outside it. While traditional, transactions-based financial measures may be adequate for confirming that value has been created (or destroyed) in the past, such measures do not satisfactorily reflect the potential for value creation/destruction in the future. In short, traditional financial measurement and reporting systems have not kept pace with changes in the external business environment or with firms' responses to those changes.

Several trends affecting business organizations prompt the dissatisfaction with today's measurement and reporting systems: (1) increasingly sophisticated and ubiquitous technology, including information technology, (2) more accessible and more competitive global markets for labor, products and capital, (3) shifting demographics, (4) the worldwide movement toward market-oriented economies, (5) the power of increasingly sophisticated and demanding customers, (6) employees who are more individualistic and entrepreneurial, (7) increasingly activist shareholders, (8) more powerful interest/pressure groups, (9) greater stock market volatility, and (10) the recent wave of corporate scandals affecting executives, board members, auditors, and others. Firms have responded to these forces in many ways, including relying more heavily on a wide range of technologies, establishing new organizational forms such as networks, partnerships and alliances, adopting new business models, emphasizing knowledge, learning and flexibility in moving in and out of markets, and implementing sophisticated business practices designed to improve efficiency and effectiveness (e.g., total quality management, business process re-engineering, just-in-time manufacturing, strategic cost management, teamwork and gainsharing, and customer relationship management).

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The limitations of traditional financial measurement systems for supporting the decision making and control activities required to manage in this new environment were widely recognized in the late 1980s and early 1990s [e.g., Berliner and Brimson, 1988; Keegan, Eiler and Jones, 1989; Maskell, 1989; Dixon, Nanni and Vollman, 1990; McNair, Lynch and Cross, 1990; Beischel and Smith, 1991; Eccles, 1991; Maisel, 1992; Wisner and Fawcett, 1991; Eccles and Pyburn, 1992; Fisher, 1992]. Concerns had been expressed even earlier by Kaplan [1983, 1984] and Johnson and Kaplan [1987]. Attention centered on the need for internal performance measurement systems that focused on performance drivers (leading measures) as well as performance outcomes (lagging measures), that combined financial and nonfinancial measures, and that linked measures to each other and to the firm's strategy.

One result was development of the Balanced Scorecard as a measurement system to "drive results" [Kaplan and Norton, 1992] and later as the centerpiece of a strategic management system to manage the business [Kaplan and Norton, 1996]. Another result, developed during roughly the same time frame but not as well known in the U.S., is the Business Navigator developed by Skandia, the global insurance and financial services company with headquarters in Stockholm. The Skandia Business Navigator, like the Balanced Scorecard, encompasses intangible value drivers around which management activities can be structured to implement strategy, and it provides a framework for measuring and communicating results. Moreover, the Navigator is a key element of Skandia's approach to understanding, measuring and managing "intellectual capital," which is seen by many as the ultimate driver of firm value.

This paper uses the Skandia Business Navigator as an organizing framework for reviewing a large body of research that examines the effects of intangible value drivers on financial outcomes at both the firm and market level. Almost 200 relevant studies are identified, conducted over more than 20 years from several disciplinary perspectives in addition to accounting, including marketing, operations, human resources, economics, strategy, and information technology. The purpose of the paper is to bring together this diverse set of studies, to organize the research within a common framework, and thus to provide a foundation for future research on value creation that will be informed by existing results and perspectives.

While none of the research reviewed here was designed specifically to address features of the Skandia Business Navigator, the results are clearly applicable to the Navigator. Moreover, because the Navigator and the Balanced Scorecard are similar in many respects, the research is also relevant to the Balanced Scorecard—as well as to value-creation frameworks that have been proposed more recently, including the Value Dynamics Framework [Boulton, Libert and Samek, 2000], the Value Chain Scorecard [Lev, 2001], and the ValueReporting Disclosure Model [Eccles, Herz, Keegan and Phillips, 2001]. The research examines such intangible value drivers as customer satisfaction, brand equity, human resource management systems, quality initiatives, R&D, information technology, and patents. It provides substantial evidence that measures reflecting such value drivers are positively associated with firm- and market-level financial outcomes.

The paper is organized as follows. The next section discusses the recent interest in measuring and reporting intangible value drivers both for internal use and for inclusion in an expanded set of external disclosures. This is followed by a description of Skandia, particularly its Assurance and Financial Services division which pioneered two developments that led directly to the Skandia Business Navigator—the “specialists-in-collaboration” concept that formed the basis for a new business model and the “federative” organizational structure that supports it. The Business Navigator, which is the centerpiece of Skandia’s intellectual capital framework and the organizing principle for the research reviewed here, is described next. The Skandia Value Scheme, which disaggregates the components of intellectual capital to make the concept less abstract, and the related Intellectual Capital Distinction Tree, are also described. The following section organizes the research evidence according to the four nonfinancial “focus areas” of the Business Navigator—human, customer, process, and renewal and development—and selected research studies in each category are reviewed. Many additional studies are summarized in the Annotated Bibliography. A final section summarizes and concludes the paper.

## INTANGIBLE VALUE DRIVERS

The interest in intangible value drivers derives from both internal information needs for managing the business and external information needs for evaluating the firm as an investment opportunity. Low and Kalafut [2002] identify three broad categories of intangibles that drive firm performance: quality of management, external intangibles, and internal intangibles. *Quality of management*, reflecting the overall managerial environment that motivates and supports value creation, includes the subcategories of leadership, strategy execution, and communication and transparency. *External intangibles*, which relate more directly to the firm’s relationships with customers and other external parties, include brand equity, reputation, and networks and alliances. *Internal intangibles*, which relate to activities and practices pursued inside the firm to create value via customers and other external parties, include technology and processes, human capital, workplace organization and culture, innovation, intellectual capital, and adaptability. Such intangibles—with their emphasis on intellectual capital, human capital, innovation, leadership, reputation, networks, and culture—are often considered “soft” and difficult to measure. While these features tend to make managers reluctant to include intangible value drivers in formal performance measurement systems, few managers would deny their fundamental importance for value creation.

In addition to the importance of intangible value drivers for firm performance, part of the recent focus on intangibles derives from increased interest in an expanded set of *external* disclosures [e.g., AICPA, 1994; Wallman, 1995, 1996; The Conference Board, 1997, 1998; FASB, 2001]. An important analysis of the need for greater external disclosure was conducted by the “Jenkins Committee” of the American Institute of Certified Public Accountants [AICPA, 1994], which recommended that the U.S. move toward a model of *business* reporting, as opposed to the narrower notion of *financial* reporting which largely involves transactions-based historical-cost financial statements.

The Committee argued that to meet the information needs of users business reporting must include more forward-looking information, focus more extensively on factors that create long term value, and better align the information reported externally with that used by senior management to manage the business. More specifically, the suggested model of business reporting contains five major components:

- Financial and nonfinancial information, e.g., financial statements and related disclosures and high-level operating data used internally
- Management's analysis of financial and nonfinancial data, e.g., reasons for changes in financial, operating, and performance-related information and analysis of trends
- Forward-looking information, e.g., on opportunities, risks, key success factors, and management's plans
- Information about management and shareholders, including compensation, directors, major shareholders, and relationships among related parties
- Background about the company, including broad objectives and strategies, scope of business, and impact of industry structure on the firm

In a follow-up to the Jenkins Committee's work, the Financial Accounting Standards Board documented a broad range of voluntary disclosures—those not required by generally accepted accounting principles or by rules of the Securities and Exchange Commission, and primarily outside traditional financial statements—that were actually being made [FASB, 2001]. The study, based on 62 companies in nine industries, was intended to assist companies in expanding their voluntary disclosures by providing evidence of the types of disclosures that many companies were already presenting. The disclosures that were documented related to the five components of the Jenkins Committee's proposed Business Reporting Model—*plus* information about intangibles that are not recognized in traditional financial statements.

Surveys of the types of intangible value drivers actually used by important user groups—typically financial analysts—have bolstered the many calls for expanded disclosures. For example, the Jenkins Committee commissioned a study involving the analysis of 479 sell-side financial analyst reports on 214 companies to better understand the types of nonfinancial information they used [Previts, Bricker, Robinson and Young, 1994]. Analysts appeared to pay special attention to quality of management, management's strategy, and anticipated changes in operations. Substantial use of nonfinancial information was found with respect to market share, competitive position, industry/economic conditions, competitors' capabilities and products, customers, suppliers, production technologies and capabilities, and R&D expenditures.

Another important study of users is the "Measures that Matter" study conducted by the Ernst & Young Center for Business Innovation [Ernst & Young, 1997]. This study examined 300 sell-side financial analyst reports and surveyed 275 buy-side investors (portfolio managers for institutional investors and funds), finding two major sets of results [Low and Siesfeld, 1998]. First, the sell-side analyst reports revealed that 39 types of nonfinancial information appeared frequently, and these fell into eight categories: quality of management, quality of investor communications, strength of market position, effectiveness of new product development, effectiveness of executive compensation policies, level of customer satisfaction, strength of corporate culture, and quality of products and services. Second, buy-side investors showed the greatest interest in 11 types of nonfinancial information in the analyst reports: execution of corporate strategy, management credibility, quality of corporate strategy, innovativeness, ability to attract and retain talented people, market share, management experience, alignment of compensation with shareholder interests, research leadership, quality of major business processes, and customer satisfaction level.

The results of Ernst & Young [1997] and Previts et al. [1994] are supported by other studies with similar findings [e.g., Dempsey, Gatti, Grinnell and Cats-Baril, 1997; Eccles and Mavrinac, 1995; Knutson, 1992; Grant, Fogarty, Bricker and Previts, 2000], and all are generally consistent with the suggestions of the Jenkins Committee [AICPA, 1994] and the follow-up study of actual voluntary disclosures by the FASB [2001]. As mentioned earlier, the FASB study also documented disclosures of intangibles that are not recognized in traditional financial statements, in recognition of the increasing importance to value creation of intangibles such as innovation, customer relationships, and human resources [e.g., Blair and Kochan, 2000; Blair and Wallman, 2000; Lev, 2001; The Conference Board, 1997]. A Brookings Institution report, which was the product of two years of work by 50 members of a special task force, clarified the broad range of intangibles in three major categories [Blair and Wallman, 2000]:

- Intangibles for which property rights are relatively clear and markets exist (generally can be bought and sold). Two types of intangibles in this category can be distinguished:
  - Assets such as patents, copyrights, brands, and trade names that are widely considered to satisfy criteria for disclosure in traditional financial statements
  - Business agreements, licenses, executory contracts, and data bases that appear to many observers to satisfy current disclosure criteria, e. g., mailing lists, operating licenses and franchises, media and other broadcast licenses, agricultural and other production quotas in regulated industries, and employment contracts

- Intangibles that are controlled by the firm but for which well-defined and legally-protected property rights may not exist, and markets are weak or nonexistent (generally can be controlled but not sold separately). Examples are R&D in process, business secrets, reputational capital, proprietary management systems, and business processes.
- Intangibles for which the firm has few, if any, control rights and markets do not exist, and which are inextricably tied to the people who work for the firm. Examples are human capital, core competences, organizational capital, and relationship capital.

The guiding principle for this classification scheme relates to the degree of difficulty of establishing ownership or control rights—and to some extent the difficulty of measurement.

Both ownership/control and measurement issues increase managers' reluctance to voluntarily disclose information concerning most types of intangible value drivers. Nevertheless, many individuals, business firms and other organizations—in the U.S. and in other countries—have recently generated a range of proposals concerning enhanced external disclosure of intangibles [e.g., Boulton, Libert and Samek, 2000; Society of Management Accountants of Canada, 2000; Danish Ministry of Science and Technology, 2003; DiPiazza and Eccles, 2002; Eccles, Herz, Keegan and Phillips, 2001; FASB, 2001; Lev, 2001; and Upton, 2001]. Moreover, two recent *multi-country* initiatives related to the measurement, management, and reporting of value-creation activities have been launched—the MERITUM project involving Denmark, Finland, France, Norway, Spain, and Sweden [European Union, 2002], and the Value Measurement and Reporting Collaborative involving Australia, Canada, Germany, South Africa, and the United States [Drozd, 2004; Burgman, 2004; Gerard, Hiris, Villani and Wunsche, 2004; Uliana, Macey and Grant, 2003; Wunsche, Gerard and Swirsky, 2003].

Research is needed to fully assess the value of these and other proposals for expanded disclosures. However, research that *already* exists provides some degree of comfort that such disclosures will be useful to investors. For example, several studies have examined the association between aggregate information contained in traditional financial statements (e.g., earnings) and stock returns over the past 40 years [e.g., Collins, Maydew and Weiss, 1997; Lev and Zarowin, 1999; Francis and Schipper, 1999; Brown, Lo and Lys, 1999; Core, Guay and Buskirk, 2003; Ryan and Zarowin, 2003]. While some studies suggest that the association has been declining over time, a review by Maines et al. [2003] concludes that the mixed nature of the evidence precludes strong conclusions. It is clear, however, that the magnitude of the earnings-returns association increases when several disaggregated financial information items are considered—including receivables, inventories, capital expenditures, order backlog, and changes in the labor force [Lev and Thiagarajan, 1993]. The incremental explanatory power of such items may reflect investors' concerns with "earnings quality" [Schipper and Vincent, 2003; Hodge, 2003].

Even after considering additional disaggregated *financial* information items, most of the variance in stock returns is still unexplained, and this has led researchers to examine *nonfinancial* variables. Maines et al. [2002] point out that such research involves two approaches: predictive ability and value relevance. *Predictive ability* studies document positive associations between current nonfinancial measures and future financial performance. *Value relevance* studies document positive associations between nonfinancial measures and firms' equity values. In the airline industry, for example, nonfinancial measures of operating performance such as load factor and on-time performance are positively associated with profitability and other financial outcomes [Behn and Riley, 1999; Schefczyk, 1993]. In the wireless communications industry, Amir and Lev [1996] find that share prices are positively associated with two nonfinancial measures—the total population area in which a firm is licensed to operate multiplied by the firm's share of ownership (called "pops"), and the penetration rate, i.e., the ratio of subscribers to "pops." Other nonfinancial measures that have been found positively associated with share prices include those related to environmental remediation [Barth and McNichols, 1994] and air-pollution prevention [Hughes 2000]. Concern with nonfinancial measures such as these reflects a shift in emphasis from value *realization*, the traditional domain of accounting and financial reporting, to value *creation*, or the potential for the firm's resources (whether or not "recognized" in the accounting sense) to generate value that will be realized in the future.

Expanded disclosures are likely to be useful (to both investors and managers) to the extent that measures meet the criteria of validity, reliability, relevance, and predictive value [Eccles et al., 2001]. *Validity* (or "construct validity") concerns whether the measure corresponds to the construct of interest, e.g., does a rating on a seven-point scale correspond to the construct of customer satisfaction? *Reliability* concerns whether measures are free from bias and repeatable by disinterested parties, e.g., does the provider of a measure have an incentive that it be high or low? *Relevance* concerns the usefulness of the measure in decision making, e.g., can management use the measure to better allocate resources? *Predictive value* (or "predictive validity") concerns whether the measure is a leading indicator of other measures in a chain of cause-and-effect relationships, e.g., do customer satisfaction ratings predict future financial outcomes? Both the predictive-ability and the value-relevance studies reviewed by Maines et al. [2002] relate to *predictive value* as described here. While traditional financial measures tend to possess acceptable levels of validity and reliability, their relevance and predictive value are sometimes questioned—which, of course, helps to explain the interest in *nontraditional* measures. The interest in disclosure of nonfinancial measures entails an underlying assumption that they possess at least a reasonable degree of validity, reliability, relevance, and predictive value, and the studies mentioned earlier lend some support to that assumption.

The "soft" nature of many types of nonfinancial measures—e.g., those relating to customer satisfaction, human capital, organizational culture, and innovativeness—is a barrier to the development and use of such measures. Additional barriers exist as well, whether the focus is on internal reporting for

managers or external disclosures for investors. Concerning internal reporting, Ittner and Larcker [1998b] document that firms (1) encounter problems developing nonfinancial information systems, (2) have difficulty establishing links between nonfinancial measures and future financial outcomes, and (3) discover that even when nonfinancial measures are available, financial measures still receive most of management's attention. Concerning external disclosures, Blair and Wallman [2000] describe four barriers to expanded disclosures. First, the conservatism of generally accepted accounting principles is a source of inertia. Second, companies have significant concerns about competitiveness and liability issues. Third, while expanded disclosures could potentially benefit all firms, any single firm has little incentive to incur the costs of developing and reporting additional information. Finally, there is a lack of good business models that describe the use to which many such disclosures might be put, and a lack of common vocabulary and definitions.

Despite such barriers, some firms have devoted substantial resources to the development of measurement and reporting frameworks for intangible value drivers. Ideally, such frameworks would not only guide the developing firm's nonfinancial measurement/reporting activities but would also serve as a model for a broader understanding of central issues involved in value creation. One such firm, Skandia, has pioneered work in this area, and their efforts are widely applicable to both the understanding of value creation and the organization of research results that examine intangible value drivers.

#### INTELLECTUAL CAPITAL—THE SKANDIA MODEL

Skandia, the insurance and financial services company with headquarters in Stockholm, has extensively focused on what many view as the ultimate intangible value driver—intellectual capital. Skandia's efforts have been described in several books, articles and cases [e.g., Bartlett and Mahmood, 1996; Earl, 1996; Oliver, 1996, 1998; Edvinsson, 1997; Edvinsson and Malone, 1997; Ghoshal and Bartlett, 1997; Roos and Roos, 1997; Stewart, 1997; Roos, Roos, Edvinsson and Dragonetti, 1998; Roos and Jacobsen, 1999; Roos, Bainbridge and Jacobsen, 2001; Grafström and Edvinsson, 2001], and in popular-press accounts such as those appearing in *Fortune* magazine [e.g., Stewart, 1991, 1994, 1995a, 1995b, 1995c, 1996, 2000].

Skandia was founded in 1855 and almost immediately began expanding to other European countries. It entered the U.S. market in 1900—the first non-British insurance company to do so—but was largely dormant in the U.S. until 60-70 years later. Its product line expanded steadily from life insurance and fire insurance to include savings products, reinsurance, banking, investment management, and other financial services. By the 1980s, Skandia was pursuing four core activities, predominantly managed by the corporate staff in Stockholm [Bartlett and Mahmood, 1996]:

- an *actuarial* function that made the risk assessments required to design insurance products



- a *sales and marketing* group that identified market opportunities and sold products mainly through company representatives and exclusive agents
- an *investment management* function that invested premium income and applied earnings to operating expenses and benefit payments
- an *administrative* group that managed the customer, accounting and regulatory functions

During this time, the largest and fastest-growing division was Skandia Assurance and Financial Services (AFS), which managed long-term savings products in markets outside the Nordic countries—a global focus that distinguished Skandia AFS from the largely Nordic emphasis of its parent company. Also during this time, Skandia AFS, under the leadership of Jan Carendi, AFS's Chief Operating Officer, and Björn Wolrath, Skandia Group President, developed and launched a new insurance/savings product and a new and innovative business model to support it.

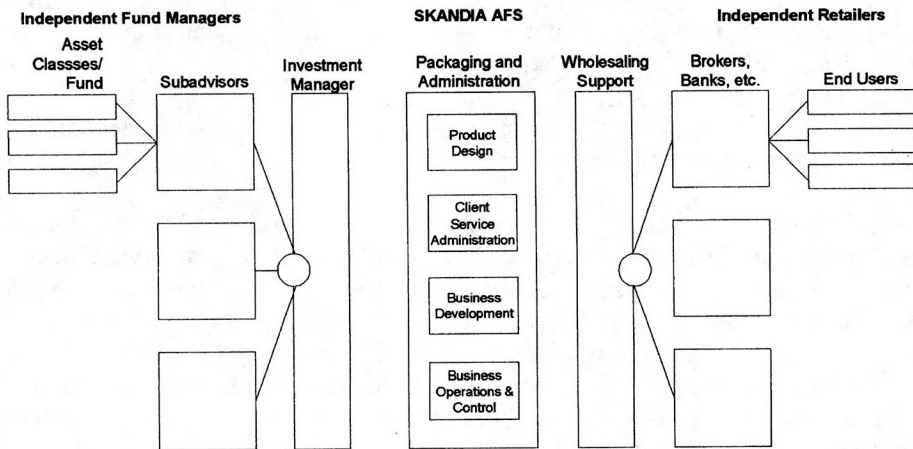
The new product was “unit-linked assurance,” a type of life insurance that allows policyholders the flexibility of investing the savings portion of the premium in a variety of investment vehicles with different risk/return profiles. Carendi and Wolrath believed the market for such a product would grow substantially because of the increasing age of the population in most industrialized countries and the widespread concern that for many people state-funded pensions alone will not provide sufficient retirement income. The new unit-linked assurance product offered flexibility and a substantial degree of self-directed investment control to Skandia AFS's customers. However, it created more complex demands on the company's product design, sales and marketing, investment management, and administration activities than traditional life insurance products. Skandia's response to these increased demands was the “specialists-in-collaboration” business model and the related “federative” organizational structure.

The specialists-in-collaboration concept, shown in Figure 1, essentially places Skandia as an intermediary between a large number of independent fund managers (e.g., mutual funds) and a large number of independent retail distributors (e.g., banks and brokers). In other words, both the fund management and the sales and distribution functions are outsourced or “externalized,” and Skandia's role is to design new products (or bundle and repackage existing products) and to administer and coordinate the various partners and alliances. Thus, the outsourced functions operate on a local level, where fund managers and retail distributors are well known in the local (country) market, while the coordination function, maintained by Skandia, operates on a global level.

The specialists-in-collaboration model not only allows Skandia to avoid absorbing financial risks but also obviates the need for investing the resources required to build fund management and distribution functions in each local market. Instead, Skandia brings “wholesale” distribution to brand-name

Figure 1

## Skandia AFS's "Specialists-in-Collaboration" Business Model



Source: Adapted from Bartlett and Mahmood [1996]

money managers, but does not serve as a "retailer" of funds that are managed by Skandia itself. As Jan Carendi put it, "We must begin to think of ourselves less as insurance specialists, and more as 'specialists in collaboration'" [Bartlett and Mahmood, 1996, p. 3]. A Goldman Sachs [2000, p. 28] report summarized these developments:

There has been a lot of talk about Skandia having pioneered a new business model, which is setting a standard for the industry. In short Skandia can be described as a packager of savings solutions for the retail market. Its distinguishing feature is that it has outsourced two key components of the savings products value chain, which traditionally insurance companies could not imagine being without: distribution and asset management. Instead Skandia focuses on only a few parts of the value chain—packaging, administration and marketing (wholesaling).

The second distinctive feature of Skandia AFS's operation is the "federative," or interdependent network, organizational structure in which the alliance partners are "tied together through a common values system but operated autonomously (much like other federations such as the different states in the USA), to develop client-based solutions" [Oliver 1996, p. 2]. This structure, shown in Figure 2, enables Skandia AFS to leverage the work of a minimal core staff—in 1995, this amounted to about 40 people in Stockholm plus a few additional "competence leaders" in other countries. Surrounding this small core, however, were some 1,700 AFS employees, including those who handled administration, information technology, and other functions for the unit-linked assurance products. Surrounding these employees were 46,000 alliance partners, including money managers, financial advisers, banks and brokers who

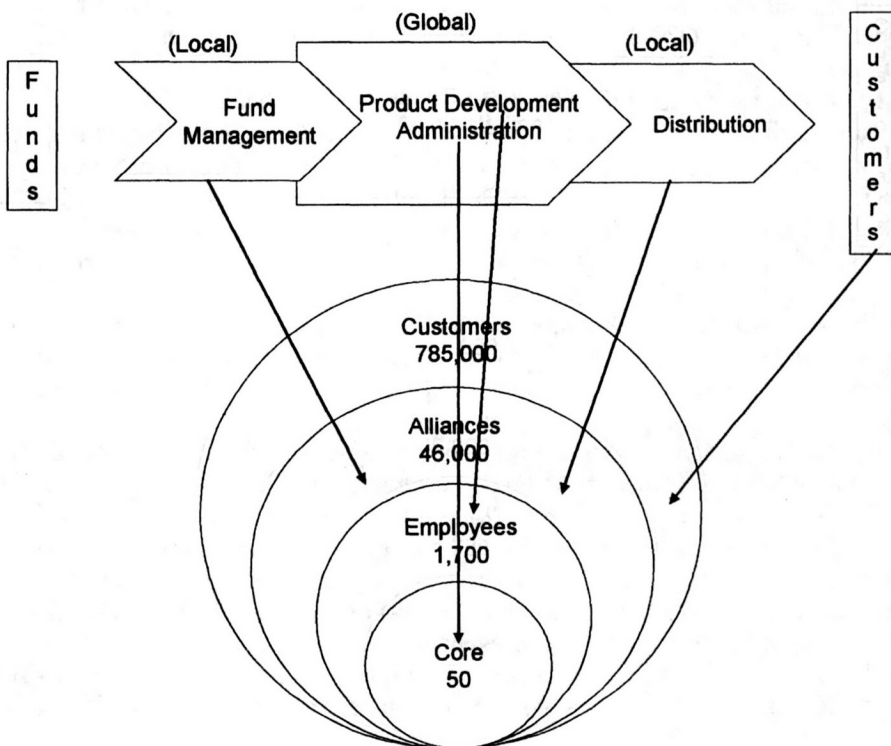
handled fund management, distribution, customer contact, and relationship development. Finally, surrounding the alliance partners were 785,000 customers, i.e., policyholders of AFS's insurance/savings products.

The federative structure relies on somewhat informal networks that connect the fund management and the sales and distribution functions to the AFS packaging-and-administration core, and that encourage information and knowledge sharing across alliance members. Thus, AFS's structure addresses what The Conference Board (1997, p. 4) regards as the "key to creating and leveraging intellectual capital . . . finding ways to speed up and expand information sharing within organizations." Moreover, since AFS has information about *both* sets of outsourced functions, it is in a strong position to integrate this information into the design of products. In this regard, AFS views the small core staff in Stockholm in a unique way:

"We don't refer to Stockholm as the *head* office," said one senior manager. "The brain power is out in the field. If anything, the center acts as the *heart* office, maintaining the values of the group and helping pump information—our lifeblood—around the organization" [Bartlett and Mahmood, 1996, p. 6].

Figure 2

## Skandia AFS's "Federative" Organizational Structure



Source: Adapted from Skandia [1995b]

Björn Wolrath and Jan Carendi believed that the specialists-in-collaboration business model and the federative organizational structure resulted in “hidden value” for Skandia AFS that was not reflected in traditional financial statements, and they wanted a way to “visualize” that value within the company and to communicate it to the stock market. To accomplish this, Leif Edvinsson, then Senior Vice President of Training and Development at a major Swedish bank, who had a strong interest in understanding the “unsurfaced” values of knowledge and service organizations, was hired by Skandia in 1991. The new position of Director of Intellectual Capital was created for Edvinsson, who reported directly to Carendi, AFS’s Chief Operating Officer. Later, the position of Intellectual Capital Controller, first held by Elisabet Gemzell Mikkelsen, was created to further support Skandia’s efforts.

The term “intellectual capital” appeared in the 1992 Skandia Group Annual Report—in Wolrath’s President’s Statement—as a label for this hidden value. Skandia’s working definition of intellectual capital was:

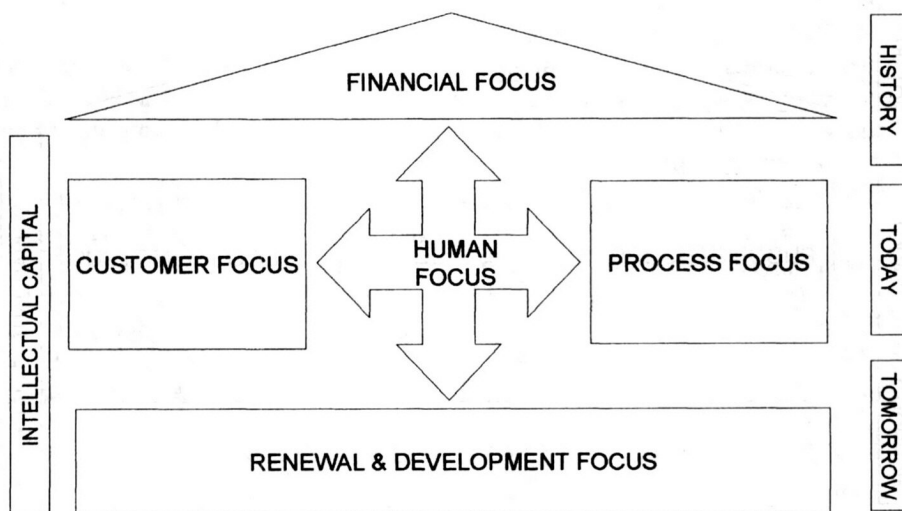
the knowledge, skill and technologies Skandia uses to create a competitive edge. This includes accessible knowledge and the applied experiences of all employees, and the organizational structure, technology and professional systems within a firm. Intellectual capital is the soft and intangible part of a company’s value. It is the sum of *human* and *structural* capital [Oliver, 1996, p. 6].

By the following year, the emphasis on intellectual capital had grown from a brief mention in the President’s Statement to an annual report supplement [Skandia, 1993] that contained indicators in eight intellectual capital “focus areas”: financial, customer, alliances, human, process, information technology, innovation, and development. A major component of Skandia’s intellectual capital framework—the Business Navigator—was later distilled from these eight focus areas. While the 1993 annual report supplement was an internal report only, beginning in 1994 Skandia published a series of Intellectual Capital Supplements to its annual and interim financial reports [Skandia, 1994, 1995a, 1995b, 1996a, 1996b, 1997, 1998]. The 1994 report, *Visualizing Intellectual Capital in Skandia*, which presented the Business Navigator, was rich in the photo themes of flowers and navigation instruments “to illustrate two important factors in developing intellectual capital: to stimulate growth and renewal, and to always have a clear sense of location and direction” [Skandia, 1994, p. 21].

The Navigator, shown in Figure 3, contains four focus areas, in addition to the traditional financial area. The *human focus* concerns the knowledge, skills, and abilities of employees that enable them to meet the needs of customers or provide other value-adding services to the organization. The *process focus* concerns the efficiency and effectiveness of internal processes that support customer needs. The *customer focus* involves a broad set of relationships with customers, based largely on aspects of the human and process areas. Finally, the *renewal and development focus* concerns investments made to support the human, process, and customer focus areas for the present and to improve them for the future.

Figure 3

## Skandia Business Navigator



Source: Adapted from Skandia [1994]

The Navigator is depicted as a house—Skandia’s metaphor for the firm itself [Edvinsson and Malone, 1997]. The foundation of the house is the renewal and development focus, and is oriented toward the future. The walls consist of the customer focus and the process focus, both oriented toward the present. The roof (or perhaps the attic) reflects the financial focus, oriented toward the past. The human focus lies at the center of the house, its “heart and soul.” Leif Edvinsson has commented, “We see the bottom line financial results as our top line. The real bottom line we want to focus on is development and renewal—the foundation for the future” [Ghoshal and Bartlett, 1997, p. 92].

The term “navigator” was chosen to evoke the dynamic, pro-active notion of “charting a course” for the company. In the words of Henrik Danckwardt, AFS’s Director of Finance and Administration, “The original purpose of the intellectual capital effort was to show the outside world our hidden values by putting metrics on intellectual capital. But the Navigator should *also* be a tool to steer the organization” [Oliver, 1996, p. 9]. The term “scorecard” was avoided for fear that it would draw attention away from the process of driving the business and toward the exercise of scorekeeping as might be done in a game or contest.

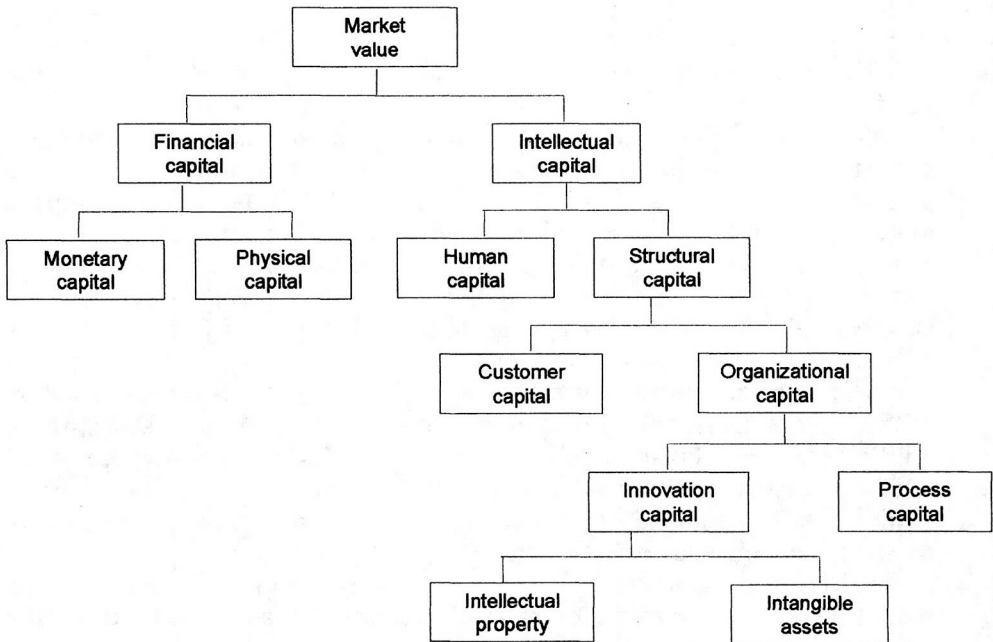
Intellectual capital—viewed as comprising the human, process, customer, and renewal and development dimensions of the Navigator—is further devel-

oped in the Skandia Value Scheme [Edvinsson, 1997; Edvinsson and Malone, 1997], shown in Figure 4. It posits that a firm's market value results from two distinct types of capital—financial capital (both monetary and physical) and intellectual capital. Of course, financial capital and intellectual capital cannot literally be summed to get market value, and no claim is made that the difference between financial capital and market value is a measure of a firm's intellectual capital at a particular point in time. Instead, financial capital, which generally is quantified and disclosed in financial reports, and intellectual capital, which generally is not, are viewed from a conceptual standpoint as the two major types of value drivers for a firm.

The Skandia Value Scheme posits that intellectual capital is composed of narrower classes of value drivers, which are in turn composed of even narrower classes, and so on, in an effort to make the conceptual notion of intellectual capital less abstract. First, intellectual capital is seen as resulting from *human capital* and *structural capital*. Human capital includes personal attributes such as knowledge, skill and experience. Structural capital includes value drivers that are both *internal* to the firm (e.g., processes, routines, databases,

Figure 4

## Skandia Value Scheme



Source: Adapted from Edvinsson [1997]

customer files, software, manuals, and organizational structures) and value drivers that are *external* to the firm (e.g., relationships with customers, suppliers, and alliance partners). Leif Edvinsson, Skandia's Director of Intellectual Capital, maintains that the value of human capital is typically small compared to the value of structural capital, and that the key task of management is to transform human capital into structural capital. (Skandia likes to say that the structural capital stays in the firm after the human capital leaves.)

The two major components of structural capital are *customer* capital (largely external) and *organizational* capital (largely internal). Organizational capital, in turn, includes both organizational *processes* that apply existing knowledge to the creation of value for customers and investors, and *innovations* that generate new knowledge for value creation. Finally, innovation capital, reflecting the renewal and development focus of the Navigator, includes *intellectual property* (intellectual capital that is legally protected) and *intangible assets* (intellectual capital that may be quantified and disclosed in financial reports).

The Skandia Value Scheme is a comprehensive framework for viewing the drivers of value creation, but at a fairly high level of abstraction. Recognizing this, Edvinsson and colleagues have further refined the framework to produce the Intellectual Capital Distinction Tree [e.g., Roos, Roos, Edvinsson and Dragonetti, 1998]. Essentially, these refinements involve a more detailed breakdown of human capital and structural capital, the two principal determinants of a firm's intellectual capital, as shown in Figure 5. Human capital is divided into three areas—competence, attitude, and “intellectual agility,”—which together capture a wide range of variables at the *individual* level (e.g., knowledge, motivation, and “conduct”). Structural capital is also divided into three areas—relationships, organization, and renewal and development—which together capture a wide range of variables at the *organizational* and *market* levels (e.g., customers, alliances, infrastructure, and “culture”).

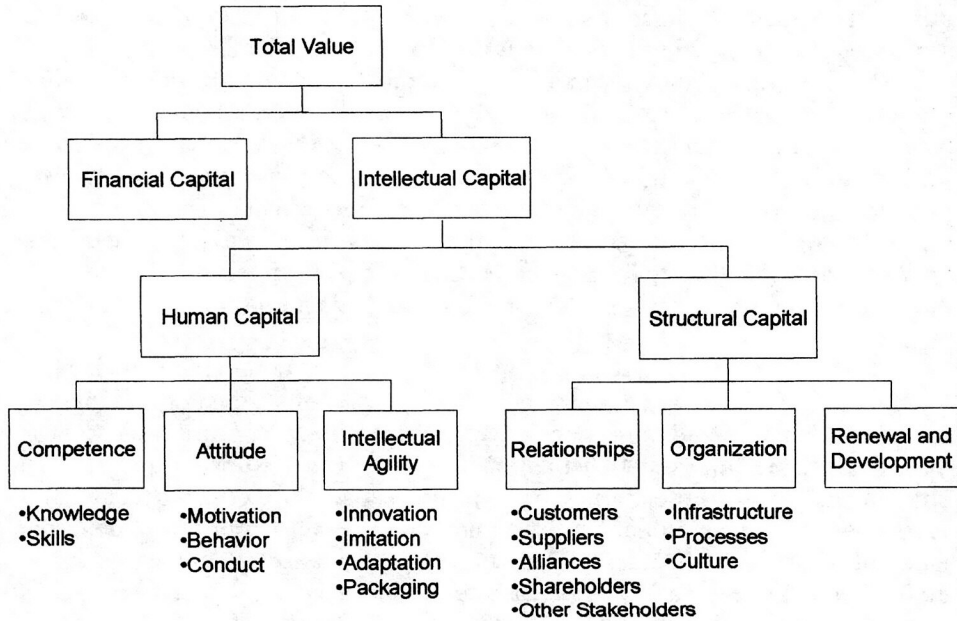
The Business Navigator and related elements of the Skandia Intellectual Capital Model have given rise to a substantial literature that reviews, refines, extends, praises, and critiques Skandia's efforts [e.g., Bontis, Dragonetti, Jacobsen and Roos, 1999; Brooking, 1996; Klein, 1998; Knight, 1999; Larsen, Bukh and Mouritsen, 1999; Lynn, 1998a, 1998b; Mouritsen, 1998; Mouritsen, Bukh, Larsen and Johansen, 2002; Mouritsen, Johansen, Larsen and Bukh, 2001; Mouritsen, Larsen and Bukh, 2001; OECD, 2000; Petty and Guthrie, 2000; Stewart, 1997, 2001; Sullivan, 1998, 2002; The Conference Board, 1997; Ulrich, 1998; and Zambon et al., 2002]. Despite this attention, neither the work by Skandia nor the subsequent literature has, to my knowledge, resulted in empirical research designed specifically to investigate the Skandia Model. As mentioned earlier, however, a substantial body of research that is directly relevant to Skandia's efforts has appeared across a variety of disciplines.

## RELEVANT RESEARCH

The research strongly supports the contention that the kinds of intangible value drivers encompassed by the Skandia Business Navigator are positively

Figure 5

## Intellectual Capital Distinction Tree



Source: Roos, Roos, Edvinsson and Dragonetti [1998]

associated with financial outcomes at both the firm and market level. The evidence comes from research conducted over the past 20-plus years in several areas, including marketing, operations, accounting, information systems, human resource management, economics, and strategy. Some of the principal results of this research are described in this section. Because of the size of the research literature, only the general nature of the research is described, along with a few examples. Almost 200 representative studies are identified in Table 1—organized according to the Navigator's four nonfinancial focus areas (human, customer, process, and renewal and development)—and summaries of a sample of 45 studies are included in the Annotated Bibliography.

The reason for focusing on the Skandia Navigator is not to suggest that Skandia's is the only—or even the best—approach to value creation/measurement, nor to suggest that Skandia's emphasis on the Navigator and related elements of its intellectual capital framework will necessarily result in sustained performance superiority with respect to firm- and market-level financial outcomes. In fact, while Skandia's business model and meas-



Table 1  
Selected Research Relevant to the Skandia Navigator

<i>Panel A. Human Focus</i>	
Abowd, Milkovich and Hannon [1990]	Hitt, Bierman, Shimizu and Kochlan [2001]
Arthur [1994]	Huselid [1995]
Banker, Field, Schroeder and Sinha [1996]	Huselid and Becker [1996]
Bartel [1994]	Huselid, Jackson and Schuler [1997]
Bartlett and Ghoshal [2002]	Ichniowski, Shaw and Prennushi [1997]
Bassi, Lev, Low, McMurrer and Seisfeld [2000]	MacDuffie [1995]
Becker and Gerhart [1996]	Miller, Kets de Vries and Toulouse [1982]
Becker and Huselid [1998]	Miller and Toulouse [1986a, 1986b]
Becker, Huselid, Pickus and Spratt [1997]	Penning, Lee and Van Witteloostuijn [1998]
Begley and Boyd [1987]	Pfau [2001]
Boone, Brabander and Van Witteloostuijn [1996]	Rynes, Brown and Colbert [2002]
Boxall and Steeneveld [1999]	Skaggs and Youndt [2004]
Delery and Doty [1996]	Szilagyi and Schweiger [1984]
Delos and Beamish [2001]	Terpstra and Rozell [1993]
Gerstein and Reisman [1983]	Welbourne and Andrews [1996]
Gupta [1984]	Wunderley, Reddy and Dember [1998]
Gupta and Govindarajan [1984]	Youndt, Snell, Dean and Lepak [1996]
Hamilton, Nickerson and Owan [2003]	

Table 1 (Continued)  
Selected Research Relevant to the Skandia Navigator

<i>Panel B. Customer Focus</i>	
Agrawal and Kamakura [1995]	Keller [2000]
Anderson, Fornell and Lehmann [1994]	Lane and Jacobson [1995]
Anderson, Fornell and Rust [1997]	Loveman [1998]
Anderson and Sullivan [1993]	Mathur and Mathur [1995]
Assmus, Farley and Lehmann [1984]	Mittal and Kamakura [2001]
Banker, Potter and Srinivasan [2000]	Morgan [2000]
Barth, Clement, Foster and Kasznik [1998]	Nagar and Rajan [2005]
Barth and Clinch [1998]	Oliver [1997]
Behn and Riley [1999]	Perera, Harrison and Poole [1997]
Capon, Farley and Hoenig [1990]	Roth and Jackson [1995]
Capron and HULLAND [1999]	Rucci, Kim and Quimm [1998]
Dresner and Xu [1995]	Rust and Zahorik [1993]
Farquhar, Han and Ijiri [1992a, 1992b]	Rust, Zahorik and Kenningham [1994, 1995]
Fornell [1992]	Simon and Sullivan [1993]
Fornell, Johnson, Anderson, Cha and Bryant [1996]	Szymanski, Bharadwaj and Varadarajan [1993]
Iftner and Lareker [1998a]	Treynor [1999]
Kallapur and Kwan [2004]	Zahorik and Rust [1992]
Kamakura, Mittal, de Rosa and Mazzon [2002]	Zeithaml [2000]
<i>Panel C. Process Focus</i>	
Aaker and Jacobson [1994]	Hitt and Brynjolfsson [1996]

Table 1 (Continued)  
Selected Research Relevant to the Skandia Navigator

<i>Panel C. Process Focus (Continued)</i>	
Abernathy, Clark and Kantrow [1981]	Ittner and Larcker [1996, 1997]
Alpar and Kim [1990]	Jacobson and Aaker [1987]
Anderson and Lanen [2002]	Jarrell and Peltzman [1985]
Anderson, Rungtusanatham, Schroeder and Devaraj [1995]	Kekre and Mukhopadhyay [1992]
Babakus, Bientstock and Van Scotter [2004]	Kelley [1994]
Baily and Chakrabarti [1988]	Kimes [1999]
Balakrishnan, Linsmeier and Venkatachalam [1996]	Kinney and Wempe [2002]
Banker and Johnston [1993, 1995]	Lau [1997]
Banker, Kaufmann and Morey [1990]	Lichtenberg [1995]
Barua, Kriebel and Mukhopadhyay [1995]	Loveman [1994]
Bates, Amundson, Schroeder and Morris [1995]	Meyer and Collier [2001]
Bharadwaj, Bharadwaj and Konsynski [1999]	Mukherjee, Lapré and Van Wassenhove [1988]
Brynjolfsson [1996]	Mukhopadhyay and Cooper [1993]
Brynjolfsson and Hitt [1995, 1996, 2000]	Mukhopadhyay, Kekre and Kalathur [1995]
Brynjolfsson and Yang [1996, 1999]	Mukhopadhyay, Rajiv and Srinivasan [1997]
Buzzell and Gale [1987]	Nagar and Rajan [2001]
Chenhall [1977]	Pannirselvam, Siferd and Ruch [1998]
Cron and Sobol [1983]	Phillips, Chang and Buzzell [1983]
Cua, McKone and Schroeder [2001]	Powell [1995]
Dean and Snell [1996]	Powell and Dent-Micallet [1997]
Devaraj and Kohli [2000, 2003]	Reger, Gustafson, DeMarie and Mullane [1994]
Dewan and Min [1997]	Ross and Georgoff [1991]

Table 1 (Continued)  
Selected Research Relevant to the Skandia Navigator

<i>Panel C. Process Focus (Continued)</i>	
Dos Santos, Peffers and Mauer [1993]	Rungtusanatham, Forza, Filippini and Anderson [1998]
Douglas and Fredendall [2004]	Salerno [1985]
Douglas and Judge [2001]	Samson and Terziovski [1999]
Easton and Jarrell [1998]	Sohal, Moss and Ng [2000]
Flynn, Sakakibara and Schroeder [1995]	Soteriou and Zenios [1999]
Flynn and Saladin [2001]	Srinivasan, Kekre and Mukhopadhyay [1994]
Flynn, Schroeder and Sakakibara [1994, 1995, 1996]	Sterman, Repenning and Kofman [1997]
Francalanci and Galal [1998]	Strassmann [1985, 1990]
Garvin [1983]	Symons and Jacobs [1995]
Goldstein and Schweikhart [2002]	Tippins and Sohi [2003]
Groves and Valsamakis [1998]	Weill [1992]
Heine, Grover and Malhotra [2003]	Westphal, Gulati and Shortell [1997]
Hendricks and Singhal [1996, 1997, 2001]	Wilson and Collier [2000]
<i>Panel D. Renewal and Development Focus</i>	
Aboody and Lev [1998]	Hall [1993]
Abrahams and Sidhu [1998]	Hall, Jaffee and Trajtenberg [2005]
Albert, Avery, Narin and McAllister [1991]	Hand and Lev [2003]
Austin [1993]	Hirschey [1982]
Bublitz and Ethridge [1989]	Hirschey, Richardson and Scholz [2001]
Chan, Kesinger and Martin [1992]	Hirschey and Weygandt [1985]

Table 1 (Continued)  
Selected Research Relevant to the Skandia Navigator

*Panel D. Renewal and Development Focus (Continued)*

- |  |                                    |
|--|------------------------------------|
| Chan, Lakonishok and Sougiannis [2001] | Jaffe and Trajtenberg [2002]       |
| Chauvin and Hirschey [1993]            | Lev [1999]                         |
| Coe and Helpman [1995]                 | Lev and Sougiannis [1996, 1999]    |
| Deng, Lev and Narin [1999]             | Megna and Klock [1993]             |
| Doukas and Switzer [1992]              | Megna and Mueller [1991]           |
| Ely and Waymire [1999]                 | Pinches, Narayanan and Kelm [1996] |
| Griliches [1990, 1995]                 | Trajtenberg [1989, 1990]           |

urement approach have often been lauded as innovative, it is clear that both the specialists-in-collaboration concept and the federative organizational structure can be imitated by competitors [e.g., Goldman Sachs, 2000]. And of course Skandia, like other insurance and financial services companies, is subject to the consequences of a general downturn in the stock market that affects long-term savings and investment products [e.g., George, 2001]. Nevertheless, the Business Navigator, which “balances” financial measures with four types of nonfinancial measures, and the related Skandia Value Scheme, which suggests a way to disaggregate intellectual capital into less abstract value drivers that potentially can be managed, provides both an intuitively appealing framework for understanding intangible value drivers and a convenient organizing principle for the enormous research literature that examines such value drivers’ firm- and market-level performance effects.

To appreciate the implications of research on the link between intangible value drivers and financial outcomes, it is essential to recognize that many interdependencies and complementarities exist among value drivers [see, for example, Brynjolfsson and Hitt, 2000; Clemons and Row, 1991; Cua, McKone and Schroeder, 2001; Devaraj and Kohli, 2000; Francalanci and Galal, 1998; Hackman and Wageman, 1995; Powell, 1995; Skaggs and Youndt, 2004; Westfall, Gulati and Shortell, 1997; Wruck and Jensen, 1994]. In the words of Kaplan and Norton [2004, pp. 29-30], value is indirect, contextual, bundled, and potential [also see Lev, 2001, pp. 6-7]. That is, intangible value drivers typically have only indirect financial impact through cause-and-effect chains that involve internal processes and customer variables such as satisfaction and loyalty. Moreover, the critical causal chains linking value drivers with financial outcomes depend on the context provided by the firm’s strategy and must be bundled with, not isolated from, that strategic context. Finally, the potential, or “readiness,” of intangibles must be realized by design, production, delivery, and customer service processes that transform such value potential into realized value.

The interdependencies and complementarities among different categories of value drivers make it difficult for a research study to isolate the financial performance effects of a particular driver. Research in this area often faces significant issues of experimental control, i.e., it must try to control for causes of performance that are not the principal focus of the study. In addition, such research must be sensitive to the conditions under which results are valid—by considering firm size, industry, life-cycle stage, general economic conditions, and other factors that might be expected to limit a study’s generalizability. Across a large number of studies, however, each focusing on controlling certain variables and understanding the impact of others, a critical mass of findings can emerge, especially if the research reflects appropriate concern for issues such as theoretical and empirical foundations, sample selection, and care in execution. For the four nonfinancial focus areas of the Skandia Navigator, the research studies in Table 1 and the Annotated Bibliography, taken together, allow a high degree of confidence that measures reflecting intangible value drivers are positively associated with financial outcomes.

Interdependencies among value drivers make it difficult to classify some of the studies in Table 1 into a single focus area of the Navigator. For exam-

ple, several studies link the quality of manufacturing or service processes to customer satisfaction, and thus could be classified under “customer focus” or “process focus.” Additionally, studies concerning human resource systems often involve human-resource-related processes and information systems, and thus could be classified under “human focus” or “process focus.” As another example, some studies investigate the impact of both advertising and R&D expenditures on share returns, and could be included under “customer focus” or “renewal and development focus.” In such cases, the classifications in Table 1 are based on the main issue addressed in the study.

The coverage of research reviewed here is necessarily selective. Hundreds of studies that bear on the focus areas of the Navigator exist, and it is not feasible to include all of them—much less to evaluate them in any detail. Moreover, important research areas that are relevant to intellectual capital and value-creation activities are omitted altogether, including research on the value-creation effects of incentive compensation schemes, traditional budgeting and financial control systems, and alliances and other types of relationships with customers, suppliers and competitors, to name a few. Nevertheless, the research included in this section is quite extensive and addresses a wide array of intangible value drivers.

The research in Table 1 examines multiple value drivers within each of the Navigator’s focus areas. Research in the human focus area examines the performance effects of both individual manager characteristics (such as ability, experience, and certain personality traits) and systems of human resource practices. Research in the customer focus area examines customer satisfaction (an outcome variable) and drivers of satisfaction such as brand equity. The process focus area involves research on the performance impact of product/service quality initiatives (via such means as branding and customer satisfaction) as well as the performance effects of investments in IT. Finally, research in the renewal and development focus area examines R&D investments (e.g., concerning process R&D related to quality improvements) and patents (e.g., concerning new product development).

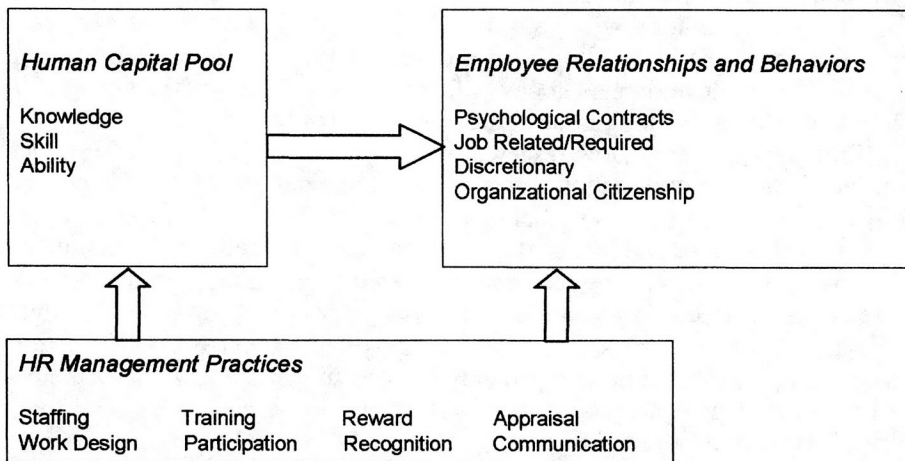
### Human Focus

Research in the human focus area has found that various aspects of human capital and its deployment in the organization are positively associated with both firm- and market-level performance outcomes (e.g., turnover, productivity, firm survival, profitability, share returns). Much of the research can be viewed in terms of the model shown in Figure 6, which highlights the key distinction between human resources and human resource *practices*. The former is the pool of human capital under the firm’s control at a given point in time, while the latter is the collection of firm activities that are directed toward managing the human capital pool to enhance firm value.

The human capital pool refers to the skills, knowledge, ability, education, experience, and personality traits of individuals, while human resource (HR) practices involve activities such as staffing, work design, training, communication, and evaluating and rewarding individuals. The distinction between human resources and HR practices is important because it emphasizes that hu-

Figure 6

## Model of Strategic Human Resource Management Components



Source: Adapted from Wright, Dunford and Snell [2001]

man resources *per se* do not create value unless they are manifested through particular *behaviors*, and that the role of HR practices is to motivate, facilitate, and align such behaviors with the firm's strategy [Wright, McMahan and McWilliams, 1994]. HR practices have a *direct* impact on employee behavior, as well as an *indirect* impact on behavior via their direct impact on the pool of human capital [Wright, Dunford and Snell, 2001].

Research that focuses on the human capital pool often takes the perspective that managers' personal characteristics should be "matched" with the nature of the business strategy being pursued [e.g., Boone, Brabander and Van Witteloostuijn, 1996; Delos and Beamish, 2001; Gupta, 1984; Gupta and Govindarajan, 1984; Szilagyi and Schweiger, 1984]. Other research in this vein takes the perspective that it is managers' behaviors, not their personal characteristics, that should be matched with strategy, as managers are assumed to be capable of exhibiting a wide range of behaviors [Schuler and Jackson, 1987]. Both perspectives, however, emphasize individual managers as the unit of analysis, and seek to link managers' characteristics/behaviors with performance outcomes.

However, much contemporary research in human resource management focuses on HR practices instead of on individual managers. The emphasis is on developing and deploying *systems* of HR practices as opposed to specific practices in isolation [e.g., Wright and McMahan, 1992; Lado and Wilson, 1994; Barney and Wright, 1998]. Such systems—often termed "high performance work systems" [Huselid, 1995; Becker and Huselid, 1998; Becker, Huselid and Ulrich, 2001]—include rigorous recruitment and selection proce-



dures, performance-contingent incentive systems, management development and training activities, and significant commitment to employee involvement. Much research has shown that high performance work systems are positively associated with a variety of performance outcomes [e.g., Becker and Gerhart, 1996; Becker and Huselid, 1998; Boxall and Steeneveld, 1999; Hitt, Bierman, Shimizu and Kochhan, 2001; Huselid, 1995; Youndt, Snell, Dean and Lepak, 1996].

The *system* aspect of HR practices is critical: The research literature emphasizes that it is the system of work practices, properly configured, and not individual elements of it, that drives performance. Not only can a system of interrelated HR practices create synergies that independent practices cannot, but the interrelatedness of the system components can make the value created by HR more difficult for competitors to imitate [Barney and Wright, 1998]. In this regard, Wright and Snell [1991] call for the "horizontal integration" of HR practices, and MacDuffie [1995] emphasizes the performance advantages of "bundles" of HR practices.

The system emphasis is also consistent with the view of organizational performance found in the literature on total quality management (TQM). While traditional approaches to human resource management often focus on individuals' contributions to firm performance (e.g., by emphasizing individual performance appraisal, goal setting, and feedback), TQM practices focus on system characteristics that facilitate or constrain individual performance, e.g., work processes, technology, training, job design, and organizational structure [Waldman, 1994a, 1994b]. Such a focus can be traced to Deming, who believed that system-based sources of variation in work performance were far more important than individual factors such as ability and motivation: "No amount of care or skill in workmanship can overcome fundamental faults in the system" [Deming, 1986, p. 315]. An implication of this view is that a strong focus on individual characteristics such as ability, motivation, personality, and experience is likely to underemphasize many of the key drivers of value creation.

High performance work systems entail both technical and strategic HR activities. Technical activities involve recruiting, selection, performance measurement, training, and administration of compensation and benefits. Strategic activities, although less clearly defined than technical activities, involve designing and implementing internally consistent policies and practices to ensure that a firm's human capital contributes to the achievement of its objectives. While managers often believe that their HR system's technical activities are more effective than its strategic activities, research suggests that strategic activities are more strongly associated with firm performance [Huselid, Jackson and Schuler, 1997].

HR systems can also be distinguished by their relative emphasis on "control" versus "commitment." The goals of control HR systems include reducing labor costs and improving efficiency by enforcing employee compliance with specified rules and procedures and by basing rewards on measurable output criteria. The goals of commitment HR systems include shaping desired employee behaviors and attitudes by forging psychological links between organizational and employee goals [Arthur, 1994]. Proponents of commitment

HR systems contend that such systems lead to a highly motivated and empowered workforce whose goals are aligned with those of the firm, while control HR systems, they maintain, often lead to employee resistance. Consequently, smoothly functioning commitment HR systems are hypothesized to result in better performance outcomes than control HR systems. Arthur's [1994] study supports this hypothesis for the performance outcomes of employee turnover and labor efficiency.

Commitment HR systems are characterized by greater employee involvement than are control HR systems. One means of increasing the level of involvement is to use employee work teams that are given a meaningful degree of autonomy. Research finds that the use of work teams is positively associated with job satisfaction, motivation, productivity, task performance, and the overall performance of the firm. One example is the research of Banker, Field, Schroeder and Sinha [1996], which finds the use of work teams to be associated with both improved product quality and greater labor productivity.

### Customer Focus

Research with a customer focus links customer-related measures to firm- and market-level performance outcomes [Srivastava, Shervani and Fahey, 1998]. Much of the research in this area examines either customer satisfaction [e.g., Anderson and Sullivan, 1993; Anderson, Fornell and Lehmann, 1994; Fornell, Johnson, Anderson, Cha and Bryant, 1996; Ittner and Larcker, 1998a; Loveman, 1998; Nagar and Rajan, 2005; Rust and Zahorik, 1993; Oliver, 1997; Zeithaml, 2000] or brand equity [e.g., Assmus, Farley, and Lehmann, 1984; Barth, Clement, Foster and Kasznik, 1998; Bublitz and Ettridge, 1989; Kallapur and Kwan, 2004; Lane and Jacobson, 1995; Morgan, 2000; Simon and Sullivan, 1993]. Customer satisfaction research often focuses on "intermediate" variables such as customer retention and referrals and their relation to financial performance outcomes, e.g., revenues, profits, and share prices. A few studies, however, examine the effects of incentive compensation plans that include customer satisfaction measures [e.g., Banker, Potter and Srinivasan, 2000].

Ittner and Larcker's [1998a] study of the performance effects of customer satisfaction illustrates this type of research. The basic questions concern whether customer satisfaction measures are leading indicators of financial performance, whether the economic value of customer satisfaction is fully reflected in contemporaneous financial measures, and whether the public release of customer satisfaction measures provides incremental information to the stock market; thus, customer satisfaction is studied at three levels—individual customer, business-unit, and firm. Analyses conducted at the *individual customer* level examine whether current satisfaction is associated with changes in customers' future purchase behavior and firm revenues. Higher satisfaction is expected to improve future financial performance by improving customer retention. Customer satisfaction is found to be associated with increases in both customer retention and revenue, while revenue growth from improved customer satisfaction diminishes at higher satisfaction levels.

Analyses at the *business unit* level examine the extent to which customer satisfaction measures predict future accounting performance and number of customers. Results indicate that business units with higher satisfaction levels have greater revenue per customer and that higher satisfaction has an indirect effect on accounting performance by attracting new customers. Changes in customer satisfaction have no *direct* effect on subsequent changes in revenues, but are positively related to future changes in the number of retail customers, which in turn is positively related to changes in revenues. Finally, analyses at the *firm* level concern whether the stock market views customer satisfaction as a forward-looking performance indicator. Specifically, the extent to which customer satisfaction scores are associated with the market value of equity, after controlling for information contained in contemporaneous accounting numbers, is examined. Satisfaction scores are positively associated with forecasted earnings, suggesting that at least some of the expected benefit from greater customer satisfaction is impounded in earnings forecasts. There is some indication that customer satisfaction is of incremental value to stock market participants, but the evidence is much weaker than that at the individual customer and business unit levels.

Other customer-focused research concerns brand equity. Such research takes many forms [Lemon, Rust and Zeithaml, 2001], including studies of the value of extending, or leveraging, an established brand name, and studies of the performance effects of advertising. Lane and Jacobson [1995] point out that brand leveraging—which attaches an established brand name to new products and evokes favorable associations with the brand name—can enhance the brand's image, generate savings in brand development and marketing costs, and increase revenues in the extension market. On the other hand, brand leveraging can result in cannibalization, brand image dilution, and brand franchise destruction—as brand extensions can lead to confusion about brand image. For example, a brand extension might diminish the perceived exclusivity or status appeal of a brand, which could not only hurt the firm in the new market but also in the brand's original market. Lane and Jacobson [1995] estimated the impact on stock returns of the release of new information regarding brand extensions in the consumer food product industry, and found significant market reactions that differed according to how familiar the brands were to consumers.

Research on advertising expenditures is relevant because such expenditures are a proxy for the development of brand equity [Barth, Clement, Foster and Kasznik, 1998]. Studies of the value-relevance of advertising often examine R&D expenditures as well, since the rationale for both is to create value that will be realized in the future. Chauvin and Hirschey [1993], for example, find that both advertising and R&D expenditures are positively associated with the future market value of the firm (especially for larger firms) in both the manufacturing and non-manufacturing sectors. They also find that few firms report exceptionally high levels of both R&D and advertising simultaneously, suggesting that firms believe R&D and advertising are alternative means of product differentiation. Finally, the importance of advertising expenditures for value creation is reinforced by Capon, Farley and Hoenig's [1990] meta-analysis of 320 empirical studies of the determinants of firms' financial per-

formance; Capon et al. conclude that advertising is one of a small number of "primary contributors" to firms' financial performance.

In the U.S., advertising expenditures generally are expensed in the period incurred because of the conservatism of generally accepted accounting principles. In Australia, however, firms are allowed to capitalize advertising and other brand-equity expenditures. Moreover, under Australian rules intangibles (as well as tangible assets) can be revalued under certain circumstances. Barth and Clinch [1998] explain that upward revaluations of appreciated assets are *discretionary* when their recoverable amounts exceed their carrying amounts, but that asset impairments *require* downward revaluations when their recoverable amounts are below their carrying amounts. Barth and Clinch examine a sample of 350 public firms in three industries (nonfinancial, financial, and mining) to determine the extent to which revaluations occur and to estimate the impact of revaluations on the market value of firms that make them. The results show that many nonfinancial firms (but not mining or financial firms) revalue intangible assets, and that the most commonly revalued intangible for nonfinancial firms is brands. Moreover, both upward and downward revaluations are value-relevant, and revaluations are significantly associated with stock prices.

### Process Focus

Research that is relevant to the Navigator's process focus includes studies of quality initiatives—or total quality management (TQM) programs—and studies of investment in information technology (IT). In the quality improvement area, research linking quality to operational and financial performance outcomes focuses on both "conformance quality" and "performance quality" [e.g., Aaker and Jacobson, 1994; Babakus, Bienstock, and Van Schotter, 2004; Buzzell and Gale, 1987; Chenhall, 1997; Douglas and Judge, 2001; Easton and Jarrell, 1998; Hendricks and Singhal, 1996, 1997, 2001; Nagar and Rajan, 2001; Powell, 1995; Samson and Terziovski, 1999]. Conformance quality concerns the extent to which a product's design, manufacturing and operating specifications meet predetermined standards, and relates mainly to the *consistency* of quality. Performance quality—sometimes called "quality of design" [Fine, 1986]—refers to the primary operating characteristics of products, and relates mainly to the *level* of quality [Hendricks and Singhal, 1996]. Several approaches for assessing the effects of quality initiatives have been developed [e.g., Black and Porter, 1996; Flynn, Schroeder and Sakakibara, 1994; Saraph, Benson and Schroeder, 1989].

Quality practices can affect financial performance through at least three avenues: cost of quality, customer satisfaction, and organizational innovation [Hendricks and Singhal, 1997]. The *cost-of-quality* avenue suggests that improving conformance levels should increase profit, in part due to the faster learning that occurs when higher quality is pursued [Fine, 1986, 1988]. As Hackman and Wageman [1995, p. 330] put it: "TQM is pro-learning, with a vengeance." The *customer-satisfaction* avenue suggests that higher customer satisfaction should lead to higher customer retention rates, increased market share, and greater profitability. The *organizational-innovation* avenue suggests

that quality initiatives improve organizational performance by encouraging the use of scientific knowledge [Wruck and Jensen, 1994] and by changing performance measurement and reward systems [Hendricks and Singhal, 1997].

Some of the early research on the effectiveness of TQM practices produced confusing and unreliable results. Powell [1995] reviews several early studies which claimed that TQM practices had significant positive performance effects, observing that most of them “were conducted by consulting firms or quality associations with vested interests in their outcomes, and most did not conform with generally-accepted standards of methodological rigor” [Powell, 1995, p. 18]. In contrast, several early claims that TQM practices are *not* effective appeared in the popular press and elsewhere, also typically based on studies performed by consulting firms. However, studies reporting a lack of TQM effectiveness were often based on managers’ *perceptions* of TQM’s impact, and not on rigorous empirical analysis. For example, Hendricks and Singhal [1997, p. 1260] refer to Hiam’s [1993] negative analysis of 20 TQM studies, noting that only three of them “report any kind of numerical measurement of the profitability impact of TQM . . . [The others] simply gave opinions about whether or not TQM improved the bottom line performance.” All three of the quantitative (non-perception) studies found *positive* associations between TQM and financial outcomes.

Some of the research on quality initiatives has used the winning of the Baldrige Quality Award or other major awards as a proxy for successful implementation of a quality improvement program, and positive associations between award proxies and various financial performance outcomes have been documented [e.g., Hendricks and Singhal, 1996, 1997, 2001]. Moreover, it has been found that quality awards given by independent organizations are more strongly associated with financial performance than are other types of awards—for example, awards given by companies to their suppliers. Most empirical studies, however, do *not* use quality awards as proxies for successful implementation, and they also find positive associations between the implementation of quality practices and financial outcome measures such as profitability, sales growth, market share, and systematic risk [e.g., Douglas and Judge, 2001; Flynn, Schroeder and Sakakibara, 1995, 1996; Mukherjee, Lapré and Van Wassenhove, 1998; Nagar and Rajan, 2001; Powell, 1995; Samson and Terziovski, 1999; Soteriou and Zenios, 1999].

The second type of process focus for which considerable research exists is investment in IT [Sethi and King, 1994]. The research literature in this area typically maintains that IT displaces other inputs—both labor and other forms of capital—in the production of goods and services as firms try to take advantage of superior price and performance improvements in IT relative to other inputs [e.g., Dewan and Min, 1997]. In fact, it has been argued that IT is not a traditional capital investment but a “general purpose technology” [Brynjolfsson and Hitt, 2000]. A general purpose technology (GPT) is an enabling technology that opens up new opportunities rather than providing a complete solution to an organizational (or societal) need; as such, GPTs are characterized by pervasiveness, the potential for further technical improvements, generalized productivity gains, and increasing returns-to-scale [Bresnahan and Trajtenberg, 1995]. Examples of GPTs are the steam engine, the telegraph, the

electric motor, and the semiconductor. The argument that IT is a general purpose technology rests on the position that "a significant component of the value of information technology is its ability to enable complementary organizational investments such as business processes and work practices [and that] these investments, in turn, lead to productivity increases by reducing costs and, more importantly, by enabling firms to increase output quality in the form of new products or in improvements in variety" [Brynjolfsson and Hitt, 2000, p. 24].

The relationship between IT investment and performance has been investigated extensively at the economy-wide level, the industry level, and the firm level [Brynjolfsson and Yang, 1996; Devaraj and Kohli, 2000]. Studies conducted at the firm level focus on investment in computers and computer-intensive technology such as electronic data interchange, automated teller machines, airline reservations systems, and computer-aided manufacturing. Such studies generally show a positive IT-productivity relationship. It is becoming increasingly recognized, however, that IT spending must be coupled with effective IT *usage* if this positive relationship is to emerge [e.g., Devaraj and Kohli, 2003].

The early literature in this area was controversial. Some early studies found little (or negative) impact of IT investment on productivity gains or financial outcomes [e.g., Alpar and Kim, 1990; Loveman, 1994; Strassmann, 1985, 1990], while others found positive impacts [e.g., Banker and Johnston, 1995; Kekre and Mukhopadhyay, 1992; Mukhopadhyay and Cooper, 1993]. These mixed results suggested to some observers that investment in IT had become a "strategic necessity" but was not a source of competitive advantage [e.g., Clemons, 1991].

Both theoretical and methodological explanations for the neutral or negative results have been considered [e.g., Brynjolfsson, 1993; Brynjolfsson and Hitt, 1996; Dos Santos, Peffer and Mauer, 1993]. From a theoretical standpoint, it has been argued that IT investments lower entry barriers, intensify market competition, and eliminate market inefficiencies that enable firms to maintain monopoly power, thus failing to create any lasting return to the investing firm [Bharadwaj, Bharadwaj and Konsynski, 1999]. Hitt and Brynjolfsson [1996, p. 121], for example, concluded from their study of IT investment by 370 large firms: "Our findings indicate that IT has increased productivity and created substantial value for consumers. However, we do not find evidence that these benefits have resulted in supranormal business profitability." Methodological issues include failure to adequately control for other industry- and firm-specific factors that influence financial performance, misspecification of the time lag between IT investment and subsequent financial impact, and the use of accounting measures of performance. While these issues are relevant to many types of value-driver research, they appear to have especially affected early studies of the IT-performance relationship.

Another feature of many early studies was the tendency to investigate aggregate outcome variables at the firm level instead of "intermediate" variables (e.g., quality, costs, inventory reductions) that are expected to affect firm-level outcomes [Barua, Kriebel and Mukhopadhyay, 1995]. On this point, Kelley [1994, p. 1406] argues that it is not surprising that early studies often

failed to find a payoff to IT because they “suffered from a lack of specificity in conceptualizing the link between technology and the affected process or processes.” Similarly, Mukhopadhyay, Rajiv and Srinivasan [1997] maintain that the impact of IT on *specific processes and tasks* must be understood because the effects of successful and unsuccessful IT applications can offset each other when the firm is the unit of analysis. Finally, Devaraj and Kohli [2000] point out that the interdependent effects of IT investment in concert with other initiatives such as business process reengineering (BPR) must be considered because the impact of IT may depend on whether other initiatives are also implemented. Moreover, the implementation of IT along with another initiative such as BPR could have a synergistic performance effect that is greater than the sum of the separate effects of the two initiatives. Francalanci and Galal [1998] make the same point with respect to the combination of IT investment and changes in workforce composition.

Later studies that address many of these theoretical and methodological issues—e.g., by using stock prices or Tobin’s *q* as the measure of performance, or by employing less aggregated performance measures—find positive associations between IT investment and financial performance [e.g., Anderson and Lanen, 2002; Bharadwaj, Bharadwaj and Konsynski, 1999; Brynjolfsson and Hitt, 1996, 2000; Francalanci and Galal, 1998; Lichtenberg, 1995; Powell and Dent-Micallet, 1997; Sohal, Moss and Ng, 2000; Srinivasan, Kekre and Mukhopadhyay, 1994; Weill, 1992]. In fact, several studies show not only positive returns to IT investment, but greater returns to IT than to investments in labor and other forms of capital [e.g., Brynjolfsson and Hitt, 1995, 1996; Lichtenberg, 1995; Dewan and Min, 1997].

Brynjolfsson and Yang [1999] observe that the positive association between IT investment and performance found in later studies could mean that IT investment is a proxy for investment in other types of organizational capital or for investment in organizational change: “Our deduction is that the main portion of the computer-related intangible assets comes from the new business processes, new organizational structure and new market strategies, which each complement the computer technology. . . . More recent studies provide direct evidence that computer use is complementary to new workplace organization. . . .” [seen in Lev, 2001, p. 64]. This is consistent with the points made earlier concerning the interdependencies and complementarities among value drivers, and the difficulty of ascribing a positive performance effect to a single driver.

Finally, studies of the market reaction to announcements of IT investment have sometimes distinguished between innovative and noninnovative investments. Investments are considered innovative if they represent the first use of a technology among firms in an industry, result in a new product or service based on IT, or lead to the development of new information technology for the industry (e.g., software with new applications). Investments are considered noninnovative if the firm is following investments already made by competitors or the investment is made to maintain an existing application. Dos Santos, Peffer and Mauer [1993] find that announcements of innovative IT investments are positively associated with excess returns, while announcements of noninnovative or follow-up IT investments are not.

## Renewal and Development Focus

With respect to the renewal and development focus of the Navigator, a substantial amount of research exists on the association between financial outcome measures and both R&D investment and patents. R&D is a major driver of technological change which, in turn, has a substantial impact on productivity and growth. The substitution of technology for labor—and more generally the substitution of intellectual capital for physical capital—has increased the importance of R&D to such an extent that some estimates suggest the returns to R&D investment are more than double the returns to investment in tangible assets, reflecting both the greater productivity and the greater risk of R&D investment [Lev, 1999].

Research on the performance effects of R&D investment entails some of the same difficulties as research on IT investment, including uncertain time lags between investment and impact and the potential difficulty of controlling for other variables that affect performance. The body of research on R&D, however, is stronger than that on IT, with many studies showing R&D spending to be positively related to financial outcomes such as sales growth, share returns, and book-to-market values [e.g., Aboody and Lev, 1998; Chan, Lakonishok and Sougiannis, 2001; Griliches, 1995; Lev and Sougiannis, 1996, 1999; Hand and Lev, 2003]. Privately-financed R&D has been found to contribute more to productivity than government-financed R&D, although the contribution of both is significant. Moreover, the impact of basic research that is aimed at developing new science and technology is greater than the impact of other types of R&D, such as product development and process R&D, that are aimed at improving production efficiency [Lev, 2001]. This is consistent with Dos Santos et al.'s [1993] finding of greater market impact for the announcement of innovative IT investments than for the announcement of follow-up IT investments.

In addition, R&D investment tends to have greater impact on firm value in the earlier stages of the R&D process. For example, Pinches, Narayanan and Kelm [1996] studied R&D's market impact in the three sequential stages of initiation, progress, and commercialization, finding a generally decreasing trend in market impact over these three stages. Their analysis involved more than 500 positive R&D announcements in the categories of biotechnology, new products, science and research, and technology. About 10% of the announcements were made in the initiation stage, while 30% were made in the progress stage and 60% in the commercialization stage. While the *average* increase in stock returns was 1.24% for the entire sample, the average increases were 1.43% for initiation, 1.61% for progress, and 1.01% for commercialization. In the biotechnology industry, the average increase was 9.44% in the initiation stage and 6.97% in the progress stage.

It is often difficult to establish a clear relationship between R&D investment and its capital market effects. One reason, as mentioned earlier, is that the time lag between R&D investment and realization of the related benefits is often unknown. Another reason is that generally accepted accounting principles typically require expensing instead of capitalization of R&D, creating concern that firm profitability is distorted—sometimes overstated and sometimes understated [Lev, 1999]. Consequently, financial statements of R&D-



intensive firms may fail to provide adequate information for assessing profitability, risk, and growth. In this regard, software expenditures, which have been *capitalized* in the U.S. since 1985, are an interesting case in that research finds that both the annually capitalized amount of software development costs and the amount of software assets reported on the balance sheet are positively associated with stock prices, and that software capitalization improves earnings predictability—despite the subjectivity involved in capitalization [Aboody and Lev, 1998].

In part because of concerns with accounting data, researchers examining R&D have sometimes relied on survey responses supplied by companies instead of on more objective data sources. This has led some researchers to employ more reliable measures of R&D such as patent activity, e.g., patent counts, patent citations, and patent renewal and fee data. Of all the types of intellectual property—including trademarks, copyrights, and trade secrets—patents stand out as being the most tangible and as enjoying the strongest legal protection. A strong contemporaneous relationship exists between patents and R&D expenditures [Trajtenberg, 1990]. However, the focus in patent research is on measures of R&D *output* rather than on input measures such as spending [see, e.g., Lev, 1999, 2001; Rivette and Klein, 2000a, 2000b; Jaffe and Trajtenberg, 2002]. Rivette and Klein maintain that by carefully managing its patents a firm can enhance its financial performance not only by using the patents to protect existing products but in several additional ways.

Research shows that even simple patent counts are positively related to investment in R&D and to firm market value. Patent counts, however, are noisy measures because patents vary widely in terms of both technological and economic significance and because very few patents generate substantial returns. Citation of patents by *subsequent* patents—reflecting the impact of a firm's research activities on future developments—is considered a more useful measure of value. Several studies have linked firm- and market-based performance outcomes to patent counts and citations [e.g., Albert, Avery, Narin and McAllister, 1991; Deng, Lev and Narin, 1999; Griliches, 1990; Hall, Jaffe and Trajtenberg, 2005; Jaffe and Trajtenberg, 2002].

### Further Research

While the research on intangible value drivers is voluminous, it is not complete, and thus contributions can be made by further studies that address the human, customer, process, and renewal and development focus areas of the Skandia Navigator. Instead of investigating aspects of each of these focus areas independently, however, as the research reviewed in this section typically has done, a more valuable research strategy may be to concentrate on the interdependencies and complementarities among value drivers in multiple categories, recognizing that many renewal-, process-, human-, and customer-related activities are necessary for value creation (and ultimately for value realization in the form of profits, cash, or share returns). Milgrom and Roberts' [1990, 1995] discussion of the complementarities among the key elements of a firm's strategy is relevant here. The defining characteristic of strategic complements is that an improvement in the effectiveness of any subset of the ac-

tivities results in marginal returns to improvements in the remaining activities. Activities are complements “if doing (more of) any one of them increases the returns to doing (more of) the others” [Milgrom and Roberts, 1995, p. 181]. Thus, complementary elements of strategy, and of the value drivers that support strategy, are mutually reinforcing, and future research on intangible value drivers should take this into account.

Other research could examine the Skandia Navigator more directly. To what extent have organizations adopted the Navigator (or other elements of Skandia’s intellectual capital framework) to guide their value-creation efforts? What have been firms’ experiences with respect to implementation and use of the Navigator, and to what extent is its use associated with improvements in financial performance? Aside from *actual* experience with the Navigator, to what extent would *experimental* studies demonstrate positive associations between use of the Navigator (or other elements of the Skandia framework) and performance? Research that directly examines the Skandia Navigator might usefully be guided by recent research on the Balanced Scorecard that specifically examines its adoption, use and performance effects [see, e.g., Banker, Potter and Srinivasan, 2000; Davis and Albright, 2004; Hoque and James, 2000; Ittner Larcker and Meyer, 2003; Lipe and Salterio, 2000; Malina and Selto, 2001; Moers, 2005; and Speckbacher, Bichof and Pfeiffer, 2003]. Direct research on the Navigator would be a valuable complement to the present approach that interprets existing research within the Navigator framework.

Research could also examine the usefulness of the Navigator as a framework for the *external disclosure* of nonfinancial information. As mentioned earlier, Skandia published an Intellectual Capital Supplement to its annual and interim reports for some years during the 1990s. These supplements typically disclosed measures within each focus area of the Navigator for several Skandia divisions. In addition, the Value Measurement and Reporting Collaborative has documented a variety of voluntary disclosures using the Navigator framework [Burgman, 2004; Gerard et al., 2004; Uliana et al., 2003; Wunsche et al., 2003]. Moreover, a model that is closely related to the Navigator—the Intangible Assets Monitor—has also been used as an external reporting framework. The Intangible Assets Monitor, developed by Sveiby [1997a, 1997b] based in part on earlier work by Sveiby, Anell, Axelsson, Emilsson, Karlsson, Wangerud and Vikström [1989], encompasses three nonfinancial value-driver categories—external structure (concerning customers and suppliers), internal structure (concerning internal organizational processes), and competence (concerning employees). Within each category, measures are divided into three subcategories—stability, efficiency, and growth/renewal (or change). The Intangible Assets Monitor has provided a foundation for nonfinancial disclosures by several European companies [see Sveiby, 1997b for examples], as well as by Infosys, an information technology service provider in India [see DiPiazza and Eccles, 2002]. However, the extent to which investors or analysts find such disclosures useful in their decision making has not, to my knowledge, been the subject of research.

## CONCLUSION

This paper describes Skandia's intellectual capital framework and reviews a large amount of research that supports it. Of particular interest is the Business Navigator, a key element of the Skandia approach that groups intangible value drivers into four focus areas—human, customer, process, and renewal and development. The research reviewed here was conducted from a variety of disciplinary perspectives, including accounting, marketing, operations, human resources, and information technology, and it examined a diverse set of value drivers. While none of the research was designed specifically to investigate the Skandia approach, it nevertheless addresses issues of value creation in the four nonfinancial focus areas of the Navigator. The research strongly supports the view that measures of intangible value drivers such as those encompassed by the Skandia Business Navigator are positively associated with financial outcomes at both the firm and market level.

Moreover, because the Skandia approach has much in common with other models of value creation that involve intangibles, linking the existing research to the Business Navigator also links it to these other approaches. An important example is the Balanced Scorecard which was developed during roughly the same time frame as the Skandia approach. The Balanced Scorecard involves three nonfinancial value-driver categories—customer, internal business processes, and learning and growth—which correspond generally to the Navigator's focus areas of customer, process, and renewal and development, respectively. The Balanced Scorecard and the Navigator differ, however, in that the other Navigator area, the human focus, does not constitute a separate Balanced Scorecard category, but is included in learning and growth. Another difference is that some aspects of the Navigator's renewal and development focus would be subsumed under the Balanced Scorecard's internal business processes category, specifically in the subcategory of "innovation processes" [Kaplan and Norton, 2004]. While these and other differences between the Navigator and the Balanced Scorecard exist, "translation" from one framework to the other is relatively straightforward.

Furthermore, a recent development in the evolution of the Balanced Scorecard framework—the Strategy Map [Kaplan and Norton, 2001, 2004]—incorporates key aspects of the Intellectual Capital Distinction Tree (Figure 5) which, as noted earlier, is an outgrowth of the Skandia Value Scheme (Figure 4). The Strategy Map is a visual representation of cause-and-effect relationships among components of a firm's strategy. Overlaying the Strategy Map on the Balanced Scorecard's four categories provides a temporal perspective on how learning and growth measures are linked to internal business process measures, which are linked to customer measures, which in turn are linked to financial measures. The most recent version of the Balanced Scorecard Strategy Map [Kaplan and Norton, 2004] proposes that the learning and growth category comprises the three subcategories of human capital, information capital, and organization capital, and considerable attention is devoted to integrating these components of intellectual capital—or "intangible assets" as Kaplan and Norton call them—with each other and to aligning them with strategy.

Thus, the relevance of the Skandia Business Navigator for informing organizational analyses that are guided by the Balanced Scorecard is clear, as is the applicability to the Balanced Scorecard of the research reviewed here.

Finally, while this paper concerns the association between components of intellectual capital and firm- and market-level financial outcomes, reflecting an internal or managerial focus, the Skandia Navigator and related framework has sometimes served as a foundation for the external reporting of nonfinancial information. Thus, the Skandia approach to intellectual capital may be useful for not only understanding value creation (and *research* on value creation) but also for communicating value-creation activities to interested stakeholders.

## ANNOTATED BIBLIOGRAPHY

Aaker, D.A., and R. Jacobson. 1994. The financial information content of perceived quality. *Journal of Marketing Research* 31 (May): 191-201.

Corporate managers are often said to be preoccupied with short-term profit to the detriment of long-term opportunities and business performance because of the pressures that financial markets place on short-term results and because the benefits accruing to long-term strategies are more difficult to measure and communicate to the market. Investors, too, focus on short-term results because strategies that enhance long-term performance often diminish current-term earnings. Against this background, the authors explore whether the perceived quality of a firm's product is associated with its stock returns. Thirty four companies/brands were studied over the 1989-1992 period. Perceived quality is positively and significantly associated with stock returns, implying that quality affects investors' expectations of future profitability. The relationship between perceived quality and stock returns holds after controlling for advertising expenses and current Return on Investment (ROI). In fact, the explanatory power of perceived quality is found to be comparable to that of ROI. Overall, the findings imply that investors are aware of the information contained in product quality and that they use this information when making decisions. Hence, it may be beneficial for firms to disclose information about their brand quality/image.

Aboody, D., and B. Lev. 1998. The value relevance of intangibles: The case of software capitalization. *Journal of Accounting Research* 36 (Supplement): 161-191.

This paper examines the relevance of information on the capitalization of software development costs by analyzing associations between financial data and both capital market variables and earnings forecast accuracy. It is motivated by the 1996 petition from the Software Publishers Association to abolish *Statement on Financial Accounting Standards No. 86: Accounting for the Costs of Computer Software to be Sold, Leased, or Otherwise Marketed*. The petition argued that capitalization of software development costs, which recognizes the existence of an asset, does not benefit investors. Because of increasing volatility in the software market (e.g., due to compression of product cycles or heightened competition), the realization of software assets has become increasingly uncertain even at the point of technological feasibility.

Data were collected on net capitalized software assets, annual software development expenses, annual capitalized software amounts, annual amortization of software assets, occasional write-offs of capitalized software, and "capitalization intensity" (ratio of the annually capitalized portion of software development costs to total development costs, whether expensed or capitalized). A sample of 163 software firms is examined over the 1987-1995 period. Annually capitalized development costs are found to be positively associated with stock returns, as are cumulative software assets reported on the balance

sheet. Firm size, software development intensity (ratio of annual software development costs to sales), profitability, and leverage are significantly related to capitalization intensity. The results also suggest that (1) the credibility of the amounts of capitalized software development costs increased over time, (2) changes in capitalization are associated with subsequent earnings changes, (3) software capitalization does not reduce earnings quality, and (4) investors distinguish between capitalized and expensed software development costs. Finally, it is shown that early in the life of a firm, when the growth in intangibles investment generally exceeds the firm's return on equity, capitalization enhances reported income proportionately more than equity, implying a higher reported return on equity under capitalization than under expensing. As the firm matures, however, this relationship disappears.

Albert, M. B., D. Avery, F. Narin, and P. McAllister. 1991. Direct validation of citation counts as indicators of industrially important patents. *Research Policy* 20: 251-259.

This research compared patent citations, as indicators of the value to a company of its patent portfolio, to technological experts' ratings of the technological strength of those same patents. The logic behind the interest in citations is that if a previously issued patent is cited by patent examiners in subsequently issued patents, the cited patent has been "prior art" to later patents. Research has consistently shown that high citation counts are associated with other indicators of technological importance. The study concerns how experts in a field evaluate patents in that field, and whether their evaluations correlate with the citations those patents receive.

Fourteen senior Eastman Kodak researchers evaluated the technological importance of 77 silver halide technology patents issued to Eastman Kodak in a two-year period. At least three researchers rated each patent based on information packets containing an abstract of each patent. They were asked to identify the two patents they believed had the greatest and the least technological impact, and to rate the remaining patents relative to those two. The patents were rated for their technological, not commercial, importance. Results reveal a strong positive association between the researchers' ratings of technological importance and the number of citations received. Most of this effect resulted from patents at the high end of the ratings and citation counts. Stated differently, the most frequently cited patents were also evaluated by the Eastman Kodak researchers as the most technologically important.

Austin, D. H. 1993. An event-study approach to measuring innovative output: The case of biotechnology. *American Economic Review* 83 (May): 253-258.

The private value of patents and the effect of selected patents on rival firms are investigated. The rivalry effects of patents is studied to show the extent to which key patent events determine market structure. The relationships among a patent's scope, its association with end products, its membership in a particular scientific patent class, and its value and rivalry effects are the principal concerns of the study. The data consist of all 565 patents owned by the

20 largest biotechnology firms as of November 1991. Seventeen products for which there had been competition in R&D among the sample firms were also identified. One-fifth (121) of the patents in the sample were linked to one of these 17 products, and another 69 patents related to these products were held by firms outside the sample. The study controls for the confounding effects of rival patents that issue on the same day as the patents of interest by excluding all except 262 "solitary" patents, i.e., those issuing in weeks when no other patent in the sample issued. The patents are divided into those with a broad scope and those with a narrow scope, depending on the number of unique scientific groups into which they are classified. A third group contains a small subset of "blockbuster" patents that were announced in the *Wall Street Journal*.

The results show that product-linked patent events are valued more highly than non-product-linked events, suggesting that patents that are identifiable with end products are more valuable than the average patent. Some of the unlinked patents cover intermediate processes that do not lead directly to marketable products. The author observes that although unlinked process patents are valued less by the market immediately, product patents are not necessarily of higher ultimate economic or social value than process patents. Moreover, patents that are announced in the press are more highly valued when they issue than are unannounced patents. Only small differences in value between broad and narrow patents are identified. Finally, the effect of patents on rival firms relative to their effects on the firms that developed them is examined. Rival effects are measured by competing firms' stock price responses to a rival firm's patent. Results show that the response of the firm owning the patent is greater than that of its rivals (which is usually negative).

Anderson, E. W., C. Fornell, and D. R. Lehmann. 1994. Customer satisfaction, market share, and profitability: Findings from Sweden. *Journal of Marketing* 58 (July): 53-66.

Links between customer-based measures of firm performance (customer satisfaction) and accounting-based measures of performance are examined. Customer satisfaction is conceptualized as both transaction-specific and cumulative, and cumulative satisfaction (based on the total purchase and consumption experience with a good or service over time) is said to motivate a firm's investment in customer satisfaction. It is noted that customer satisfaction differs from product or service quality in several ways: (1) In contrast to quality which can be perceived without consumption, customer satisfaction requires experience with a product. (2) Customer satisfaction depends on value (ratio of perceived quality to price) and thus, in contrast to quality, depends on price. (3) Quality pertains to a customer's current perception of a good or service, whereas satisfaction is based on current and past experience.

The paper posits that market expectations and experiences affect customer satisfaction, which in turn affects profitability. High customer satisfaction (reflecting increased loyalty, reduced price elasticity, enhanced reputation, and lower future transaction costs) leads to customer retention and should be

reflected in a firm's economic return. Higher customer satisfaction is expected to lead to higher profitability at a diminishing rate. Customer satisfaction itself is affected by overall quality, price, and market expectations. In the context of cumulative customer satisfaction, the long-run effects of increased expectations should outweigh short-term negative effects and lead to an increase in overall customer satisfaction. The experience of customers in a previous period should have a positive influence on buyers' expectations of quality. While both current quality and expectations are hypothesized to have a positive impact on customer satisfaction, the effect of current quality is expected to be stronger because of the greater salience of current quality experiences. Finally, it is suggested that the relationship between customer satisfaction and market share is not obvious. While increasing market share can lead to lower prices, it might also result in an increasingly heterogeneous customer base that is more difficult to satisfy. A high market share or "one size fits all" strategy is likely to be profitable only when the customer base is homogenous.

The results indicate that (1) current customer satisfaction is primarily a function of current quality and past satisfaction, (2) quality has the greatest impact on customer satisfaction, (3) customer satisfaction is cumulative, (4) the effect of expectations of quality on customer satisfaction is positive and significant, (5) ROI is strongly affected by customer satisfaction, (6) market share and customer satisfaction are inversely related, and (7) year-to-year increases in market share are associated with decreases in customer satisfaction. The following implications are offered: (1) The long-run nature of economic returns from improving customer satisfaction suggests that current customers are an "asset" to the firm. (2) Since increasing customer satisfaction affects future cash flows, resources allocated to improving quality and customer satisfaction should be treated as investments rather than expenses. (3) Implementing a customer-asset orientation requires aligning the firm's processes, resources, performance measures, and organizational structure to treat customers as assets. (4) Firms that achieve high customer satisfaction enjoy superior economic returns, although those returns are not realized immediately.

Anderson, E. W., C. Fornell, and R. T. Rust. 1997. Customer satisfaction, productivity, and profitability: Differences between goods and services. *Marketing Science* 16 (Spring): 129-145.

This paper is motivated by the observation that efforts to improve productivity can harm customer satisfaction. The study concerns how customer satisfaction and productivity relate to each other and whether the relationship differs between goods and services. Disagreement exists about the relationship between customer satisfaction and productivity. The rationale for a positive relationship is based on the notion that customer satisfaction allows fewer resources to be allocated to handling returns, rework, warranties and complaints, thereby decreasing costs and improving productivity. The rationale for a negative relationship entails that the pursuit of customer satisfaction increases costs and thereby reduces productivity. To resolve the issue, quality has been defined as having two dimensions: (1) quality that meets customer needs (reflecting design characteristics of a product) and (2) quality that consists of



freedom from deficiencies (product reliability, suggesting standardization). When customer satisfaction is positively related to standardized quality, productivity and customer satisfaction are more likely to be compatible. Therefore, achieving superiority in both productivity and customer satisfaction is most likely when quality standardization for a product is both possible for producers and desirable for customers. Moreover, productivity and customer satisfaction are compatible when standardization is more important than customization. This is hypothesized to be more likely for goods than for services.

Customer satisfaction data from the Swedish Customer Satisfaction Barometer, which measures overall customer satisfaction as experienced by customers, are analyzed. Productivity is measured as sales per employee. Findings include: (1) The association between customer satisfaction and productivity is significant and positive for goods, and significant and negative for services. (2) Simultaneous changes in both customer satisfaction and productivity are more strongly associated with economic returns for goods than for services. (3) Tradeoffs between satisfaction and productivity are less likely for goods than for services. In addition, types of businesses are classified as either high or low on both customer satisfaction and productivity: (1) High Customer Satisfaction/High Productivity: automobiles, basic foods, PCs, mainframe computers, clothing stores, mail order, insurance. (2) High Customer Satisfaction/Low Productivity: airlines, banks, charter travel, furniture stores, shipping. (3) Low Customer Satisfaction/High Productivity: department stores, gas stations, newspapers. (4) Low Customer Satisfaction/Low Productivity: supermarkets. In summary, the study suggests that customer satisfaction and productivity are compatible only for industries with a substantial goods component where customer satisfaction is highly dependent on standardized quality. In industries where customer satisfaction depends on dimensions of quality that are difficult to standardize (and therefore must be customized), an increased focus on customer satisfaction is warranted. Thus, the role of the dual nature of quality—standardization vs. customization—is important for firms to consider when evaluating the tradeoffs between productivity and customer satisfaction, and the paper alerts managers to the risks and costs involved in the tradeoff.

Anderson, E. W., and M. W. Sullivan. 1993. The antecedents and consequences of customer satisfaction for firms. *Marketing Science* 12 (Spring): 125-143.

Research has shown that customer satisfaction is linked to firm profits and executive compensation. For a firm to increase customer satisfaction, however, it is necessary to understand the relationship between the antecedents and consequences of satisfaction. The authors develop a model of these relationships and test it using data from a national survey of 22,300 customers of 114 companies in 16 major product and service industries in Sweden. Satisfaction is modeled as a function of perceived quality and "disconfirmation," i.e., the extent to which perceived quality fails to match pre-purchase expectations. Buyers form expectations regarding the quality of a product or service. Purchase and consumption of the product/service reveals a perceived quality that

is influenced by the individual's prior expectations. Comparison of perceived quality with expectations causes the buyer to either confirm or disconfirm pre-purchase expectations, an outcome that is likely to influence the buyer's future purchasing behavior. The ease with which customers can evaluate the quality of a product is thought to moderate the extent of disconfirmation. When buyers find it easy to distinguish high and low quality, they are more likely to experience disconfirmation. Therefore, it may be especially important for firms whose buyers are familiar with their product, and that offer products whose quality is difficult to standardize, to control quality and manage dissatisfaction. On the other hand, disconfirmation is less a concern for products whose quality is difficult to evaluate. Thus, firms should consider raising expectations on attributes that are difficult for customers to disconfirm, and vice versa.

Firms that consistently provide high satisfaction tend to have customers with a low variance of expectations about quality, which results in a positive reputation for the firm; in turn, reputation determines the sensitivity of customers to short-run deviations in product quality and satisfaction. High-satisfaction firms are less vulnerable to the impact of disconfirmation on customer retention. Consequently, current satisfaction, current perceived quality, and disconfirmation have less impact for high-satisfaction than for low-satisfaction firms. Since attracting new customers is more expensive than retaining existing customers, satisfaction can have important financial implications for firms. The results reveal that: (1) Satisfaction increases both perceived quality and disconfirmation and has a positive impact on repurchase intentions. (2) It is more important to manage customer satisfaction when customers are familiar with a product and when the product is not complex. (3) Expectations play a greater role in determining satisfaction when quality is difficult to evaluate. (4) Firms that consistently provide high satisfaction and high-quality products are better able to retain customers. (5) A firm's ability to control the impact of disconfirmation through effective customer service and responsiveness is a key aspect of managing satisfaction. (6) Quality that falls short of expectations has a greater impact on satisfaction and retention than quality that exceeds expectations. Thus, the results suggest how customers' expectations of product quality interact with the actual experience of product quality to generate satisfaction, and how satisfaction influences the likelihood of subsequent purchases.

Arthur, J. B. 1994. Effects of human resource systems on manufacturing performance and turnover. *Academy of Management Journal* 37 (June): 670-687.

This study compares the impact of different strategic human resource systems—termed “control” and “commitment” systems—on performance and turnover in U.S. steel mini-mills. It tests the proposition that the relationship between turnover and manufacturing performance differs between the two types of systems. It is observed that control and commitment systems represent two distinct approaches to shaping employee behaviors and attitudes. The

goal of control HR systems is to reduce direct labor costs and improve efficiency by enforcing employee compliance with specified rules and procedures and basing employee rewards on measurable output criteria. The goal of commitment HR systems is to shape desired employee behaviors and attitudes by forging psychological links between organizational and employee goals. Commitment HR systems typically involve higher levels of employee involvement than control HR systems.

It is argued that smoothly functioning commitment HR systems result in higher organizational performance than control HR systems. A commitment system can lead to a highly motivated and empowered work force whose goals are closely aligned with those of management, while a control system can lead to strong resistance from a unionized workforce. The first hypothesis is that plants with commitment systems will exhibit better manufacturing performance than plants with control systems. The second hypothesis is that turnover will be higher in control systems than in commitment systems. Finally, the literature on strategic human resource management suggests that the effect of turnover on organizational performance depends on the nature of the system in which the turnover occurs. For instance, the tendency for jobs in organizations having commitment systems to require high training and skill levels suggests a stronger relationship between organizational tenure and performance in commitment systems than in control systems. The third hypothesis is a stronger negative relationship between turnover and manufacturing performance in commitment systems than in control systems.

Data were collected via a survey of managers at 30 U.S. steel mini-mills, and involved multiple respondents per mini-mill. Human resource variables examined included decentralization, participation, training, skill, due process, wages, benefits, bonuses, and the percentage of the workforce that is unionized. The dependent variables were manufacturing performance and turnover. Manufacturing performance was proxied by labor efficiency and measured as scrap rate—the number of tons of raw steel needed to produce one ton of finished product. Turnover was measured as the number of production and maintenance employees who left the mill over the past year divided by the total number of production and maintenance employees in the mill. Control variables were firm age, size, union status, and business strategy. Mean scores on measures of decentralization, training, skill, and wages were significantly greater in commitment systems than in control systems. Bonuses were significantly higher in control systems, consistent with the use of an output control strategy. Mills pursuing low-cost strategies were more likely to have control systems, while mills with differentiation strategies were more likely to have commitment systems. Commitment systems were associated with significantly higher manufacturing performance than control systems—reflected in both fewer labor hours per ton and lower scrap rates. Turnover was more than twice as high in mills with control systems than in mills with commitment systems. Finally, the negative relationship between turnover and manufacturing performance was greater in commitment systems than in control systems.

Banker, R. D., J. Field, R. G. Schroeder, and K. K. Sinha. 1996. Impact of work teams on manufacturing performance: A longitudinal field study. *Academy of Management Journal* 39 (August): 867-890.

Companies are increasingly forming work teams in an attempt to improve performance and achieve faster product innovation, higher quality, and improved customer satisfaction. Human resource management theories distinguish work teams along an autonomy continuum ranging from traditional work groups with low or no autonomy to self-designing teams with high autonomy. Self-designing teams have control over the composition of the team, and they decide on the tasks to be completed and the person(s) to complete them. Research has found that use of work teams is positively associated with idea generation and implementation, as well as improved productivity, satisfaction, motivation, attitude, and task performance—thereby positively affecting overall firm performance.

This study focuses on the performance implications of a team-based work system over a 21-month period in the context of manufacturing. The teams studied are intended to institutionalize worker participation in four production lines of a manufacturing plant (submotor, gear train, printed circuit board, and final assembly). These four lines vary in product diversity and capital/labor intensity. In the first part of the study, team effectiveness is found to improve over time after teams have built trust and resolved internal conflicts. The evolution of the work teams and their increasing effectiveness over time imply that team performance should be modeled as a time-trend instead of a one-time intervention. In the second part of the study, quantitative evidence of improved manufacturing performance (quality and labor productivity data) is collected. Quality is measured as the percentage of defective units produced, and labor productivity is measured as the number of units produced divided by total production hours. Results show that while there is no time trend in the defect rate prior to the formation of work teams, there is a significant reduction in the defect rate during the weeks following work-team formation. Labor productivity increases as well. Overall, the findings show that the use of work teams is positively associated with product quality and labor productivity.

Banker, R. D., G. Potter, and D. Srinivasan. 2000. An empirical investigation of an incentive plan that includes nonfinancial performance measures. *The Accounting Review* 75 (January): 65-92.

This study investigates whether nonfinancial performance measures are leading indicators of financial performance, and whether the adoption of an incentive compensation plan that includes nonfinancial measures for key managers leads to improvements in financial and nonfinancial performance. Relatively little is known about the impact of nonfinancial measures in incentive contracts, and prior research has produced mixed findings, possibly due to the short time periods investigated. The present study examines the use of nonfinancial measures in a hotel chain with more than 60 longitudinal observations per business unit, and lagged measures are used to examine the ability of nonfinancial measures to predict future financial performance. The results suggest

that (1) customer satisfaction is associated with future financial performance (operating profits, revenues, and costs) and contains additional information not reflected in financial measures, (2) customer satisfaction does not appear to impact current performance, and (3) while both financial and nonfinancial measures improve after the implementation of an incentive plan that includes nonfinancial measures, the improvement in financial performance cannot be ascribed solely to inclusion of nonfinancial measures.

Barth, M. E., and G. Clinch. 1998. Revalued financial, tangible, and intangible assets: Associations with share prices and non-market-based value estimates. *Journal of Accounting Research* 36 (Supplement): 199-233.

Two principal questions are addressed: Do the relevance, reliability, and timeliness of asset revaluations differ across types of assets—investments, property, plant and equipment, and intangibles? Do the relevance, reliability and timeliness of such revaluations differ if the valuation amount is determined by the firm's board of directors or by an independent appraiser? The study concerns firms in Australia, where upward revaluations of appreciated assets are *discretionary* when their recoverable amounts exceed their carrying amounts and must be done for all assets in an asset class, and downward revaluations of impaired assets are *required* when their recoverable amounts are below their carrying amounts and may be done for specific assets. Using a sample of 350 public firms in three industries (nonfinancial, financial, and mining), the following results emerge: (1) Many nonfinancial firms revalue intangible assets, but no mining firms and few financial firms do; the most commonly revalued intangible for nonfinancial firms is brands. (2) Both upward and downward revaluations are value-relevant. (3) Revalued amounts in all three asset classes—investment, property, plant and equipment, and intangibles—are value-relevant. (4) Revalued amounts are associated with share prices and firm value estimates. (5) Revalued operating assets are more value-relevant than assets that are less directly related to operations. (6) Director-based and independent-appraiser-based valuations are not viewed differently by investors. Overall, revalued assets have implications for firms' current value and future profitability.

Bassi, L. J., B. Lev, J. Low, D. McMurrer, and G. A. Siesfeld. 2000. Measuring corporate investments in human capital. In M.M. Blair and T.A. Kochan, Eds. *The New Relationship: Human Capital in the American Corporation*. Washington, DC: The Brookings Institution.

This is a broad-ranging essay on the central importance to both firms and markets of human capital. Among the points made are the following: (1) Firms know little about the nature and magnitude of the investments they make in human capital and whether these investments are effective. (2) The growing gap between the book and market values of firms in knowledge-intensive industries suggests an enormous role of human capital. (3) While the capital markets serve to adjust firm valuations based on changes in a firm's

human capital, the adjustment process is not well understood. (4) Public companies have little incentive to disclose human capital information. (5) The absence of accepted methods for measuring and valuing firms' investments in human capital is likely to result in underinvestment. Finally, several possible measures of human capital are proposed, involving, e.g., investments in formal and informal training, employee and customer satisfaction, collaboration levels in key initiatives, productivity of knowledge workers, employee awareness of knowledge sources, management experience and credibility, alignment of compensation with shareholder interests, and performance-based compensation policies.

Becker, B. E., and B. Gerhart. 1996. The impact of human resource management on organizational performance: Progress and prospects. *Academy of Management Journal* 39 (August): 779-801.

The influence of human resource (HR) decisions on organizational performance is discussed, and unresolved questions for further research are identified. The paper is motivated by the fact that the mechanisms by which HR decisions create and sustain value are complex and poorly understood. For example, HR systems are "invisible" assets that create value only when properly embedded in the operational systems of an organization, and they are socially complex because of the importance of organizational culture and interpersonal relationships. Finally, HR systems are more than single practices, and they exhibit synergies with the rest of the organization and the environment. Thus, individual practices must be both aligned with each other and consistent with the HR architecture if they are to affect performance.

The importance of developing a cumulative body of knowledge in this area is emphasized. In response to researchers often focusing on different sets of HR practices and measures and their links with organizational performance, which can hinder efforts to achieve cumulative results, the use of broad effectiveness measures (shareholder return, firm profit, organizational survival, productivity, cycle time, and customer complaints) for assessing performance is proposed. Several avenues for research are discussed. First, while cross-sectional studies can provide generalizable results on the link between HR and performance, they typically offer little insight into the *process* by which value is created; studies of single firms or plants often provide a clearer picture of such processes. Second, future research should focus more on ruling out alternative explanations for observed relationships between HR and performance; reverse causation is an example—does profit sharing cause higher profits or do firms with higher profits implement profit sharing? Third, firm-specific measures of HR system alignment are needed, instead of simply basing such measures on the generic strategies of cost leadership and differentiation. Fourth, omitted variables often prevent drawing reliable conclusions about the link between HR and performance. Finally, in survey-based research a method bias may exist if both dependent and independent variables are subjectively assessed by a single survey respondent instead of being collected from different individuals.

Behn, B. K., and R. J. Riley. 1999. Using nonfinancial information to predict financial performance: The case of the U.S. airline industry. *Journal of Accounting, Auditing & Finance* 4 (Winter): 29-56.

This study examines the relationship between nonfinancial information and current financial performance, as well as whether nonfinancial information predicts future financial performance, for airlines in the U.S. Since airlines have significant fixed costs, it is argued, the information content of financial statements based on historical cost may be limited. Using analysts' reports and business press articles, several nonfinancial measures that might be expected to affect financial outcomes are identified, including on-time performance, customer satisfaction (complaints), mishandled baggage, ticket oversales, in-flight service, load factor, market share, and available ton miles. Monthly nonfinancial performance data were gathered from sources published by the U.S. Department of Transportation, with approximately 30 quarterly observations for each of seven airlines from 1988 to 1996.

Findings include the following: (1) On-time performance, mishandled baggage, ticket oversales, and in-flight service are important measures of customer service. (2) Customer satisfaction, load factor, and market share are positively associated with both current revenue and current operating income. (3) Customer satisfaction and market share are positively associated with future operating income. (4) Customer satisfaction, load factor, available ton miles, and market share are positively associated with future revenues. (5) Customer satisfaction is negatively associated with future expenses. (6) Available ton miles are negatively associated with future operating income. Overall, the results suggest that nonfinancial performance measures are related to current financial performance, and are useful in predicting future revenues, expenses, and operating income.

Bharadwaj, A. S., S. J. Bharadwaj, and B. R. Konsynski. 1999. Information technology effects on firm performance as measured by Tobin's q. *Management Science* 45 (June): 1008-1023.

The relationship between IT investment and firm performance is examined. Previous studies of this relationship are criticized on methodological grounds because they often used accounting-based performance measures that reflect past information, are not adjusted for risk, and are influenced by tax laws and accounting rules. The measure of firm performance used here is Tobin's q (the market value of the firm divided by the replacement cost of its assets), a measure that is forward-looking, risk-adjusted, and less susceptible to accounting- and tax-related influences. After controlling for industry characteristics and other firm-specific variables, IT investment had a significant positive association with Tobin's q, implying that IT investment is related to a firm's performance *potential* and contributes to intangible value as firms use IT to improve product quality, refine market orientation, and pursue superior customer relationships. Consequently, IT capital may be an important determinant of firm value.

Brynjolfsson, E. 1993. The productivity paradox of information technology. *Communications of the ACM* 36 (December): 66-77.

The relationship between information technology and productivity is analyzed, motivated by the observation that while the computing power of the U.S. economy has increased, productivity, especially in the services sector, seems to have stagnated. This phenomenon, called the productivity paradox, could be the result of problems with productivity measurement or mismanagement of IT by developers and users. To elaborate, during the 1980s a decrease in productivity coincided with an increase in IT investment that caused the level of IT capital per information worker to approach the level of production capital per production worker. The negative relationship between IT spending and productivity at the economy level, while potentially due to many factors, was worse in the services sector (where more than 80 percent of IT was employed), possibly because of measurement issues associated with the idiosyncracies of many services.

Four potential explanations for the IT productivity paradox are offered. Two point to shortcomings in measurement and research regarding productivity effects, while the other two recognize the possibility that there might actually be no major benefits to IT spending. The main argument of the paper is that output is measured incorrectly. Traditional measures of the relationship between inputs and outputs fail to account for nontraditional sources of value. Benefits attributed to IT—such as increased quality, variety, customer service, speed and responsiveness—are difficult to measure and are poorly reflected in accounting-based metrics. Consequently, the benefits from IT may be underestimated. Further problems arise because IT enables the introduction of greater product variety and diversity, which leads to reduced economies of scale, in turn resulting in higher unit costs. In addition, researchers may err with respect to IT input measures. For instance, if the level of IT usage is overestimated, then the unit productivity of IT will appear smaller than it really is. A consequence could be that much of the productivity improvement attributed to computer-producing industries should be attributed to computer-using industries. Overall, the author concludes that measurement problems are the most likely explanation for the IT productivity paradox.

The other three explanations offered relate to time lags, redistribution effects, and mismanagement. Significant lags between costs and benefits may exist because learning is slow and benefits from IT take several years to materialize. Or IT may benefit individual firms but be unproductive from the standpoint of an industry or the economy as a whole, so wealth could be redistributed from firms with inadequate IT budgets to firms with higher IT spending. Finally, mismanagement of information and technology could exist at the firm level, as IT can increase organizational slack and build inefficient systems. Thus, while measurement issues may be critical, a definitive answer to the question of whether and how much IT contributes to productivity is not available.



Brynjolfsson, E., and L. Hitt. 1996. Paradox lost? Firm-level evidence on the returns to information systems spending. *Management Science* 42 (April): 541-558.

This paper addresses the "productivity paradox" of information systems (IS), i.e., despite enormous improvements in technology, researchers have been unable to identify benefits of IS spending in aggregate output statistics. Three weaknesses in typical research data, it is noted, make it difficult to distinguish the contribution of information technology (IT) from random shocks that affect productivity: (1) Industry-level data allow only distinctions between industries with high and low IT investments; thus comparisons are often made only among industries. (2) Firm-level data are often difficult to collect; thus studies using firm-level data usually focus on relatively narrow samples. (3) Measuring the benefits of IT investment is difficult. The present study tries to circumvent these issues by using detailed firm-level data from 367 large firms on several components of IS spending for 1987 to 1991. The data are from annual surveys of IS managers administered by International Data Group.

The paper builds on the economic theory of production to posit a set of relevant variables and to define the structural relationships among them. Output is posited to be a function of computer capital, non-computer capital, IS staff labor, and other labor and expenses. Computer capital is measured by adding the market value of central processors (supercomputers, mainframes, and minicomputers) to an estimate of the value of PCs and terminals that is derived by multiplying the weighted average value of PCs and terminals by the number of PCs and terminals. IS staff expense is measured by multiplying the IS budget figure by the percentage of the IS budget devoted to labor expenses. Earlier studies typically had not distinguished computer capital from other capital, or IS staff labor from other types of labor expenses.

The results suggest that (1) the contribution of IT to productivity is positive, (2) net marginal profit for computer capital is higher than that for non-computer capital, (3) IS staff spending generates higher returns than spending on other labor expenses, and (4) the rate of return is highest for firms using a balanced mix of PCs and mainframes. Thus the study finds that computer capital and IS labor are significantly associated with increased output. It is argued that changes in business processes that were needed to realize the benefits of IT may have taken some time to implement, making initial returns from investments in computers low, consistent with the strategy for optimal investment in the presence of learning-by-using; that is, initial returns to IT will be lower than returns to other capital, but will subsequently rise to exceed the returns to other capital, thus compensating for the investment in learning.

Chan, S. H., J. W. Kesinger, and J. D. Martin. 1992. The market rewards promising R&D—and punishes the rest. *Journal of Applied Corporate Finance* 5 (Summer): 59-66.

This research is motivated by the belief that current stock prices do not fully reflect long-term investments such as research and development (R&D)

that pay off years after the expenditure is made. An events study is conducted to estimate the immediate impact of planned R&D spending announcements on the stock prices of announcing firms. Increases in R&D spending over the amount of the prior year are the focus of the analysis. Announcements that receive press coverage, as well as announcements that do not, are included. Other variables examined are the level of technology in the industry, R&D intensity in relation to industry norms, industry concentration, market power, and the size of the increase in R&D relative to sales. The data, from 1979-1985, consist of 95 announcements by 64 firms, all of which are well-established with average annual sales of \$4.3 billion and average annual R&D expenditures of \$158 million. The sample was divided into four categories for purposes of analysis: (1) Announcements of plans to increase R&D expenditures with no additional information provided; (2) R&D announcements that also released management earnings forecasts; (3) R&D announcements that also released quarterly earnings reports; (4) R&D announcements that also reported increases in capital expenditures.

Overall, the market response was found to be significantly positive. While high-tech firms had positive returns to R&D announcements on average, low-tech firms had negative returns on average. (Only 25% of low-tech firms had positive abnormal returns, while the figure was 71% for high-tech firms.) Higher-than-average R&D intensity was associated with larger returns only for firms in high-tech industries. Typically, results for firms in which R&D announcements were not accompanied by other disclosures were similar to those from the full sample. However, when concurrent disclosures regarding capital expenditure decisions were included with the R&D announcements, the market reaction was greater. Concurrent announcements of decreases in earnings did not change the overall results, suggesting that the market tends to reward firms that pursue aggressive R&D strategies even in the face of earnings declines. Finally, neither firm size nor market power (reflecting the extent of a firm's dominance in its industry) explained differential market reaction to the announcements.

Chauvin, K. W., and M. Hirschey. 1993. Advertising, R&D expenditures and the market value of the firm. *Financial Management* 22 (Winter): 128-140.

Relying on the notion that advertising and R&D spending provide investors with information regarding the amount and variability of future cash flows, this paper investigates the association of advertising and R&D with Tobin's  $q$ , or the ratio of the market value of the firm to the replacement cost of its assets. Both advertising and R&D spending are found to vary greatly across industries. R&D spending is more concentrated *within* industries than is advertising, with a few high-tech industries accounting for the overwhelming share of R&D activity. Few companies simultaneously report high levels of both advertising and R&D, implying that advertising and R&D are considered alternative means of product differentiation. R&D spending is a more effective means of differentiation for manufacturing firms, whereas advertising is

equally effective for both manufacturing and non-manufacturing firms. Both advertising and R&D spending are higher among larger firms, and R&D spending is more concentrated among large firms than is advertising. Thus, the results provide evidence for the value-relevance of both advertising and R&D spending for both manufacturing and non-manufacturing firms.

Coff, R. W. 1999. How control in human-asset-intensive firms differs from physical-asset-intensive firms: A multi-level approach. *Journal of Managerial Issues* 11 (Winter): 389-405.

Human assets differ from physical assets in that the former are controlled by the organization but not owned, and there is greater uncertainty and information asymmetry concerning the value of human assets. This has implications for organizational control, i.e., the process of influencing individuals to behave in ways that increase the probability of attaining organizational goals. Four levels of organizational control are posited. The *environment* includes other organizations, the government, customers, investors, legal institutions, and the economy. *Culture* refers to the underlying values, beliefs and norms that influence individual behavior and goal pursuit. Organizational *structure* reflects the formal hierarchy and distribution of authority. Finally, the formal *reward system* tries to influence individuals via goal setting, measurement, performance appraisal, and rewards.

At each level, information asymmetry results in control dilemmas with respect to human assets. In the environment, the market for corporate control may be hindered due to lack of knowledge about the target's human assets and the possibility of defection. A weak internal culture can result from firm members' loyalties to professional associations. Concerning organizational structure, centralization and formalization rely on sound information and routine tasks, yet human-asset-intensive firms often lack these attributes. Moreover, performance is more difficult to measure in human-asset-intensive firms, making it more difficult to link rewards to performance. Finally, since accounting-based measures do not reflect human assets, underinvestment in such assets may result.

Dos Santos, B. L., K. Peffer, and D. C. Mauer. 1993. The impact of information technology investment announcements on the market value of the firm. *Information Systems Research* 4 (March): 1-24.

While logic suggests that information technology (IT) can significantly impact firm performance, few large-scale empirical studies have attempted to link IT investment to performance; instead, empirical support for the IT-performance relationship consists largely of case studies. Some empirical analyses show that IT investment does not benefit firms as much as the available case study evidence might lead one to expect, suggesting that in some instances investment in IT would have produced better returns elsewhere. This study contends, however, that IT investment *can* positively affect the value of the firm. Using an event study methodology and focusing on public announcements of IT investments, the study finds that innovative IT investments

increase firm value while non-innovative (follow-up) investments do not, and this is interpreted as supportive of innovative IT investments as a means of gaining competitive advantage.

Farquhar, P. H., J. Y. Han, and Y. Ijiri. 1992. Brands on the balance sheet. *Marketing Management* 1 (Winter): 16-22.

Managers conduct brand valuations to improve managerial decisions such as assessing potential brand acquisitions, allocating resources internally between existing and start-up brands, tracking the performance of brands over time, and comparing their own brands with those of competitors. They also conduct brand valuations for purposes of mergers and acquisitions, licensing, and fund raising. Moreover, financial institutions conduct brand valuations when evaluating security for commercial loans. Brand valuation would thus appear to be a valuable activity, and it is argued that putting brands on the balance sheet would allow a clearer picture of firm value. Toward this end, three methods for assessing brand value are reviewed: *Cost-based methods*: Brands are valued based on either the actual cost associated with acquiring or building them or the replacement cost of recreating the brand. *Market-based methods*: Brands are valued based on the selling price of similar brands that have recently traded or royalty payments from the licensing of similar brands. *Economic valuation methods*: Brands are valued by a two-stage process that involves measuring the current earnings or cash flow attributable to a specific brand and forecasting the future profitability of the brand based on its existing use or on "stretching" the brand to other uses. Six principles for valuing brands are recommended: (1) Define the brand to be evaluated—what exactly is the brand and what is the target market? (2) Establish the value premise, which might be total value, discounted cash flow, royalty rate, etc. (3) Separate the brand from other sources of value as the brand's value may depend in part on tangible assets. (4) Forecast the brand's future uses and future value, including the impact of potential extensions. (5) Assure reliability of the brand valuation, i.e., the consistency of the subjective judgments required. (6) Check for validity and auditability.

Farquhar, P. H., J. Y. Han, and Y. Ijiri. 1992. Measuring brand momentum. *Marketing Management* 1 (Spring): 24-31.

This article proposes a brand valuation system based on "momentum accounting," which has been developed over the past 25 years by Ijiri. In this application, momentum accounting monitors changes in brand performance, standardizes patterns for tracking changes in brand values, and offers a resolution to the amortization issue that can be critical to the external reporting of brand values. Momentum accounting shifts the focus from independent events that are summarized in traditional financial statements to a flow of occurrences of events, by considering the rate at which income is being generated by a brand. Similar to the relationship between the balance sheet and the income statement in traditional accounting, changes in net momenta are explained by a

set of "impulse accounts," e.g., incremental revenues produced by a new advertising campaign or additional investments in new product research. Impulse accounts report how internal and external actions have positively or negatively affected net momenta. Tracking brand momentum involves several steps. First, the change in momentum from period to period is allocated to recurring and nonrecurring causes. Second, momentum changes are explained in terms of a set of impulse accounts, e.g., the change could be attributable to past advertising, past promotion, a competitor's product launch, etc. Third, rather than focusing on individual cases, managers should adopt a standardized pattern of momentum dissipation for a given impulse, based on prior knowledge about that particular activity. Steps such as these should provide incentives for managers to direct efforts toward long-term rather than short-term profitability.

Momentum changes occur if the revenues generated by a brand vary from one period to the next. Constant momentum throughout a period indicates zero performance, i.e., the brand generates no additional economic value. Improvements in momentum result from actions that are oriented toward long-term growth, such as introducing a successful brand extension, opening a new regional market for the brand, or improving attitudes toward the brand with successful advertising campaigns. Thus, momentum accounting enables managers to identify particular sources of brand value over time. Brand accounting using the Ijiri model can produce several benefits, including refining the language for communicating brand activities, providing a brand track record that shows employees how well the brand is doing, helping management to allocate resources internally, and enabling executives to communicate brand information across levels of management.

Fornell, C., M. D. Johnson, E. W. Anderson, J. Cha, and B. E. Bryant. 1996. The American customer satisfaction index: Nature, purpose, and findings. *Journal of Marketing* 60 (October): 7-18.

This article describes the nature and purpose of the American Customer Satisfaction Index (ACSI), a market-based performance measure for firms, industries, economic sectors, and national economies. ACSI represents a cumulative evaluation of a firm's market offering, rather than an individual's evaluation of a specific transaction. ACSI provides annual estimates of a firm-level customer satisfaction index for each company in the sample and weights these firm-level indices to calculate industry, sector, and national indices. Motivated by the observation that as the economy changes measures must also change, it is argued that in today's economy of increasingly differentiated goods and services, producing more, however efficiently, need not necessarily be better. Conventional output measures of economic performance, such as productivity, are not only difficult to compute in a more differentiated marketplace, but also may be less informative than in an economy based more on mass production and consumption of commodities.

Overall customer satisfaction is said to have three determinants—perceived quality, perceived value, and customer expectations. *Perceived*

*quality* depends on the two primary components of consumption experience—customization (the degree to which the firm's offering is customized to meet heterogeneous customer needs) and reliability (the degree to which a firm's offering is reliable, standardized, and free from deficiencies). *Perceived value* is the ratio of the perceived level of product quality to price. *Customer expectations* represents the served market's prior consumption experience as well as a forecast of the supplier's ability to deliver quality in the future. Research based on the ACSI suggests that customers are generally more satisfied with goods than with services. It also suggests that (1) customization is more important than reliability in determining customer satisfaction, (2) customer expectations play a larger role in sectors in which variance in production and consumption is relatively low, and (3) customer satisfaction is driven more by quality than by value or price. It is argued that ACSI provides an important measure of past and current financial health, and that ACSI is a leading indicator of financial performance.

Hendricks, K. B., and V. R. Singhal. 1996. Quality awards and the market value of the firm: An empirical investigation. *Management Science* 42 (March): 415-436.

This study examines the impact of winning a quality award on the market value of the firm by measuring the change in the firm's stock price when information about the award is publicly announced. It investigates stock price behavior from three years before to one year after winning an award, as well as changes in the systematic risk of the firm after winning an award. Since some of the benefits of a quality initiative might be reflected in stock price *prior* to announcement of the award, possibly causing the market reaction to understate the complete impact of effective quality implementation, winning a quality award might not be a complete surprise to the market. Nevertheless, a positive market reaction to winning an award would indicate that the event provides information to the market.

One hypothesis is that implementing a quality program that improves conformance quality has a positive impact on the firm's future cash flow. Prior research has shown that conformance quality lowers costs and improves a firm's likelihood of gaining market share. Hence improvements in conformance quality are expected to increase a firm's revenues while reducing its costs. A second hypothesis is that winning a quality award is associated with changes in the systematic risk of the winning firm, reflecting the belief that improving quality improves the firm's competitive position. The third hypothesis is that firm size is inversely related to the magnitude of the abnormal return. Since larger firms are tracked more closely than smaller firms, more information about large firms' efforts to implement quality programs is available to the market, resulting in a smaller change in response to the award announcement. A final hypothesis, distinguishing between independent awards such as Baldrige and awards that are given by companies to their suppliers, is that the market reaction is greater for independent awards than for awards given in company/supplier relationships.

The sample consists of 91 award announcements covering 76 firms and 34 awarding organizations. The results indicate that the market reacts positively to award announcements and that systematic risk decreases in the post-award period. The event of winning a quality award has a greater market impact for smaller firms than for larger firms. In addition, the market reacts only slightly to awards given by firms to their suppliers, even if the supplier is a small firm. Finally, large firms experience negative stock price performance in the second year prior to winning awards and this is followed by a year of positive performance, whereas small firms experience positive stock price performance prior to winning awards (which is not sustained in the post-award period).

Hendricks, K. B., and V.R. Singhal. 1997. Does implementing an effective TQM program actually improve operating performance? Empirical evidence from firms that have won quality awards. *Management Science* 43 (September): 1258-1274.

Concerns have been expressed about whether TQM programs generate real improvement in operating performance, and stories circulate about Baldrige award winners that have suffered financial setbacks and in some cases bankruptcy—leading to the idea that TQM might actually damage firm performance. Such stories and concerns typically are not supported by rigorous evidence, but rely on anecdotes, hype, and publicity. Most TQM studies have been conducted by businesses and consulting firms using surveys of managers' *opinions* of TQM's success in their organizations. Such studies neither control for industry- and economy-wide influences nor test the statistical significance of performance improvements following TQM implementation. In contrast, the present study aims to provide rigorous empirical evidence on whether implementation of TQM programs affects firms' operating performance.

TQM can affect operating performance through its impact on cost of quality, customer satisfaction, and organizational innovation. The concept of cost of quality suggests that improving conformance levels should increase profit, while customer satisfaction suggests that higher customer satisfaction should lead to higher customer retention rates, increased market share, and greater profitability. Organizational innovation suggests that TQM improves efficiency by encouraging the use of scientific knowledge and by changing performance measurement and reward systems. The study tests the hypotheses that implementing an effective TQM program improves profitability, increases revenues, and reduces costs. Additionally, the impact of implementing a TQM program on capital expenditures, total assets, and number of employees is explored.

The sample consists of almost 400 publicly traded firms that won their first quality award between 1983 and 1993. To estimate the benefits of TQM programs, operating performance is measured both before and after implementation of TQM. Since an awarding organization can take several months to evaluate the effectiveness of a firm's TQM program, the authors use one year prior to winning an award as an estimate of when the firm's TQM program

became effective. Results show that firms that have won quality awards outperform a control sample on operating-income-based measures. Changes in the ratio of operating income to assets, to sales, and to number of employees are significantly greater for firms winning awards, relative to the control sample. Moreover, firms that have won quality awards outperform non-award-winning firms in terms of sales growth. Weaker evidence suggests that firms with TQM programs are more successful in controlling costs than firms without TQM programs. Finally, firms that implement TQM experience higher growth in both employment and total assets.

Hendricks, K. B., and V.R. Singhal. 2001. The long-run stock price performance of firms with effective TQM programs. *Management Science* 47 (March): 359-368.

This paper compares the performance of firms winning quality awards with that of non-award winners over a five-year pre-and post implementation period. The stock price performance of award winners is viewed as an indicator of the value of TQM. Because the market might view the winning of quality awards cautiously—resulting in a slow adjustment of stock prices over time—it is important to link TQM to long-run stock price performance as well as to short-term returns. The study is based on a sample of almost 600 firms chosen by trained examiners from different awarding organizations.

The results reveal that abnormal stock returns are not significantly different from zero during the implementation period. Thus, the stock price performance of award winners does not differ significantly from that of non-award winners during the implementation period. However, during the post-implementation period, award winners significantly outperform non-award winners of similar size, industry, and book-to-market ratios. The results are interpreted as encouraging for firms that are considering the adoption of TQM, and as reassuring for firms that have already invested in TQM. The results also confirm that the benefits of TQM implementation are not realized immediately.

Hitt, M.A., L. Bierman, K. Shimizu, and R. Kochar. 2001. Direct and moderating effects of human capital on strategy and performance in professional service firms: A resource-based perspective. *Academy of Management Journal* 44 (February): 13-28.

This paper examines how human capital moderates relationships among service diversification, geographic diversification, and firm performance in a professional service (law) firm. Building on the view that much of an organization's knowledge resides in its human capital, the authors distinguish between articulable and tacit knowledge. Articulable knowledge can be codified and easily transferred, while tacit knowledge cannot. It is argued that professionals build articulable knowledge through formal education and tacit knowledge through experience with the firm. Therefore, partners of a professional firm, having acquired large amounts of articulable and tacit knowledge, represent substantial human capital to the firm. Moreover, a curvilinear relationship



between human capital and firm performance is posited: Early in a partner's career, when he or she has substantial articulable knowledge but little tacit knowledge, a firm might pay employees more than their marginal productivity. Later, however, as tacit knowledge is gained, productivity increases and average costs decrease. Moreover, a positive relationship between leveraging of human capital and firm performance is expected: Leveraging occurs when partners help other employees, particularly associates, to develop their own knowledge and capabilities, thereby transferring tacit knowledge to them. Leveraging enables more efficient client management and can result in new services and geographic coverage. The interaction of human capital, service diversification, and geographic diversification is expected to be positively associated with firm performance.

The study examines a sample of 93 law firms between 1987 and 1991, using survey methods and archival data. The quality of law schools attended by partners proxies for articulable knowledge, while number of years in the firm proxies for total experience. Firm performance is measured as the ratio of net income to total revenue. Leveraging is measured as the ratio of associates to partners. The results reveal a curvilinear relationship between human capital and firm performance and a positive relationship between leveraging and firm performance, as expected. A significant interaction effect of human capital and leveraging on firm performance is not found, nor is a three-way interaction among human capital, service diversification, and geographic diversification. Overall, the results suggest that time is required for new employees to develop human capital and that, when developed, human capital is important in the implementation of both service diversification and geographic diversification in professional service firms.

Hitt, L. M., and E. Brynjolfsson. 1996. Productivity, business profitability, and consumer surplus: Three different measures of information technology value. *MIS Quarterly* 20 (June): 121-142.

This paper addresses a contradiction in the results of prior research on the association between IT investment and performance—findings that productivity improvements and consumer benefits result from IT investment versus findings that IT has not had an impact on business profitability. The value of IT is viewed as comprising three related issues, stated here as questions: (1) Have investments in IT increased productivity, i.e., enabled the production of more output? (2) Have investments in IT created value for consumers, i.e., resulted in benefits that have been passed on to consumers? (3) Have investments in IT improved business profitability, i.e., led to competitive advantage? The paper stresses that productivity, consumer value, and business profitability, although related, are three different measures of IT value. Three research perspectives are used to address the above questions: (1) *Productivity theory*, which concerns the evaluation of the productivity of various inputs such as capital, labor, and R&D expenditures, predicts that lower prices for IT will create benefits in the form of lower production costs for a given level of output. (2) *Competitive strategy theory* holds that in a competitive market firms cannot earn sustainable supranormal profits because other firms will enter the

market, driving prices down. Accordingly, if IT is available to all firms in an industry, it will not confer supranormal profits, but will become simply a "strategic necessity." If a firm has *unique* access to IT, however, it might be able to earn higher profits. The impact of IT on barriers to entry, however, is ambiguous as it could reduce both economies of scale and search costs, leading to lower industry profits, or it could enable increased product differentiation, perhaps resulting in higher profits. Hence, competitive strategy theory does not clearly predict either a positive or negative relationship between IT and profits. (3) *Consumer value theory* entails estimating the total benefit accruing to the consumer. Finally, it is observed that two broad ways to increase value exist—it can be created or it can be redistributed from others—and it is maintained that productivity improvements are associated with value creation, while increased business profitability and consumer value are associated with value redistribution.

Data on IT spending and other variables were obtained from 370 large firms for 1988 to 1992, and empirical analyses conducted with respect to productivity (focusing on "total IT stock," non-computer capital, and labor—and their relationships to a firm's value added), profitability (focusing on IT stock per employee, capital intensity, debt/equity ratio, market share, and sales growth—and their relationships to ROA, ROE, and total shareholder return), and consumer surplus (focusing on the ratio of IT stock to value added, the cost of IT stock, and value added in the reference year—and their relationships to the increase in consumer surplus between two periods). The main results are that IT investment appears to be associated with increased productivity and substantial benefits to consumers, but there is no clear connection between these two types of benefit and firm profitability or stock prices. In fact, the study finds some evidence of a small *negative* impact on profitability. Overall, the results suggest that IT investment may be an effective way to pursue a cost leadership strategy, but only if the resulting cost reductions cannot be emulated by other firms, and that pursuit of increased profits must look beyond productivity and focus on how IT can address other strategic concerns such as product position and customer service.

Huselid, M.A. 1995. The impact of human resource management practices on turnover, productivity, and corporate financial performance. *Academy of Management Journal* 38 (June): 635-672.

The link between systems of high performance work practices and firm performance is studied. The basic question concerns the impact of an extensive set of human resource management practices on immediate employment outcomes (turnover and productivity) and overall financial performance. It is proposed that (1) systems of high performance work practices are associated with lower employee turnover, increased productivity, and better overall financial performance, and (2) turnover and productivity mediate the association between high performance work practices and overall financial performance. The study combines survey methods and archival data analysis using a sample of 968 firms. Measures of high performance work practices are based on prior

research that identified key practices in the areas of personnel selection, performance appraisal, incentive compensation, job design, grievance procedures, information sharing, attitude assessment, and labor-management participation as representing sophistication in human resource management. Three additional measures were included: intensity of recruiting efforts, average number of hours of training per employee per year, and promotion criteria. Factor analysis reduced this set of variables to two factors: employee skills and organizational structures, and employee motivation. Dependent variables included annual employee turnover rate, productivity (sales per employee), and overall financial performance, the latter involving both economic and accounting measures (Tobin's  $q$  and rate of return on capital).

High performance work practices were found to affect both overall firm performance and employee outcomes. The effect of employee skills and organizational structures on turnover was negative and significant, while the effect of employee motivation was not significant. The effects of both factors on productivity were positive and significant. Both factors were positively but weakly related to the financial performance measures studied. The overall conclusion is that firms benefit financially from investing in high performance work practices, and that part of that benefit is due to employee turnover and productivity effects.

Huselid, M. A., S. E. Jackson, and R. S. Schuler. 1997. Technical and strategic human resource management effectiveness as determinants of firm performance. *Academy of Management Journal* 40 (February): 171-188.

This research evaluates the impact of human resource managers' capabilities on human resource management (HRM) effectiveness, and the latter's impact on firm financial performance. It is argued that two types of HRM staff capabilities significantly influence the management of a firm's human capital—professional capabilities and business-related capabilities. Professional capabilities relate to the delivery of traditional technical HRM practices, while business-related capabilities enable members of a human resources staff to understand how firm-specific business considerations can create firm-specific HRM needs. Also addressed is whether firms have achieved a higher level of technical HRM effectiveness or strategic HRM effectiveness. Technical HRM activities include recruiting, selection, performance measurement, training, and administration of compensation and benefits. Strategic HRM activities, although less clearly defined than technical HRM activities, involve designing and implementing internally consistent policies and practices to ensure that a firm's human capital contributes to the achievement of business objectives.

The study involves a survey of 293 publicly-held U.S. firms that assessed HRM effectiveness across a wide range of practices. More than 90 percent of respondents were senior executives in human resource management positions. Major findings include: (1) Firms' technical HRM activities were described as more effective than their strategic HRM activities. (2) Strategic HRM effectiveness was significantly associated with firm performance, but technical HRM effectiveness was not. (3) The professional capabilities of HRM staff were described as greater than their business-related capabilities. (4) Both

technical capabilities and business-related capabilities were associated with strategic HRM effectiveness. Thus, the results support the contention that investments in human resource management practices can provide competitive advantage.

Ittner, C.D., and D. F. Larcker. 1998. Are nonfinancial measures leading Indicators of financial performance? An analysis of customer satisfaction. *Journal of Accounting Research* 36 (Supplement): 1-35.

The effect of customer satisfaction on financial performance and stock returns is examined. The basic research questions concern whether customer satisfaction measures are leading indicators of financial performance, whether the economic value of customer satisfaction is fully reflected in contemporaneous financial measures, and whether the public release of customer satisfaction measures provides incremental information to the stock market. Analyses are conducted at the customer, business unit and firm levels, and focus primarily on measures from 73 retail bank branches.

Analysis at the customer level examines whether current satisfaction levels of individual customers are associated with changes in their future purchase behavior and firm revenues. Higher satisfaction levels are expected to improve future financial performance by increasing revenues from existing customers and by improving customer retention. A Customer Satisfaction Index (CSI) is developed based on three questions that assess overall satisfaction with service, the extent to which service falls short of expectations, and how well actual service compares to ideal service. Results reveal that CSI is associated with increases in both customer retention and revenue.

Analysis at the business unit level examines the extent to which business unit customer satisfaction measures predict future accounting performance and number of customers. In this case, the CSI is a composite of 20 items. Results indicate that branches with higher satisfaction levels have greater revenue per customer and that higher satisfaction levels have an indirect effect on accounting performance by attracting new customers. Changes in customer satisfaction have no *direct* effect on subsequent changes in revenues. However, CSI changes are positively related to future changes in the number of retail customers, which in turn is positively related to changes in revenues. Results are strongest for CSI changes in the top quartile, suggesting that large increases in customer satisfaction may be necessary to improve performance.

Analysis at the firm level concerns whether the stock market views customer satisfaction as a forward-looking performance indicator, and it uses data from the American Customer Satisfaction Index (ACSI) where satisfaction scores are based on 15 questions. This part of the study examines the extent to which ACSI scores are associated with the market value of equity after controlling for information contained in contemporaneous accounting numbers. ACSI measures are found to be positively associated with forecasted earnings, suggesting that at least some of the expected benefit from customer satisfaction is impounded in earnings forecasts. Overall, however, the evidence linking firm-level customer satisfaction to the value of equity is weak, especially for firms with satisfaction scores below the median.

Keller, K. L. 2000. The brand report card. *Harvard Business Review* 78 (January-February): 147-157.

Ten attributes that are similar across some of the world's strongest brands are identified, and a brand report card, i.e., a systematic way for managers to evaluate a brand's performance for each of the ten attributes, is presented. A brand report card can potentially help a company to objectively assess areas in which a brand is strong and to identify areas that need improvement. The ten brand attributes are: (1) The brand excels at delivering the benefits customers truly desire. (2) The brand stays relevant. (3) Pricing strategy is based on consumers' perceptions of value. (4) The brand is properly positioned. (5) The brand is consistent. (6) The brand portfolio and hierarchy make sense. (7) The brand makes use of and coordinates a full repertoire of marketing activities to build equity. (8) The brand's managers understand what the brand means to consumers. (9) The brand is given proper support, and that support is sustained over the long run. (10) The company monitors sources of brand equity. Building a strong brand, it is argued, requires a brand manager to know how a brand is performing on all ten attributes and to use this knowledge to evaluate the effects of new advertising campaigns and other marketing activities.

Lane, V., and R. Jacobson. 1995. Stock market reactions to brand extension announcements: The effects of brand attitude and familiarity. *Journal of Marketing* 59 (January): 63-77.

Whether and how a firm's stock return is associated with brand extension announcements is studied. Brand names are considered valuable when they generate incremental earnings, i.e., greater than those generated by tangible assets. Brand leveraging, which attaches an established brand name to new products and evokes favorable associations with the brand name, can generate savings in brand development and marketing costs over time, increase revenues in the extension market, and enhance the brand's image. On the other hand, brand leveraging can lead to cannibalization, brand image dilution, and brand franchise destruction—raising the question of when brand leveraging creates a net advantage or a net disadvantage. The answer is asserted to depend on two brand equity components—brand attitude and brand name familiarity—that influence investors' expectations as well as consumers' brand perceptions and related purchasing behavior. An event study is used to estimate the market impact of brand extension announcements in the area of new consumer food products. As expected, the market reacted differently to the announcements depending on brand attitude and brand name familiarity, responding most favorably to extensions of high-esteem (attitude), high-familiarity brands and to low-esteem, low-familiarity brands. The market responded less favorably, and sometimes negatively, to brand extensions where consumer familiarity was disproportionately high relative to consumer regard, and where consumer regard was disproportionately high relative to familiarity. As an example of the latter, brands with very high consumer regard and low familiarity tend to be niche brands that appeal strongly to a select group of consumers; such brands succeed because they focus on the idiosyncratic needs

of a small target market, and brand leveraging attempts are often unsuccessful because they do not have broad appeal.

Lev, B. 1999. R&D and capital markets. *Journal of Applied Corporate Finance* 11 (Winter): 21-35.

An overview of recent R&D trends is provided. It is argued that, while disclosure regulations for R&D expenditures vary greatly across countries, regulations in the U.S. are oriented strongly toward immediate expensing, creating difficulties for financial analysis and distorting the reported profitability of firms by sometimes overstating and sometimes understating it. Moreover, because accounting rules generally require expensing instead of capitalization, much of the research on R&D has relied on survey data supplied by companies instead of on more objective data sources. Further, the time lag between R&D spending and the subsequent realization of benefits is unknown, making it difficult to establish a clear relationship between R&D spending and its capital market effects. It is concluded that information deficiencies and reporting practices related to R&D activities have had various adverse effects on the market valuation of firms, and that financial statements of R&D-intensive firms fail to provide adequate information for assessing profitability, growth, and risk.

Megna, P., and M. Klock. 1993. The impact of intangible capital on Tobin's  $q$  in the semiconductor industry. *American Economic Review* 83 (May): 265-269.

This paper investigates whether measures of intangible capital explain variation in Tobin's  $q$ , the ratio of the market value of a firm to the replacement cost of its assets. The focus is on the semiconductor industry, where patents are an important form of intangible capital. In addition to patents, R&D expenditures are investigated as semiconductor firms spend an average of 10% of sales on R&D. The possibility that *rival* firms' intangible capital affects  $q$  is also considered: Such an effect should be positive if intangible capital cannot be perfectly appropriated by the investing firm and if technological advances are cumulative. The results indicate that intangible capital explains significant variation in  $q$  in this industry. The results also confirm the importance of considering both R&D and patents since they appear to reflect different elements of intangible capital. Rivals' patents affect a competitor firm's  $q$  negatively, implying that the intangible capital is appropriated by the investing firm. In contrast, rivals' R&D expenditures affect a competitor firm's  $q$  positively, which suggests that R&D knowledge is transferred across firms.

Pinches, G. E., V. K. Narayanan, and K.M. Kelm. 1996. How the market values the different stages of corporate R&D—initiation, progress, and commercialization. *Journal of Applied Corporate Finance* 9 (Spring): 60-69.

The extent to which research and development (R&D) adds value to a firm at three identifiable stages of the R&D process—initiation, progress, and

commercialization—is examined. Stock returns to announcements of R&D projects at all three stages are the main concern of the study, but industry- and company-specific factors are also examined to better understand the valuation process. The data consist of 527 positive R&D announcements in the categories of biotechnology, new products, science and research, and technology. A total of 469 of these announcements occurred in computer and office equipment, drugs, electronics and related equipment, measuring instruments, photo goods, watches, chemicals, food and related products, communications, and biotechnology. About 60% of the announcements came at the end of the R&D process (the commercialization stage), while 10% were in the initiation stage, and 30% were in the progress stage.

On average, the announcements resulted in an increase in stock returns of 1.24%. The average increase was 1.43% for initiation, 1.61% for progress, and 1.01% for commercialization. Announcements in the biotechnology industry, however, resulted in an average increase of 9.44% in the initiation stage and 6.97% in the progress stage. Several industry- and firm-related factors—including R&D intensity, industry concentration, firm size, and frequency of R&D announcements—were examined, and a significant amount of the difference in valuation effects across companies was explained by these variables. Specifically, industry and firm factors explained 39% of the variation in returns at the initiation stage, 10% at the progress stage, and 18% at the commercialization stage. Firms announcing less frequently experienced much larger responses than those announcing more frequently, but once industry- and firm-level factors were considered frequency of announcements was less important.

Rivette, K. G., and D. Kline. 2000. Discovering new value in intellectual property. *Harvard Business Review* 78 (January-February): 54-66.

It is proposed that by carefully managing its patents a firm can enhance its performance in three broad ways—establishing a proprietary market advantage, improving financial performance, and enhancing competitive advantage. First, patents enable companies to stake out and defend a proprietary market advantage. A “clustering” strategy can enable a company to build a patent wall around products to exclude competitors from the market, and a “bracketing” strategy can enable a firm to obtain patents for technologies that support a product or service deployed by competitors, again potentially excluding competitors from the market. Second, patents can be leveraged as a source of revenue by finding new product or licensing opportunities. Repackaging a set of existing patents can allow a firm to enter new markets and perhaps to create a new entity that is attractive to investors. And by effectively managing its patents a firm can achieve significant savings in the form of reduced portfolio maintenance costs and taxes. Third, patents can be a source of competitive intelligence, potentially enabling a firm to steer its R&D and mergers/ acquisitions program around infringement and due diligence problems. When considering an acquisition or merger, a company should carefully map out the patent holdings of both firms and determine the patents’ current status and usability.

In general, it is argued that companies that treat their patent portfolios as a strategic asset or core competence can enjoy an advantage over those that do not.

Rucci, A. J., S. P. Kim, and R. T. Quinn. 1998. The employee-customer-profit chain at Sears. *Harvard Business Review* 76 (January-February): 82-97.

Initiatives undertaken by Sears, Roebuck & Co. in the 1990s to address its sagging financial performance are discussed, many of which emphasized marketing strategies to rebuild the company around its customers. Management developed an employee-customer-profit model that tracked value creation from management behavior to employee attitudes to customer satisfaction and finally to financial performance. A basic tenet of the approach was that cause-and-effect relationships exist between employees' behaviors and attitudes and customer satisfaction. Sears developed a Total Performance Indicator based on measures that capture the time lag between changes in employee and customer measures and changes in financial performance.

Five new strategic priorities were defined—core business growth, customer focus, cost reduction, responsiveness to local markets, and organizational and cultural renewal—and task forces were created around the five recurring themes of customers, employees, financial performance, values, and innovation. The result was an emphasis on Sears as a compelling place to work, to shop, and to invest. Management developed a business model that linked “working, shopping and investing” in a causal model that served as a kind of balanced scorecard. With the resulting employee-customer-profit model, Sears was able to make causal statements such as “. . . a 5 point improvement in employee attitudes will drive a 1.3 point improvement in customer satisfaction, which in turn will drive a 0.5% improvement in revenue growth.”

Rust, R.T., and A.J. Zahorik. 1993. Customer satisfaction, customer retention, and market share. *Journal of Retailing* 69 (Summer): 193-215.

A model for assessing the value of customer satisfaction is introduced, based on an individual-level model of customer loyalty and retention. Customer satisfaction is considered important in part because of its impact on market share, which can result from both “offensive marketing” that emphasizes promotional activities and “defensive marketing” which emphasizes the use of resources to retain existing customers more than to attract new ones. The model contends that satisfaction with specific service attributes leads to satisfaction on several broader loyalty factors, and that more satisfied customers are more loyal to the firm. Retail banking customers were surveyed regarding various service attributes, e.g., friendliness of the bank and the cost of checking accounts. Respondents were asked if they had switched to their current service provider because of dissatisfaction and, if so, customer satisfaction ratings for both the current and previous providers were obtained. Switchers were directly asked their reasons for switching.



Logistic regression was used to link satisfaction to service quality attributes and retention. The dependent variable was binary (switch or not switch), and the independent variables were satisfaction ratings for convenience, checking ease, and "warmth" (consisting of attributes such as friendliness, how well the manager knows the customer and listens to the customer's needs, and convenience from home). Only warmth was significantly associated with switching, and it was concluded that warmth is a key to customer loyalty in retail banking. The results also show that an improvement in satisfaction is associated with an increase in retention and market share. After the satisfaction elements that affect retention have been identified—warmth in this study—the question is how much a firm should invest to improve that element. To address this, a function is developed that relates expenditures to satisfaction. Although the link between satisfaction and retention is not found to be straightforward, it is suggested that by linking satisfaction to a firm's probability of retaining customers, which in turn is related to market share and revenue, the profit impact of increased customer satisfaction can be predicted.

Schefczyk, M. 1993. Operational performance of airlines: An extension of traditional measurement paradigms. *Strategic Management Journal* 14 (May): 301-317.

The operational performance of 15 international airlines is examined using publicly-available data, especially the extent to which operational performance is explained by nonfinancial measures. Performance evaluation is difficult in this setting because airlines must make long-term decisions about aircraft, routes and facilities in the face of considerable uncertainty, because capital costs are an extremely important factor in airline operations, and because such operations must consider cost effectiveness, reliability, speed, and other factors. The study examines several asset-related and cost-related inputs and outputs that are linked by passenger demand. Asset-related inputs include information on facilities, affiliated companies, and available ton-kilometers. Cost-related inputs include aircraft fuel and commissions to agents. Output measures include revenue-passenger kilometers, non-passenger load factors, percentage of international kilometers, operating costs, non-flight assets, and return on equity. Selected findings are that (1) high efficiency is associated with low non-flight assets and high gross margin, (2) efficiency is positively related to return on equity, and (3) an efficient and passenger-focused airline is more profitable.

Sethi, V., and W. R. King. 1994. Development of measures to assess the extent to which an information technology application provides competitive advantage. *Management Science* 40 (December): 1601-1627.

This paper concerns the development of measures for a construct termed "Competitive Advantage Provided by an Information Technology Application" (CAPITA), the purpose of which is to assess the extent to which information technology provides competitive advantage. The proposed CAPITA

construct is based on two fundamental approaches to understanding the strategic role of technology: (1) The *outcome* approach—reflected in notions such as competitive efficiency, management productivity, and business value—assesses competitive advantage using performance outcomes. Limitations are that outcome variables are often highly aggregated, are sometimes insensitive to the effects of a single IT application, and generally provide little insight about the underlying processes through which IT affects competitive advantage. (2) The *trait* approach, in contrast, seeks to identify key traits or attributes that characterize competitive advantage, and is reflected in notions such as competitive forces, value activities, and customer resource life cycles. The trait approach suggests that competitive advantage is embodied in the degree to which an IT application possesses certain key attributes. Data were collected from information systems executives regarding information technology applications developed for the purpose of gaining competitive advantage. Respondents described the IT application developed in their own organization that was intended to make the *most* significant contribution to their firm's competitive position.

CAPITA was conceptualized in terms of five dimensions: (1) *Efficiency*—the extent to which an IT application enables a firm to produce products at lower cost than competitors; (2) *Functionality*—the extent to which an IT application provides the functionality desired by users; (3) *Threat*—the impact of the IT application on the bargaining power of customers and suppliers; (4) *Preemptiveness*—early preemption of the market by the application; (5) *Synergy*—the application's integration with business goals, strategies, and environment. A factor analysis of survey responses identified seven factors based on these five dimensions: *Primary Activity Efficiency*—impact on cost of inbound logistics, operations, outbound logistics, and service; *Support Activity Efficiency*—impact on cost of human resource management, firm infrastructure, and coordination of activities; *Resource Management Functionality*—assistance to primary users in upgrading, transferring, disposing of, and monitoring the usage of a resource; *Resource Acquisition Functionality*—impact on the acquisition phase of the resource life cycle; *Threat*—impact on supplier selection, supplier switching costs, ability to threaten vertical integration, customer selection, and customer switching costs; *Preemptiveness*—extent to which an application provides unique access to channels, forces competitors to adopt less favorable market postures, and influences development of industry standards and practices; *Synergy*—alignment with the firm's business strategy. It is suggested that CAPITA can serve as the basis for a multidimensional measure of sources of competitive advantage with respect to IT investments, and that the associated measures can be used as variables in empirical research.

Simon, C. J., and M. W. Sullivan. 1993. The measurement and determinants of brand equity: A financial approach. *Marketing Science* 12 (Winter): 28-52.

A market-based approach to estimating brand equity, and to analyzing changes in product-level brand equity within a firm, is illustrated. The ap-

proach rests on the assumptions that market data provide the most objective indication of the financial value of a firm, that firms with widely-recognized brand names possess greater brand equity, and that a reliable measure of brand equity is required to understand the brand-equity effects of marketing events. The approach was applied to marketing events in the soft drink industry (concerning Coca-Cola and Pepsi) during the 1980s. Results include the following: (1) Industries and firms with widely-recognized brand names have higher estimates of brand equity. (2) Industries that sell branded consumer products have higher estimates of brand equity. (3) Coca-Cola's brand equity increased when the Coke name was extended to Diet Coke, while Pepsi's brand equity declined during the same period. (4) The introduction of "new Coke" decreased Coca-Cola's brand equity while it increased Pepsi's brand equity. (5) Coca-Cola and Pepsi both gained brand equity after the approval of aspartame for use in soft drinks.

Trajtenberg, M. 1990. A penny for your quotes: Patent citations and the value of innovations. *Rand Journal of Economics* 21 (Spring): 172-187.

This study examines patents as indicators of value in the context of one important innovation—computed tomography scanners. The central thesis is that patent citations are informative with respect to the economic value of innovations. The paper is motivated by the fact that simple *counts* of patents are not particularly informative about innovative output, probably because patents vary enormously in technological and economic significance. To overcome the limitations of simple counts, it is suggested that counts be weighted by *citations* to the patent that are made by subsequent patents. All 456 U.S. patents granted in computed tomography from the beginning of the field in 1971 to the end of 1986 were included in the sample. Citation-weighted patent counts were related to independent measures of innovations in computed tomography taken from an earlier study. Two hypotheses were tested: (1) Citation-weighted patent counts are good indicators of the value of innovations, but simple patent counts are not; (2) Simple patent counts are good indicators of the inputs to the innovative process as measured by R&D expenses. Both hypotheses were supported, and the marginal information content of weighted patent counts was found to increase with the number of citations. Moreover, a strong contemporaneous relationship exists between patents and R&D expenditures. Therefore, patents are important to the extent that they open new routes to successful further innovations, and citations in subsequent patents can be taken as evidence of the path-breaking nature of the original patent.

Welbourne, T. M., and A.O. Andrews. 1996. Predicting the performance of initial public offerings: Should human resource management be in the equation? *Academy of Management Journal* 39 (August): 891-919.

The relationship between human resource management (HRM) and firm performance is examined. The emphasis is on two variables—human resource value and organization-based rewards—and whether they predict both investors' reactions to an initial public offering (IPO) and long-term survival (five

years or more). Almost all prior research in this area focused on large firms, thus generating few insights into human resource practices and their performance effects in smaller (including start-up) firms. The IPO setting provides an opportunity to study smaller firms that are undergoing dramatic changes and are facing high risk of failure. A measure of the degree to which firms consider employees important to their business is developed, called human resource value, and is hypothesized to affect the likelihood of organizational survival: Organizations that place more value on employees at the time of an IPO should have greater survival chances. It is also hypothesized that compensation policies affect survival: Pay based on organizational performance should better link employees to a firm's mission, thus encouraging collective action and decreased competition between employees and work teams, while individual incentives and team bonuses may encourage employees and teams to pursue separate goals. Thus, it is expected that firms having organization-based compensation programs at the time of their IPOs are more likely to survive.

The sample consists of 136 nonfinancial companies that had IPOs in 1988. Half of the firms employed fewer than 110 workers while 20% employed 700 or more. Based on the presumption that the degree to which a firm considers employees a key source of competitive advantage will be revealed in its strategy, mission statement, and operating practices, information in IPO prospectuses was coded to develop the measure of *human resource value*. Items coded reflect whether (1) the company's strategy and mission statement cite employees as a competitive advantage, (2) a training program indicating that employees receive company-specific education exists, (3) an officer with HRM responsibilities is present, and (4) full-time employees, rather than temporary or contract employees, are regularly used. *Organization-based rewards* involve measures of stock options for all employees, stock options for key employees and management, profit sharing for all employees, profit sharing for key employees and management, and other group-based incentives.

Three dependent variables are employed—two that relate to short-term IPO performance (Tobin's  $q$  and stock price minus book value) and one that relates to long-term performance (survival beyond five years). Major findings include: (1) Human resource value is positively related to survival. (2) Organization-based rewards are negatively related to initial stock performance and positively related to survival. (3) Using percentage price premium as the dependent variable, the market ignores information related to the degree to which a firm values its employees, but reacts negatively if a firm adopts compensation programs that link pay to organizational performance. (4) Using Tobin's  $q$  as the dependent variable, the results are similar to those for price premium in that human resource value has no impact on performance, but the rewards variable has a negative impact. Moreover, significant differences are found to exist between survivors and non-survivors, especially in the rewards variable. A firm with a high level of employee rewards has a greater chance of survival than a firm with a low level of employee rewards; a firm with a high level of human resource value *and* a high level of organization-based employee rewards has an even greater chance of survival. Overall, the results

seem to indicate that while the market initially reacts negatively to IPO firms that use their capital for employee rewards programs, firms that use organization-based compensation programs and value their employees more highly are more likely to survive beyond five years.

## REFERENCES

- Aaker, D. A., and R. Jacobson. 1994. The financial information content of perceived quality. *Journal of Marketing Research* 31 (May): 191-201.
- Abernathy, W. J., K. B. Clark, and A. M. Kantrow. 1981. The new industrial competition. *Harvard Business Review* 59 (September-October): 68-81.
- Aboddy, D., and B. Lev. The value relevance of intangibles: 1998. The case of software capitalization. *Journal of Accounting Research* 36 (Supplement): 161-191.
- Abowd, J. M., G. T. Milkovich, and J. M. Hannon. 1990. The effects of human resource decisions on shareholder value. *Industrial and Labor Relations Review* 45: 203-235.
- Abrahams, T., and B. K. Sidhu. 1998. The role of R&D capitalisations in firm valuation and performance measurement. *Australian Journal of Management* 23 (December): 169-183.
- Agrawal, J., and W. Kamakura. 1995. The economic worth of celebrity endorsers: An event study analysis. *Journal of Marketing* 59 (July): 56-62.
- Albert, M., D. Avery, F. Narin, and P. McAllister. 1991. Direct validation of citation counts as indicators of industrially important patents. *Research Policy* 20 1991: 251-259.
- Alpar, P., and M. Kim. 1990. A microeconomic approach to the measurement of information technology value. *Journal of Management Information Systems* 7 (Fall): 55-69.
- American Institute of Certified Public Accountants. 1994. *Improving Business Reporting—A Customer Focus: Meeting the Information Needs of Investors and Creditors*. New York: AICPA.
- Amir, E., and B. Lev. 1996. Value-relevance of nonfinancial information: The wireless communications industry. *Journal of Accounting and Economics* 22 (December): 3-30.
- Anderson, E. W., C. Fornell, and D. R. Lehmann. 1994. Customer satisfaction, market share, and profitability: Findings from Sweden. *Journal of Marketing* 58 (July): 53-66.
- Anderson, E. W., C. Fornell, and R. T. Rust. 1997. Customer satisfaction, productivity, and profitability: Differences between goods and services. *Marketing Science* 16 (Spring): 129-145.
- Anderson, E. W., and M. W. Sullivan. 1993. The antecedents and consequences of customer satisfaction for firms. *Marketing Science* 12 (Spring): 125-143.
- Anderson, J. C., M. Rungtusanatham, R. G. Schroeder, and S. Devaraj. 1995. A path analytic model of a theory of quality management underlying the Deming management method: Preliminary empirical findings. *Decision Sciences* 26 (September-October): 637-658.
- Anderson, S. W., and W. N. Lanen. 2002. Using electronic data interchange (EDI) to improve the efficiency of accounting transactions. *The Accounting Review* 77 (October): 703-729.
- Arthur, J. B. 1994. Effects of human resource systems on manufacturing performance and turnover. *Academy of Management Journal* 37 (June): 670-687.
- Assmus, G., J. U. Farley, and D. R. Lehmann. 1984. How advertising affects sales: Meta-analysis of econometric results. *Journal of Marketing Research* 21 (February): 65-74.
- Austin, D. H. 1993. An event study approach to measuring innovative output: The case of biotechnology. *American Economic Review* 83 (May): 253-258.
- Babakus, E., C. C. Bienstock, and J. R. Van Scotter. 2004. Linking perceived quality and customer satisfaction to store traffic and revenue growth. *Decision Sciences* 35 (Fall): 713-737.
- Bailey, M. N., and A. Chakrabarti. 1988. *Innovation and the Productivity Crisis*. Washington, D.C.: The Brookings Institution.
- Balakrishnan, R., T. J. Linsmeier, and M. Venkatachalam. 1996. Financial benefits from JIT adoption: Effects of customer concentration and cost structure. *The Accounting Review* 71 (April): 183-205.
- Banker, R. D., J. Field, R. G. Schroeder, and K. K. Sinha. 1996. Impact of work teams on manufacturing performance: A longitudinal field study. *Academy of Management Journal* 39 (August): 867-890.
- Banker, R. D., and H. H. Johnston. 1993. Cost driver analysis in the service sector: An empirical study of the U.S. airlines. *The Accounting Review* 68 (July 1993): 576-601.
- Banker, R. D., and H. H. Johnston. 1995. An empirical study of the business value of the U.S. airlines' computerized reservation systems. *Journal of Organizational Computing & Electronic Commerce* 5 (1995): 255-275.

- Banker, R. D., R. J. Kauffman, and R. C. Morey. 1990. Measuring gains in operational efficiency from information technology: A study of the positran deployment at Hardee's Inc. *Journal of Management Information Systems* 7 (Fall): 29-54.
- Banker, R. D., G. Potter, and D. Srinivasan. 2000. An empirical investigation of an incentive plan that includes nonfinancial performance measures. *The Accounting Review* 75 (January): 65-92.
- Barney, J. B., and P. M. Wright. 1998. On becoming a strategic partner: The role of human resources in gaining competitive advantage. *Human Resource Management* 37 (Spring): 31-46.
- Bartel, A. P. 1994. Productivity gains from the implementation of employee training programs. *Industrial Relations* 33 (October): 411-425.
- Barth, M. E., M. B. Clement, G. Foster, and R. Kasznik. 1998. Brand values and capital market valuation. *Review of Accounting Studies* 3: 41-68.
- Barth, M. E., and G. Clinch. 1998. Revalued financial, tangible, and intangible assets: Associations with share prices and non-market-based value estimates. *Journal of Accounting Research* 36 (Supplement): 199-233.
- Barth, M. E., and M. F. McNichols. 1994. Estimation and market valuation of environmental liabilities relating to Superfund sites. *Journal of Accounting Research* 32 (Supplement): 177-209.
- Bartlett, C. A., and S. Ghoshal. 2002. Building competitive advantage through people. *Sloan Management Review* 43 (Winter): 34-41.
- Bartlett, C. A., and T. Mahmood. 1996. *Skandia AFS: Developing Intellectual Capital Globally*. HBS Case 9-396-412. Boston: Harvard Business School.
- Barua, A., H. C. Kriebel, and T. Mukhopadhyay. 1995. Information technologies and business value: An analytic and empirical investigation. *Information Systems Research* 6 (March): 3-23.
- Bassi, L. J., B. Lev, J. Low, D. P. McMurrer, and G. A. Siesfeld. 2000. Measuring corporate investments in human capital. In M. M. Blair and T. A. Kochan, Eds., *The New Relationship: Human Capital in the American Corporation*. Washington, DC: The Brookings Institution.
- Bates, K. A., S. D. Amundson, R. G. Schroeder, and W. T. Morris. 1995. The crucial interrelationships between manufacturing strategy and organizational culture. *Management Science* 41 (October): 1565-1580.
- Becker, B. E., and B. Gerhart. 1996. The impact of human resource management on organizational performance: Progress and prospects. *Academy of Management Journal* 39 (August): 779-801.
- Becker, B. E., and M. A. Huselid. 1998. High performance work systems and firm performance: A synthesis of research and managerial implications. In *Research in Personnel and Human Resources Management*. Greenwich, CT: JAI Press.
- Becker, B. E., M. A. Huselid, P. S. Pickus, and M. F. Spratt. 1997. HR as a source of shareholder value: Research and recommendations. *Human Resource Management* 36 (Spring): 39-47.
- Becker, B. E., M. A. Huselid, and D. Ulrich. 2001. *The HR Scorecard: Linking People, Strategy, and Performance*. Boston: Harvard Business School.
- Begley, T. M., and D. P. Boyd. 1987. Psychological characteristics associated with performance in entrepreneurial firms and smaller businesses. *Journal of Business Venturing* 2 (Winter): 79-93.
- Behn, B. K., and R. A. Riley. 1999. Using nonfinancial information to predict financial performance: The case of the U.S. airline industry. *Journal of Accounting, Auditing & Finance* 14 (Winter): 29-56.
- Beischel, M. E., and K. R. Smith. 1991. Linking the shop floor to the top floor. *Management Accounting* 73 (October): 25-29.
- Berliner, C., and J. A. Brimson (Eds.). 1988. *Cost Management for Today's Advanced Manufacturing*. Boston: Harvard Business School.
- Bharadwaj, A. S., S. G. Bharadwaj, and B. R. Konsynski. 1999. Information technology effects on firm performance as measured by Tobin's q. *Management Science* 45 (June): 1008-1023.
- Black, S. A., and L. J. Porter. 1996. Identification of the critical factors of TQM. *Decision Sciences* 27 (Winter): 1-21.
- Blair, M. M., and T. A. Kochan (Eds.). 2000. *The New Relationship: Human Capital in the American Corporation*. Washington, DC: The Brookings Institution.
- Blair, M. M., and S. M. H. Wallman (Eds.). 2000. *Unseen Wealth: Report of the Brookings Task Force on Understanding Intangible Sources of Value*. Washington, D.C.: The Brookings Institution.
- Bontis, N., N. C. Dragonetti, K. Jacobsen, and G. Roos. 1999. The knowledge toolbox: A review of the tools available to measure and manage intangible resources. *European Management Journal* 17 (August): 391-402.

- Boone, C., B. Brabander, and A. Van Witteloostuijn. 1996. CEO locus of control and small business performance: An integrative framework and empirical test. *Journal of Management Studies* 33 (September): 667-699.
- Boulton, R. E. S., B. D. Libert, and S. M. Samek. 2000. *Cracking the Value Code: How Successful Businesses are Creating Wealth in the New Economy*. New York: HarperBusiness.
- Boxall, P., and M. Steeneveld. 1999. Human resource strategy and competitive advantage: A longitudinal study of engineering consultancies. *Journal of Management Studies* 36 (July): 442-463.
- Bresnahan, T. F., and M. Trajtenberg. 1995. General purpose technologies: "Engines of growth"? *Journal of Econometrics* 65 (January): 83-108.
- Brooking, A. 1996. *Intellectual Capital: Core Asset for the Third Millennium Enterprise*. London: International Thomson Business Press.
- Brown, S., K. Lo, and T. Lys. 1999. Use of  $R^2$  in accounting research: Measuring changes in value relevance over the last four decades. *Journal of Accounting and Economics* 28 (December): 83-115.
- Brynjolfsson, E. 1993. The productivity paradox of information technology. *Communications of the ACM* 36 (December): 66-77.
- Brynjolfsson, E. 1996. The contribution of information technology to consumer welfare. *Information Systems Research* 7 (November): 281-300.
- Brynjolfsson, E., and L. Hitt. 1995. Information technology as a factor of production: The role of differences among firms. *Journal of Economic Innovations and New Technology* 3 (Special Issue): 183-199.
- Brynjolfsson, E., and L. Hitt. 1996. Paradox lost? Firm-level evidence on the returns to information systems spending. *Management Science* 42 (April): 541-558.
- Brynjolfsson, E., and L. M. Hitt. 2000. Beyond computation: Information technology, organizational transformation and business performance. *Journal of Economic Perspectives* 14 (Fall): 23-48.
- Brynjolfsson, E., and S. Yang. 1996. Information technology and productivity: A review of the literature. In M. V. Zelkowitz (Ed.), *Advances in Computers* 43: 179-214.
- Brynjolfsson, E., and S. Yang. 1999. The intangible costs and benefits of computer investments: Evidence from the financial markets. Working Paper, Sloan School of Management, MIT.
- Bublitz, B., and M. Ettredge. 1989. The information in discretionary outlays: Advertising, research and development. *The Accounting Review* 64 (January): 108-124.
- Burgman, R. J. 2004. Reporting on intangibles and intellectual capital assets. Value Measurement and Reporting Collaborative. April.
- Buzzell, R., and B. Gale. 1987. *The PIMS Principles: Linking Strategy to Performance*. New York: Free Press.
- Capon, N., J. U. Farley, and S. Hoenig. 1990. Determinants of financial performance: A meta-analysis. *Management Science* 36 (October): 1143-1159.
- Capron, L., and J. Hulland. 1999. Redeployment of brands, sales forces, and general marketing management expertise following horizontal acquisitions: A resource-based view. *Journal of Marketing* 63 (April): 41-54.
- Chan, L. K. C., J. Lakonishok, and T. Sougiannis. 2001. The stock market evaluation of research and development expenditures. *Journal of Finance* 56 (December): 2431-2456.
- Chan, S. H., J. W. Kesinger, and J. D. Martin. 1992. The market rewards promising R&D—and punishes the rest. *Journal of Applied Corporate Finance* 5 (Summer): 59-66.
- Chauvin, K. W., and M. Hirschey. 1993. Advertising, R&D expenditures and the market value of the firm. *Financial Management* 22 (Winter): 128-140.
- Chenhall, R. 1997. Reliance on manufacturing performance measures, total quality management and organizational performance. *Management Accounting Research* 8 (June): 187-206.
- Clemons, E. K. 1991. Evaluation of strategic investments in information technology. *Communications of the ACM* 34 (January): 22-36.
- Clemons, E. K., and M. C. Row. 1991. Sustaining IT advantage: The role of structural differences. *MIS Quarterly* 15 (September): 275-292.
- Coe, D. T., and E. Helpman. 1995. International R&D spillovers. *European Economic Review* 39 (May): 859-887.
- Collins, D. W., E. L. Maydew, and I. S. Weiss. 1997. Changes in the value-relevance of earnings and book value over the past forty years. *Journal of Accounting and Economics* 24 (December): 39-67.
- Core, J. E., W. R. Guay, and A. Van Buskirk. 2003. Market valuations in the new economy: An investigation of what has changed. *Journal of Accounting and Economics* 34 (January): 43-67.



- Cron, W. L., and M. G. Sobol. 1983. The relationship between computerization and performance: A strategy for maximizing the economic benefits of computerization. *Information & Management* 6 (June): 171-181.
- Cua, K. O., K. E. McKone, and R. G. Schroeder. 2001. Relationships between implementation of TQM, JIT, and TPM and manufacturing performance. *Journal of Operations Management* 19 (November): 675-694.
- Danish Ministry of Science and Technology. 2003. *Intellectual Capital Statements—The New Guideline*. February.
- Davis, S., and T. Albright. 2004. An investigation of the effect of balanced scorecard implementation on financial performance. *Management Accounting Research* 15 (June): 135-153.
- Dean, J. W., and S. A. Snell. 1996. The strategic use of integrated manufacturing: An empirical examination. *Strategic Management Journal* 17 (June): 459-480.
- Delery, J. E., and D. H. Doty. 1996. Models of theorizing in strategic human resource management: Tests of universalistic, contingency, and configurational performance predictions. *Academy of Management Journal* 39 (August): 802-835.
- Delos, A., and P. W. Beamish. 2001. Survival and profitability: The roles of experience and intangible assets in foreign subsidiary performance. *Academy of Management Journal* 44 (October): 1028-1038.
- Deming, W. E. 1986. *Out of the Crisis*. Cambridge: MIT Center for Advanced Engineering Study.
- Dempsey, S. J., J. F. Gatti, D. J. Grinnell, and W. L. Cats-Baril. 1997. The use of strategic performance variables as leading indicators in financial analysts' forecasts. *Journal of Financial Statement Analysis* 2 (Summer): 61-79.
- Deng, Z., B. Lev, and F. Narin. 1999. Science and technology as predictors of stock performance. *Financial Analysts Journal* 55 (May-June): 20-32.
- Devaraj, S., and R. Kohli. 2000. Information technology payoff in the health-care industry: A longitudinal study. *Journal of Management Information Systems* 16 (Spring): 41-67.
- Devaraj, S., and R. Kohli. 2003. Performance impacts of information technology: Is actual usage the missing link? *Management Science* 49 (March): 273-289.
- Dewan, S., and C. Min. 1997. The substitution of information technology for other factors of production: A firm level analysis. *Management Science* 43 (December): 1660-1675.
- DiPiazza, S. A., and R. G. Eccles. 2002. *Building Public Trust: The Future of Corporate Reporting*. New York: Wiley.
- Dixon, J. R., A. J. Nanni, and T. E. Vollmann. 1990. *The New Performance Challenge—Measuring Operations for World-Class Competition*. Homewood, IL: Dow Jones-Irwin.
- Dos Santos, B. L., K. Peffers, and D. C. Mauer. 1993. The impact of information technology investment announcements on the market value of the firm. *Information Systems Research* 4 (March): 1-23.
- Douglas, T. J., and L. D. Fredendall. 2004. Evaluating the Deming management model of total quality in services. *Decision Sciences* 35 (Summer): 393-422.
- Douglas, T. J., and W. Q. Judge. 2001. Total quality management implementation and competitive advantage: The role of structural control and exploration. *Academy of Management Journal* 44 (February): 158-169.
- Doukas, J., and L. Switzer. 1992. The stock market's valuation of R&D spending and market concentration. *Journal of Economics and Business* 44 (May): 95-114.
- Dresner, M., and K. Xu. 1995. Customer service, customer satisfaction and corporate performance in the service sector. *Journal of Business Logistics* 16: 23-40.
- Droz, F. 2004. A. The components of value measurement. *Journal of Accountancy* 198 (December): 79-82.
- Earl, M. J. 1996. *Skandia International*. LBS Case 396-041-1. London: London Business School.
- Easton, G. S., and S. L. Jarrell. 1998. The effects of total quality management on corporate performance: an empirical investigation. *Journal of Business* 71 (April): 253-307.
- Eccles, R. G. 1991. The performance measurement manifesto. *Harvard Business Review* 69 (January-February): 131-137.
- Eccles, R. G., R. H. Herz, E. M. Keegan, and D. M. H. Phillips. 2001. *The Value Reporting Revolution: Moving Beyond the Earnings Game*. New York: John Wiley & Sons.
- Eccles, R. G., and S. C. Mavrinac. 1995. Improving the corporate disclosure process. *Sloan Management Review* 36 (Summer): 11-25.
- Eccles, R. G., and P. J. Pyburn. 1992. Creating a comprehensive system to measure performance. *Management Accounting* 74 (October): 41-44.

- Edvinsson, L. 1997. Developing intellectual capital at Skandia. *Long Range Planning* 30 (June): 366-373.
- Edvinsson, L., and M. S. Malone. 1997. *Intellectual Capital: Realizing Your Company's True Value by Finding its Hidden Roots*. New York: HarperCollins.
- Ely, K., and G. Waymire. 1999. Intangible assets and stock prices in the pre-SEC era. *Journal of Accounting Research* 37 (Supplement): 17-44.
- Ernst & Young LLP. 1997. *Measures that Matter*. [www.businessinnovation.ey.com](http://www.businessinnovation.ey.com)
- European Union. 2002. The MERITUM (Measuring Intangibles to Understand and Improve Innovation Management) Project. [www.fek.su.se/home/bic/meritum](http://www.fek.su.se/home/bic/meritum)
- Farquhar, P. H., J. Y. Han, and Y. Ijiri. 1992a. Brands on the balance sheet. *Marketing Management* 1 (Winter): 16-22.
- Farquhar, P. H., J. Y. Han, and Y. Ijiri. 1992b. Measuring brand momentum. *Marketing Management* 1 (Spring): 24-31.
- Financial Accounting Standards Board. 2001. *Improving Business Reporting: Insights into Enhancing Voluntary Disclosures*. Norwalk, CT: FASB.
- Fine, C. H. 1986. Quality improvement and learning in productive systems. *Management Science* 32 (October): 1301-1315.
- Fine, C. H. 1988. A quality control model with learning effects. *Operations Research* 36 (May-June): 437-444.
- Fisher, J. 1992. Use of nonfinancial performance measures. *Journal of Cost Management* 6 (Spring): 31-38.
- Flynn, B. B., S. Sakakibara, and R. G. Schroeder. 1995. The interrelationship between JIT and TQM: Practice and performance. *Academy of Management Journal* 38 (October): 1325-1360.
- Flynn, B. B., and B. Saladin. 2001. Further evidence on the validity of the theoretical models underlying the Baldrige criteria. *Journal of Operations Management* 19 (November): 617-652.
- Flynn, B. B., R. G. Schroeder, and S. Sakakibara. 1994. A framework of quality management research and an associated measurement instrument. *Journal of Operations Management* 11 (March): 339-366.
- Flynn, B. B., R. G. Schroeder, and S. Sakakibara. 1995. The impact of quality management practices on performance and competitive advantage. *Decision Sciences* 26 (September-October): 659-691.
- Flynn, B. B., R. G. Schroeder, and S. Sakakibara. 1996. The relationship between quality management practices and performance: Synthesis of findings from the world class manufacturing project. In Fedor, D. G., and S. Ghosh (Eds.), *Advances in the Management of Quality*. Greenwich, CT: JAI Press.
- Fornell, C. 1992. A national customer satisfaction barometer: The Swedish experience. *Journal of Marketing* 56 (January): 6-21.
- Fornell, C., M. D. Johnson, E. W. Anderson, J. Cha, and B. E. Bryant. 1996. The American customer satisfaction index: Nature, purpose, and findings. *Journal of Marketing* 60 (October): 7-18.
- Francalanci, C., and H. Galal. 1998. Information technology and worker composition: Determinants of productivity in the life insurance industry. *MIS Quarterly* 22 (May-June): 227-241.
- Francis, J., and K. Schipper. 1999. Have financial statements lost their relevance? *Journal of Accounting Research* 37 (Autumn): 319-352.
- Garvin, D. A. 1983. Quality on the line. *Harvard Business Review* 61 (September-October): 64-75.
- George, N. 2001. Skandia shares hit after fall in sales. *Financial Times* (February 15).
- Gerard, J., C. Hiris, S. Villani, and A. Wunsche. 2004. Customer and relational capital measurement and reporting in the context of value creation. Value Measurement and Reporting Collaborative. March.
- Gerstein, M., and H. Reisman. 1983. Strategic selection: Matching executives to business conditions. *Sloan Management Review* 24 (Winter): 33-49.
- Ghoshal, S., and C. A. Bartlett. 1997. *The Individualized Corporation: A Fundamentally New Approach to Management*. New York: HarperCollins.
- Goldman Sachs Global Equity Research. 2000. *Skandia Group*. London: Goldman Sachs (October 24).
- Goldstein, S. M., and S. B. Schweikhart. 2002. Empirical support for the Baldrige award Framework in U.S. hospitals. *Health Care Management Review* 27 (Winter): 62-75.
- Grafström, G., and L. Edvinsson. 2001. *Accounting for Minds*. Stockholm: Skandia.
- Grant, J., T. Fogarty, R. Brieker, and G. Previts. 2000. *Corporate Reporting of Nonfinancial Performance Indicators and Operating Measures*. Morristown, NJ: Financial Executives Research Foundation.
- Griliches, Z. 1990. Patent statistics as economic indicators: A survey. *Journal of Economic Literature* 28 (December): 1661-1707.
- Griliches, Z. 1995. R&D and productivity: Econometric results and measurement issues. In Stoneman, P. (Ed.), *Handbook of the Economics of Innovation and Technological Change*. Oxford: Blackwell.

- Groves, G., and V. Valsamakis. 1998. Supplier-customer relationships and company performance. *International Journal of Logistics Management* 9: 51-64.
- Gupta, A. K. 1984. Contingency linkages between strategy and general manager characteristics: A conceptual examination. *Academy of Management Review* 9 (July): 399-412.
- Gupta, A. K., and V. Govindarajan. 1984. Business unit strategy, managerial characteristics, and business unit effectiveness at strategy implementation. *Academy of Management Journal* 27 (March): 25-41.
- Hackman, J., and R. Wageman. 1995. Total quality management: Empirical, conceptual, and practical issues. *Administrative Science Quarterly* 40 (June): 309-342.
- Hall, B. H. 1993. The stock market's valuation of R&D investment during the 1980's. *American Economic Review* 83 (May): 259-264.
- Hall, B. H., A. Jaffe, and M. Trajtenberg. 2005. Market value and patent citations. *Rand Journal of Economics* 36 (Spring): 16-38.
- Hamilton, B. H., J. A. Nickerson, and H. Owan. 2003. Team incentives and worker heterogeneity: An empirical analysis of the impact of teams on productivity and participation. *Journal of Political Economy* 111 (June): 465-497.
- Hand, J., and B. Lev (Eds.). 2003. *Intangible Assets: Values, Measures, and Risks*. New York: Oxford University Press.
- Heine, M. L., V. Grover, M. K. Malhotra. 2003. The relationship between technology and performance: A meta-analysis of technology models. *OMEGA: The International Journal of Management Science* (June): 189-204.
- Hendricks, K. B., and V. R. Singhal. 1996. Quality awards and the market value of the firm: An empirical investigation. *Management Science* 42 (March): 415-436.
- Hendricks, K. B., and V. R. Singhal. 1997. Does implementing an effective TQM program actually improve operating performance? Empirical evidence from firms that have won quality awards. *Management Science* 43 (September): 1258-1274.
- Hendricks, K. B., and V. R. Singhal. 2001. The long-run stock price performance of firms with effective TQM programs. *Management Science* 47 (March): 359-368.
- Hiam, A. 1993. *Does Quality Work? A Review of Relevant Studies*. Report No. 1043. New York: The Conference Board.
- Hirschey, M. 1982. Intangible capital aspects of advertising and R&D expenditures. *The Journal of Industrial Economics* 30 (June): 375-390.
- Hirschey, M., V. J. Richardson, and S. W. Scholz. 2001. Value relevance of nonfinancial information: The case of patent data. *Review of Quantitative Finance & Accounting* 17 (November): 223-235.
- Hirschey, M., and J. J. Weygandt. 1985. Amortization policy for advertising and research and development. *Journal of Accounting Research* 23 (Spring): 326-335.
- Hitt, M. A., L. Bierman, K. Shimizu, and R. Kochhan. 2001. Direct and moderating effects of human capital on strategy and performance in professional service firms: A resource-based perspective. *Academy of Management Journal* 44 (February): 13-28.
- Hitt, L. M., and E. Brynjolfsson. 1996. Productivity, business profitability, and consumer surplus: Three different measures of information technology value. *MIS Quarterly* 20 (June): 121-142.
- Hodge, F. D. 2003. Investors' perceptions of earnings quality, auditor independence, and the usefulness of audited financial information. *Accounting Horizons* 17 (Supplement): 37-48.
- Hoque, Z., and W. James. 2000. Linking balanced scorecard measures to size and market factors: Impact on organizational performance. *Journal of Management Accounting Research* 12: 1-17.
- Hughes, K. E. 2000. The value relevance of nonfinancial measures of air pollution in the electric utility industry. *The Accounting Review* 75 (April): 209-228.
- Huselid, M. A. 1995. The impact of human resource management practices on turnover, productivity, and corporate financial performance. *Academy of Management Journal* 38 (June): 635-672.
- Huselid, M. A., and B. E. Becker. 1996. Methodological issues in cross-sectional and panel estimates of the HR-firm performance link. *Industrial Relations* 35: 400-422.
- Huselid, M. A., S. E. Jackson, and R. S. Schuler. 1997. Technical and strategic human resource management effectiveness as determinants of firm performance. *Academy of Management Journal* 40 (February): 171-188.
- Ichniowski, C., K. Shaw, and G. Prennushi. 1997. The effects of human resource management practices on productivity: A study of steel finishing lines. *American Economic Review* 87 (June): 291-313.
- Ittner, C. D., and D. F. Larcker. 1996. Measuring the impact of quality initiatives on firm financial performance. *Advances in the Management of Organizational Quality* 1: 1-37.

- Ittner, C. D., and D. F. Larcker. 1997. Quality strategy, strategic control systems, and organizational performance. *Accounting, Organizations and Society* 22 (April-May): 293-314.
- Ittner, C. D., and D. F. Larcker. 1998a. Are nonfinancial measures leading indicators of financial performance? An analysis of customer satisfaction. *Journal of Accounting Research* 36 (Supplement): 1-35.
- Ittner, C. D., and D. F. Larcker. 1998b. Innovations in performance measurement: Trends and research implications. *Journal of Management Accounting Research* 10: 205-238.
- Ittner, C. D., D. F. Larcker, and M. W. Meyer. 2003. Subjectivity and the weighting of performance measures: Evidence from a balanced scorecard. *The Accounting Review* 78 (July): 725-758.
- Jacobson, R., and D. A. Aaker. 1987. The strategic role of product quality. *Journal of Marketing* 51 (October): 31-44.
- Jaffe, A. B., and M. Trajtenberg. 2002. *Patents, Citations, and Innovations: A Window on the Knowledge Economy*. Cambridge: MIT Press.
- Jarrell, G., and S. Peltzman. 1985. The impact of product recalls on the wealth of sellers. *Journal of Political Economy* 93 (June): 512-536.
- Johnson, H. T., and R. S. Kaplan. 1987. *Relevance Lost: The Rise and Fall of Management Accounting*. Boston: Harvard Business School.
- Kallapur, S., and S. Y. S. Kwan. 2004. The value relevance and reliability of brand assets recognized by U. K. firms. *The Accounting Review* 79 (January): 151-172.
- Kamakura, W. A., V. Mittal, F. de Rosa, and J. A. Mazzon. 2002. Assessing the service-profit chain. *Marketing Science* 21 (Summer): 294-317.
- Kaplan, R. S. 1983. Measuring manufacturing performance: A new challenge for managerial accounting research. *The Accounting Review* 58 (October): 686-705.
- Kaplan, R. S. 1984. The evolution of management accounting. *The Accounting Review* 59 (July): 390-418.
- Kaplan, R. S., and D. P. Norton. 1992. The balanced scorecard—Measures that drive performance. *Harvard Business Review* 70 (January-February): 71-79.
- Kaplan, R. S., and D. P. Norton. 1996. Using the balanced scorecard as a strategic management system. *Harvard Business Review* 74 (January-February): 75-85.
- Kaplan, R. S., and D. P. Norton. 2001. *The Strategy-Focused Organization: How Balanced Scorecard Companies Thrive in the New Business Environment*. Boston: Harvard Business School.
- Kaplan, R. S., and D. P. Norton. 2004. *Strategy Maps: Converting Intangible Assets Into Tangible Outcomes*. Boston: Harvard Business School.
- Keegan, D. P., R. G. Eiler, and C. R. Jones. 1989. Are your performance measures obsolete? *Management Accounting* 70 (June): 45-50.
- Kekre, S., and T. Mukhopadhyay. 1992. Impact of electronic data interchange technology on quality improvement and inventory reduction programs: A field study. *International Journal of Production Economics* 28: 265-282.
- Keller, K. L. 2000. The brand report card. *Harvard Business Review* 78 (January-February): 147-157.
- Kelley, M. R. 1994. Productivity and information technology: The elusive connection. *Management Science* 40 (November): 1406-1425.
- Kimes, S. E. 1999. The relationship between product quality and revenue per available room at Holiday Inn. *Journal of Service Research* 2 (November): 138-144.
- Kinney, M. R., and W. F. Wempe. 2002. Further evidence on the extent and origins of JIT's profitability effects. *The Accounting Review* 77 (January): 203-225.
- Klein, D. A. (Ed.). 1998. *The Strategic Management of Intellectual Capital*. Boston: Butterworth-Heinemann.
- Knight, D. J. 1999. Performance measures for increasing intellectual capital. *Strategy & Leadership* 27 (March-April): 22-27.
- Knutson, P. 1992. *Financial Reporting in the 1990's and Beyond*. Charlottesville, VA: Association for Investment Management and Research.
- Lado, A. A., and M. C. Wilson. 1994. Human resource systems and sustained competitive advantage: A competency-based perspective. *Academy of Management Review* 19 (October): 699-727.
- Lane, V., and R. Jacobson. 1995. Stock market reactions to brand extension announcements: The effects of brand attitude and familiarity. *Journal of Marketing* 59 (January): 63-77.
- Larsen, H. T., P. N. D. Bukh, and J. Mouritsen. 1999. Intellectual capital statements and knowledge management: "Measuring", "reporting", "acting". *Australian Accounting Review* 9: 15-26.
- Lau, R. S. M. 1997. Operational characteristics of highly competitive manufacturing firms. *Production and Inventory Management Journal* 38 (4th Quarter): 17-21.

- Lemon, K. N., R. T. Rust, and V. A. Zeithaml. 2001. What drives customer equity. *Marketing Management* 10 (Spring): 20-25.
- Lev, B. R&D and capital markets. 1999. *Journal of Applied Corporate Finance* 11 (Winter): 21-35.
- Lev, B. 2001. *Intangibles: Management, Measurement, and Reporting*. Washington, DC: The Brookings Institution.
- Lev, B., and T. Sougiannis. 1996. The capitalization, amortization, and value-relevance of R&D. *Journal of Accounting and Economics* 21 (February): 107-138.
- Lev, B., and T. Sougiannis. 1999. Penetrating the book-to-market black box: The R&D effect. *Journal of Business Finance & Accounting* 26 (April-May): 410-449.
- Lev, B., and S. R. Thiagarajan. 1993. Fundamental information analysis. *Journal of Accounting Research* 31 (Autumn): 190-215.
- Lev, B., and P. Zarowin. 1999. The boundaries of financial reporting and how to extend them. *Journal of Accounting Research* 37 (Autumn): 353-385.
- Lichtenberg, F. R. 1995. The output contribution of computer equipment and personnel: A firm level analysis. *Journal of Economic Innovation and New Technologies* 3: 201-217.
- Lipe, M. G., and S. E. Salterio. 2000. The balanced scorecard: Judgmental effects of common and unique performance measures. *The Accounting Review* 75 (July): 283-298.
- Loveman, G. W. 1994. An assessment of the productivity impact of information technologies. In Allen, T. J., and M. Scott-Morton (Eds.), *Information Technology and the Corporation of the 1990s*. New York: Oxford University Press.
- Loveman, G. W. 1998. Employee satisfaction, customer loyalty, and financial performance: An empirical examination of the service profit chain in retail banking. *Journal of Service Research* 1 (August): 18-31.
- Low, J., and P. C. Kalafut. 2002. *Invisible Advantage: How Intangibles are Driving Business Performance*. Cambridge, MA: Perseus Publishing.
- Low, J., and T. Siesfeld. 1998. Measures that matter: Wall Street considers non-financial performance more than you think. *Strategy & Leadership* 26 (March-April): 24-30.
- Lynn, B. 1998a. Intellectual capital. *CMA: The Management Accounting Magazine* 72 (February): 10-15.
- Lynn, B. 1998b. *The Management of Intellectual Capital: The Issues and the Practice*. Management Accounting Issues Paper 16. Hamilton, ON: Society of Management Accountants of Canada.
- MacDuffie, J. P. 1995. Human resource bundles and manufacturing performance: Organizational logic and flexible production systems in the world auto industry. *Industrial and Labor Relations Review* 48 (January): 197-221.
- Maines, L. A. et al. 2002. Recommendations on disclosure of nonfinancial performance measures. *Accounting Horizons* 16 (December): 353-362.
- Maines, L. A. et al. 2003. Implications of accounting research for the FASB's initiatives on disclosure of information about intangible assets. *Accounting Horizons* 17 (June): 175-185.
- Maisel, L. S. 1992. Performance measurement: The balanced scorecard approach. *Cost Management* 6 (Summer): 47-52.
- Malina, M. A., and F. H. Selto. 2001. Communicating and controlling strategy: An empirical study of the effectiveness of the balanced scorecard. *Journal of Management Accounting Research* 13: 47-90.
- Maskell, B. 1989. Performance measures for world class manufacturing. *Management Accounting (UK)* (May): 32-33.
- Mathur, L. K., and I. Mathur. 1995. The effect of advertising slogan changes on market values of firms. *Journal of Advertising Research* (January-February): 59-65.
- McNair, C. J., R. L. Lynch, and K. F. Cross. 1990. Do financial and nonfinancial performance measures have to agree? *Management Accounting* 72 (November): 28-36.
- Megna, P., and M. Klock. 1993. The impact of intangible capital on Tobin's q in the semiconductor industry. *American Economic Review* 83 (May): 265-269.
- Megna, P., and D. C. Mueller. 1991. Profit rates and intangible capital. *The Review of Economics and Statistics* 73 (November): 632-642.
- Meyer, S. M., and D. A. Collier. 2001. An empirical test of the causal relationships in the Baldrige health care pilot criteria. *Journal of Operations Management* 19 (July): 403-425.
- Milgrom, P., and J. Roberts. 1990. The economics of modern manufacturing: Technology, strategy, and organization. *American Economic Review* 80 (June): 511-528.
- Milgrom, P., and J. Roberts. 1995. Complementarities and fit: Strategy, structure, and organizational change in manufacturing. *Journal of Accounting and Economics* 19 (March-May): 179-208.

- Miller, D., M. F. R. Kets de Vries, and J. M. Toulouse. 1982. Top executive locus of control and its relationship to strategy-making, structure, and environment. *Academy of Management Journal* 25 (June): 237-253.
- Miller, D., and J. M. Toulouse. 1986a. Chief executive personality and corporate strategy and structure in small firms. *Management Science* 32 (November): 1389-1409.
- Miller, D., and J. M. Toulouse. 1986b. Strategy, structure, CEO personality and performance in small firms. *American Journal of Small Business* 10 (Winter): 47-62.
- Mittal, V., and W. A. Kamakura. 2001. Satisfaction, repurchase intent, and repurchase behavior: Investigating the moderating effect of customer characteristics. *Journal of Marketing Research* 38 (February): 131-142.
- Moers, F. 2005. Discretion and bias in performance evaluation: The impact of diversity and subjectivity. *Accounting, Organizations and Society* 30 (January): 67-80.
- Morgan, R. P. 2000. A consumer-oriented framework of brand equity and loyalty. *International Journal of Market Research* 42 (Winter): 65-78.
- Mouritsen, J. 1998. Driving growth: Economic value added versus intellectual capital. *Management Accounting Research* 9 (December): 461-482.
- Mouritsen, J., P. N. D. Bukh, H. T. Larsen, and M. R. Johansen. 2002. Developing and managing knowledge through intellectual capital statements. *Journal of Intellectual Capital* 3 (February): 10-29.
- Mouritsen, J., M. R. Johansen, T. Larsen, and P. N. Bukh. 2001. Reading an intellectual capital statement: Describing and prescribing knowledge management strategies. *Journal of Intellectual Capital* 2 (October): 359-383.
- Mouritsen, J., H. T. Larsen, and P. N. D. Bukh. 2001. Intellectual capital and the "capable firm": Narrating, visualizing and numbering for managing knowledge. *Accounting, Organizations and Society* 26 (October-November): 735-762.
- Mukherjee, A. S., M. A. Lapré, and L. N. Van Wassenhove. 1998. Knowledge driven quality improvement. *Management Science* 44 (November): 35-49.
- Mukhopadhyay, T., and R. B. Cooper. 1993. A microeconomic production assessment of the business value of management information systems. *Journal of Management Information Systems* 10 (Summer): 33-55.
- Mukhopadhyay, T., S. Kekre, and S. Kalathur. 1995. Business value of information technology: A study of electronic data interchange. *MIS Quarterly* 19 (June): 137-156.
- Mukhopadhyay, T., S. Rajiv, and K. Srinivasan. 1997. Information technology impact on process output and quality. *Management Science* 43 (December): 1645-1659.
- Nagar, V., and M. V. Rajan. 2001. The revenue implications of financial and operational measures of product quality. *The Accounting Review* 76 (October 2001): 495-513.
- Nagar, V., and M. V. Rajan. 2005. Measuring customer relationships: The case of the retail banking industry. *Management Science* 51 (June): 904-919.
- Oliver, D. 1996. *Skandia Assurance and Financial Services: Measuring and Visualizing Intellectual Capital*. IMD Case 396-116-1. Lausanne: International Institute for Management Development.
- Oliver, D. 1998. *Skandia Future Centers: Charting a Course for the Future*. IMD Case 398-189-1. Lausanne: International Institute for Management Development.
- Oliver, R. L. 1997. *Satisfaction: A Behavioral Perspective on the Consumer*. Boston: Irwin/McGraw-Hill.
- Organization for Economic Cooperation and Development (OECD). 2000. *Final Report: Measuring and Reporting Intellectual Capital: Experience, Issues, and Prospects*. Paris: OECD.
- Pannirselvam, G. P., S. P. Siferd, and W. A. Ruch. 1998. Validation of the Arizona Governor's Quality Award criteria: A test of the Baldrige criteria. *Journal of Operations Management* 16 (October): 529-550.
- Pennings, J. M., K. Lee, and A. van Witteloostuijn. 1998. Human capital, social capital, and firm dissolution. *Academy of Management Journal* 47 (August): 425-440.
- Perera, S., G. Harrison, and M. Poole. 1997. Customer-focused manufacturing strategy and the use of operations-based non-financial performance measures: A research note. *Accounting, Organizations and Society* 22 (August): 557-572.
- Petty, R., and J. Guthrie. 2000. Intellectual capital literature review: Measurement, reporting and management. *Journal of Intellectual Capital* 1 (September): 155-176.
- Pfau, B. N. 2001. Measuring the link between human capital and shareholder value. *Journal of Cost Management* 15 (January-February): 16-20.
- Phillips, L. W., D. Chang, and R. D. Buzzell. 1983. Product quality, cost position, and business performance: A test of some key hypotheses. *Journal of Marketing* 47 (Spring): 26-43.

- Pinches, G. E., V. K. Narayanan, and K. M. Kelm. 1996. How the market values the different stages of corporate R&D—initiation, progress, and commercialization. *Journal of Applied Corporate Finance* 9 (Spring): 60-69.
- Powell, T. C. 1995. Total quality management as competitive advantage: A review and empirical study. *Strategic Management Journal* 16 (January): 15-37.
- Powell, T. C., and A. Dent-Micallet. 1997. Information technology as competitive advantage: The role of human, business, and technology resources. *Strategic Management Journal* 18 (May): 375-405.
- Previts, G. J., R. J. Bricker, T. R. Robinson, and S. J. Young. 1994. A content analysis of sell-side financial analyst company reports. *Accounting Horizons* 8 (June): 55-70.
- Reger, R. K., L. T. Gustafson, S. M. DeMarie, and J. V. Mullane. 1994. Reframing the organization: Why implementing total quality is easier said than done. *Academy of Management Review* 19 (July): 565-584.
- Rivette, K. G., and D. Kline. 2000a. Discovering new value in intellectual property. *Harvard Business Review* 78 (January-February): 54-66.
- Rivette, K. G., and D. Kline. 2000b. *Rembrandts in the Attic: Unlocking the Hidden Value of Patents*. Boston: Harvard Business School.
- Roos, G., A. Bainbridge, and K. Jacobsen. 2001. Intellectual capital analysis as a strategic tool. *Strategy & Leadership* 29 (July-August): 21-26.
- Roos, G., and K. Jacobsen. 1999. Management in a complex stakeholder organization. *Monash Mt. Eliza Business Review* (July): 83-93.
- Roos, G., and J. Roos. 1997. Measuring your company's intellectual performance. *Long Range Planning* 30 (June): 413-426.
- Roos, J., G. Roos, L. Edvinsson, and N. C. Dragonetti. 1998. *Intellectual Capital: Navigating in the New Business Landscape*. New York: New York University Press.
- Ross, J., and D. Georgoff. 1991. A survey of productivity and quality issues in manufacturing: The state of the industry. *Industrial Management* 33 (January-February): 3-5, 22-25.
- Roth, A. V., and W. E. Jackson. 1995. Strategic determinants of service quality and performance: Evidence from the banking industry. *Management Science* 41 (November): 1720-1733.
- Rucci, A. J., S. P. Kim, and R. T. Quinn. 1998. The employee-customer-profit chain at Sears. *Harvard Business Review* 76 (January-February): 82-97.
- Rungtusanatham, M., C. Forza, R. Filippini, and J. C. Anderson. 1998. A replication study of a theory of quality management underlying the Deming management method: Insights from an Italian context. *Journal of Operations Management* 17 (December): 77-95.
- Rust, R. T., and A. J. Zahorik. 1993. Customer satisfaction, customer retention, and market share. *Journal of Retailing* 69 (Summer): 193-215.
- Rust, R. T., A. J. Zahorik, and T. L. Keiningham. 1994. *Return on Quality: Measuring the Financial Impact of Your Company's Quest for Quality*. Homewood, IL: Irwin.
- Rust, R. T., A. J. Zahorik, and T. L. Keiningham. 1995. Return on quality (ROQ): Making service quality financially accountable. *Journal of Marketing* 59 (April): 58-70.
- Ryan, S. G., and P. A. Zarowin. 2003. Why has the contemporaneous linear return-earnings relation declined? *The Accounting Review* 78 (April): 523-553.
- Rynes, S. L., K. G. Brown, and A. E. Colbert. 2002. Seven common misconceptions about human resource practices: Research findings vs. practitioner beliefs. *Academy of Management Executive* 16 (August): 92-102.
- Salerno, L. M. 1985. What happened to the computer revolution. *Harvard Business Review* 63 (November-December): 129-138.
- Samson, D., and M. Terziovski. 1999. The relationship between total quality management practices and operational performance. *Journal of Operations Management* 17 (June): 393-409.
- Saraph, J. V., P. G. Benson, and R. G. Schroeder. 1989. An instrument for measuring the critical factors of quality management. *Decision Sciences* 20 (Fall): 810-829.
- Schefczyk, M. 1993. Operational performance of airlines: An extension of traditional measurement paradigms. *Strategic Management Journal* 14 (May): 301-317.
- Schipper, K., and L. Vincent. 2003. Earnings quality. *Accounting Horizons* 17 (Supplement): 97-110.
- Schuler, R. S., and S. E. Jackson. 1987. Linking competitive strategies with human resource management practices. *Academy of Management Executive* 1 (August): 207-219.
- Sethi, V., and W. R. King. 1994. Development of measures to assess the extent to which an information technology application provides competitive advantage. *Management Science* 40 (December): 1601-1627.

- Simon, C. J., and M. W. Sullivan. 1993. The measurement and determinants of brand equity: A financial approach. *Marketing Science* 12 (Winter): 28-52.
- Skaggs, B. C., and M. Youndt. 2004. Strategic positioning, human capital, and performance in service organizations: A customer interaction approach. *Strategic Management Journal* 25 (January): 85-99.
- Skandia. 1993. *Balanced Annual Report on Intellectual Capital*. Supplement to Skandia's 1993 Annual Report. Stockholm: Skandia.
- Skandia. 1994. *Visualizing Intellectual Capital in Skandia*. Supplement to Skandia's 1994 Annual Report. Stockholm: Skandia.
- Skandia. 1995a. *Renewal and Development*. Supplement to Skandia's 1995 Interim Report. Stockholm: Skandia.
- Skandia. 1995b. *Value-Creating Processes*. Supplement to Skandia's 1995 Annual Report. Stockholm: Skandia.
- Skandia. 1996a. *Power of Innovation*. Supplement to Skandia's 1996 Interim Report. Stockholm: Skandia.
- Skandia. 1996b. *Customer Value*. Supplement to Skandia's 1996 Annual Report. Stockholm: Skandia.
- Skandia. 1997. *Intelligent Enterprising*. Supplement to Skandia's 1997 Interim Report. Stockholm: Skandia.
- Skandia. 1998. *Human Capital in Transformation*. Supplement to Skandia's 1998 Annual Report. Stockholm: Skandia.
- Society of Management Accountants of Canada. 2000. *Measuring Knowledge Assets*. Mississauga, ON: SMAC.
- Sohal, A. S., S. Moss, and L. Ng. 2000. Using information technology productively: Practices and factors that enhance the success of IT. *International Journal of Technology Management* 20: 340-353.
- Soteriou, A., and S. A. Zenios. 1999. Operations, quality, and profitability in the provision of banking services. *Management Science* 45 (September): 1221-1238.
- Speckbacher, G., J. Bischof, and T. Pfeiffer. 2003. A descriptive analysis on the implementation of balanced scorecards in German-speaking countries. *Management Accounting Research* 14 (December): 361-387.
- Srinivasan, K., S. Kekre, and T. Mukhopadhyay. 1994. Impact of electronic data interchange technology on JIT shipments. *Management Science* 40 (October): 1291-1304.
- Srivastava, R. K., T. A. Shervani, and L. Fahey. 1998. Market-based assets and shareholder value: A framework for analysis. *Journal of Marketing* 62 (January): 2-18.
- Sterman, J. D., N. Repenning, and F. Kofman. 1997. Unanticipated side effects of successful quality improvement programs: Exploring a paradox of organizational improvement. *Management Science* 43 (April): 503-21.
- Stewart, T. A. 1991. Brainpower. *Fortune* (June 3): 44-60.
- Stewart, T. A. 1994. Your company's most valuable asset: Intellectual capital. *Fortune* (October 3): 68-73.
- Stewart, T. A. 1995a. Trying to grasp the intangible. *Fortune* (October 2): 157-161.
- Stewart, T. A. 1995b. Mapping corporate brainpower. *Fortune* (October 30): 209-212.
- Stewart, T. A. 1995c. Getting real about brainpower. *Fortune* (November 27): 201-203.
- Stewart, T. A. 1996. The invisible key to success. *Fortune* (August 5): 173-176.
- Stewart, T. A. 1997. *Intellectual Capital: The New Wealth of Organizations*. New York: Doubleday.
- Stewart, T. A. 2000. The house that knowledge built. *Fortune* (October 2): 278-279.
- Stewart, T. A. 2001. *The Wealth of Knowledge: Intellectual Capital and the Twenty-first Century Organization*. New York: Currency Doubleday.
- Strassmann, P. A. 1985. *Information Payoff: The Transformation of Work in the Electronic Age*. New York: Free Press.
- Strassmann, P. A. 1990. *The Business Value of Computers: An Executive's Guide*. New Canaan, CT: Information Economics Press.
- Sullivan, P. H. 1998. *Profiting from Intellectual Capital: Extracting Value from Innovation*. New York: Wiley.
- Sullivan, P. H. 2002. *Value-Driven Intellectual Capital: How to Convert Intangible Corporate Assets into Market Value*. New York: Wiley.
- Sveiby, K. E. 1997a. The intangible assets monitor. *Journal of Human Resource Costing and Accounting* 2 (Spring): 73-97.
- Sveiby, K. E. 1997b. *The New Organizational Wealth: Managing and Measuring Knowledge-Based Assets*. San Francisco: Berrett-Koehler Publishers.



- Sveiby, K. E., E. Anell, S. Axelsson, P. Emilsson, H. Karlsson, C. J. Wangerud, and S. Vikström. 1989. *Den Osynliga Balansräkningen (The Invisible Balance Sheet: Key Indicators for Accounting, Control and Valuation of Know-How Companies)*. Stockholm: Affarsvarlden/Ledarskap.
- Symons, R., and R. Jacobs. 1995. A total quality management based incentive system supporting total quality management implementation. *Production and Operations Management* 4: 28-41.
- Szilagyi, A. D., and D. M. Schweiger. 1984. Matching managers to strategies: A review and suggested framework. *Academy of Management Review* 9 (October): 626-637.
- Szymanski, D. M., S. G. Bharadwaj, and P. R. Varadarajan. 1993. An analysis of the market share-profitability relationship. *Journal of Marketing* 57 (July): 1-18.
- Terpstra, D. E., and E. J. Rozell. 1993. The relationship of staffing practices to organizational levels of performance. *Personnel Psychology* 46 (Spring): 27-48.
- The Conference Board. 1997. *Leveraging Intellectual Capital*. HR Executive Review, Vol. 5, No. 3. New York: The Conference Board.
- The Conference Board. 1998. *The Continuing Search for Performance Excellence*. Report No. 1225-98-CH. New York: The Conference Board.
- Tippins, M. J., and R. S. Sohi. 2003. IT competency and firm performance: Is organizational learning a missing link? *Strategic Management Journal* 24 (August): 745-761.
- Trajtenberg, M. 1989. The welfare analysis of product innovation with an application to computer tomography scanners. *Journal of Political Economy* 97 (April): 445-479.
- Trajtenberg, M. 1990. A penny for your quotes: Patent citations and the value of innovations. *Rand Journal of Economics* 21 (Spring): 172-187.
- Treynor, J. 1999. The investment value of brand franchise. *Financial Analysts Journal* 55 (March-April): 27-34.
- Uliana, E., J. Macey, and P. Grant. 2003. Measurement and reporting of human capital in the context of value creation. Value Measurement and Reporting Collaborative. November.
- Ulrich, D. 1998. Intellectual capital = competence x commitment. *Sloan Management Review* 39 (Winter): 15-26.
- Upton, W. S. 2001. *Business and Financial Reporting, Challenges from the New Economy*. Norwalk, CT: Financial Accounting Standards Board.
- Waldman, D. A. 1994a. Designing performance management systems for total quality implementation. *Journal of Organizational Change Management* 7: 31-44.
- Waldman, D. A. 1994b. The contributions of total quality management to a theory of work performance. *Academy of Management Review* 19 (July): 510-536.
- Wallman, S. M. H. 1995. The future of accounting and disclosure in an evolving world: The need for dramatic change. *Accounting Horizons* 9 (September): 81-91.
- Wallman, S. M. H. 1996. The future of accounting and financial reporting. Part II: The colorized approach. *Accounting Horizons* 10 (June): 138-148.
- Weill, P. 1992. The relationship between investment in IT and firm performance: A study of the valve manufacturing sector. *Information Systems Research* 3 (December): 307-333.
- Welbourne, T. M., and A. O. Andrews. 1996. Predicting the performance of initial public offerings: Should human resource management be in the equation? *Academy of Management Journal* 39 (August): 891-919.
- Westphal, J., R. Gulati, and S. Shortell. 1997. Customization or conformity? An institutional and network perspective on the context and consequences of TQM adoption. *Administrative Science Quarterly* 42 (June): 366-394.
- Wilson, D. D., and D. A. Collier. 2000. An empirical investigation of the Malcolm Baldrige National Quality Award causal model. *Decision Sciences* 31 (Spring): 361-390.
- Wisner, J. D., and S. E. Fawcett. 1991. Linking firm strategy to operating decisions through performance measurement. *Production and Inventory Management Journal* 32 (3rd Quarter): 5-11.
- Wright, P. M., B. B. Dunford, and S. A. Snell. 2001. Human resources and the resource based view of the firm. *Journal of Management* 27 (June): 701-721.
- Wright, P. M., and G. C. McMahan. 1992. Theoretical perspectives for strategic human resource management. *Journal of Management* 18 Special Issue (June): 295-320.
- Wright, P. M., G. C. McMahan, and A. McWilliams. 1994. Human resources and sustained competitive advantage: A resource-based perspective. *International Journal of Human Resource Management* 5 (May): 301-326.
- Wright, P. M., and S. A. Snell. 1991. Toward an integrative view of strategic human resource management. *Human Resource Management Review* 1 (Autumn): 203-225.

- Wruck, K. H., and M. C. Jensen. 1994. Science, specific knowledge, and total quality management. *Journal of Accounting and Economics* 18 (November): 247-287.
- Wunderley, L. J., W. B. Reddy, and W. N. Dember. 1998. Optimism and pessimism in business leaders. *Journal of Applied Social Psychology* 28: 751-760.
- Wunsche, A., J. Gerard, and B. Swirsky. 2003. Innovation measurement and reporting in the context of value creation. Value Measurement and Reporting Collaborative. November.
- Youndt, M. A., S. A. Snell, J. W. Dean, and D. P. Lepak. 1996. Human resource management, manufacturing strategy, and firm performance. *Academy of Management Journal* 39 (August): 836-866.
- Zahorik, A. J., and R. T. Rust. 1992. Modeling the impact of service quality on profitability: A review. In Schwartz, T. (Ed.), *Advances in Services Marketing and Management* (Vol. 1, 247-276). Greenwich, CT: JAI Press.
- Zambon, S. et al. 2002. The communication of intangibles and intellectual capital: An empirical model of analysis. Official Report No. 106, Italian Association of Financial Analysts. January.
- Zeithaml, V. A. 2000. Service quality, profitability, and the economic worth of customers: What we know and what we need to learn. *Journal of the Academy of Marketing Science* 28 (Winter): 67-85.