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RELATIONSHIP BETWEEN INNOVATIVENESS, QUALITY, GROWTH, PROFITABILITY, AND MARKET VALUE

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The purpose of this study is to examine the relationship between innovativeness, quality, growth, profitability, and market value at the firm level. Building on concepts from a resource-based view of a firm and organizational learning, innovation and quality literature, we propose the innovativeness–quality–performance model, which describes how a firm's capability to balance innovativeness with quality drives growth and profitability, and in turn drives superior market value. Results of structural equation models indicate that (1) innovativeness mediates the relationship between quality and growth, (2) quality mediates the relationship between innovativeness and profitability, (3) both innovativeness and quality have mediation effects on market value, and (4) both growth and profitability have mediation effects on market value. Implications for theories and practices are discussed. Copyright © 2005 John Wiley & Sons, Ltd.

There seems to be broad agreement that inimitable intangible resources, such as a firm's capability to promote innovation and creativity while controlling the quality of its products or services, are key drivers of competitive advantage. There is no shortage of examples in management literature that illustrate how innovativeness and quality contribute to business successes (see, for example, Buzzell and Gale, 1987; Garvin, 1988; Nonaka, 1991). However, so far, case studies and anecdotal examples have not been complemented with a large-scale data analysis; thus, the exact nature of the relationship between innovativeness, quality, and firm performance is not clear yet.

The purpose of this study was to test whether the reported success stories were firm specific or valid across firms *in general*. In particular, we applied structural equation modeling techniques to examine how innovativeness and quality were related to a firm's overall financial performance such as growth, profitability, and market value. We designed this study to test their relationship in a non-random sample of *Fortune* 1000 companies, using the data obtained from the *Fortune* Corporate Reputation Survey (hereafter designated as 'FRS' or 'the Survey') and the COMPUSTAT database.

Keywords: innovativeness; quality; growth; profitability; market value; mediation effect
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THEORETICAL BACKGROUND

Although innovativeness and quality may intuitively appear to impact positively on a firm's performance—including growth, profitability, and market value—in a similar fashion, pursuing these strategies may involve some hard choices in allocating resources. The controversy regarding an emerging Internet business model over the past several years was very much framed by a debate over an optimal way to plan and execute strategies

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for superior firm performance—either being the first through innovation or being the best through superior quality. Because resources and strategies required for the implementation of innovation and quality focus are different, a firm has to master how to allocate its limited resources in ways aligned with its strategic goals.

We draw on theoretical constructs from several sources: intangible resources from a resource-based view of a firm (Penrose, 1959; Wernerfelt, 1984), various innovation and quality literature, and exploration and exploitation from organizational learning (March, 1991).

Resource-based view of the firm

Why do highly innovative and superior quality products or services give sustainable competitive advantage to companies? A useful starting point for discussion is the literature on the resource-based view of the firm (RBV) (e.g., Penrose, 1959; Wernerfelt, 1984). According to the RBV, the sustainable competitive advantage results from the inimitability, rarity, and non-tradability of intangible resources (Barney, 1991, 1997; Grant, 1991; Penrose, 1959; Peteraf, 1993). These studies emphasize that a firm should possess certain intangible resources that competitors cannot copy or buy easily. As a result, the firm possessing intangible resources can gain competitive advantage in the market.

Several researchers have listed examples of resources a firm could possess (Hall, 1992; Penrose, 1959; Wernerfelt, 1984). For example, Wernerfelt (1984) listed brand names, in-house knowledge of technology, employment of skilled personnel, trade contracts, machinery, efficient procedures, and capital. Hall (1992), considering intangible resources a firm's competencies, listed the culture of the organization and the know-how of employees, suppliers, and distributors as such. In this study, we define that a firm's capability of being innovative and at the same time delivering high-quality products or services to customers is its intangible resources.

Innovation/innovativeness

Innovation is an application of knowledge to produce new knowledge (Drucker, 1993). There is no shortage of literature that illustrates the importance of knowledge, innovation, and creativity for superior firm performance. Their importance for the survival and success of organizations is widely accepted among organizational researchers (Damanpour, 1996; Wolfe, 1994) and has resulted in a proliferation of studies and theories on innovation (e.g., Gopalakrishnan and Damanpour, 1997). Most organizational innovation researchers, however, have agreed that understanding innovative behavior in organizations has remained relatively undeveloped, inconclusive, and inconsistent (Fiol, 1996; Gopalakrishnan and Damanpour, 1997; Wolfe, 1994). A reason for inconclusive and inconsistent findings was the different definitions of innovation or innovativeness across disciplines. However, irrespective of these differences, innovativeness is universally perceived as exploring something new that has not existed before.

Quality

The importance of the quality of products or services in today's business environment is paramount (Russell and Taylor, 1995: 87). When the strategic aspects of quality were recognized in the 1970s and 1980s, top managers began to link quality to firm performance and included quality in a strategic planning process as a means to sustain competitive advantage. This brought changes in the definition of quality, from a manufacturer's perspective to a customer's perspective (Garvin, 1988). Since then, researchers in manufacturing, marketing, and consumer behavior have produced a plethora of definitions of and theories on quality (see, for example, Miller, 1996; Stone-Romero, Stone, and Grewal, 1997). Much of the literature on quality demonstrates that, over the years, depending on different academic disciplines, orientations, and economic sectors, different definitions and dimensions of quality have been emphasized. However, regardless of these differences, quality is almost universally perceived as a dynamic threshold that a firm must meet to satisfy customers.

Exploration and exploitation in organizational learning

While innovation and quality can contribute to a firm's success, balancing between the two may require hard choices. March (1991) formulated it as a contrast between the exploration of new possibilities and the exploitation of old certainties.

A firm's activities related to exploration include such things as search, variation, openness, risk taking, experimentation, flexibility, play, discovery, radical change, creativity, and innovation. Those related to exploitation include such things as refinement, discipline, control, standardization, rigidity, selection, choice, efficiency, incremental change, implementation, execution, and improvement. All these activities are to some degree two extreme points of one dimension. For example, experimentation is one extreme and standardization is the other; flexibility is one extreme and control the other. As a result, a firm has to learn how to deal with these paradoxes and dualities (Evans, Pucik, and Barsoux, 2002: 80).

However, as March (1991: 71) explained, 'understanding the choices and improving the balance between exploration and exploitation are complicated by the fact that returns from the two options vary not only with respect to their expected values, but also with respect to their variability, their timing, and their distribution within and beyond the organization.' A challenge facing an organization is to know not only how to maintain an appropriate balance between exploration and exploitation for sustainability and prosperity, but also when to emphasize one over the other. Both exploration and exploitation are essential for organizations, but they compete for scarce resources (March, 1991: 71). Thus, a firm's capability to allocate scarce resources that can maximize the returns from either exploration or exploitation is its intangible competencies.

Building on March, we propose that a firm's level of overall innovativeness manifests its capability to explore new possibilities, and likewise a firm's level of product or service quality manifests its capability to exploit currently established certainties. In this study, innovativeness is to quality what exploration is to exploitation. We investigate whether the returns from the two strategic options vary with respect to growth, profitability, and market value.

RELEVANT EMPIRICAL RESEARCH

The direct relationship between innovativeness and firm performance

A major assumption in the innovativeness and firm performance literature is that innovativeness improves firm performance. We identified three streams in the literature. The first stream was from studies on the relationship between organizational innovation and firm performance. For example, Damanpour and Evan (1984) reported a positive relationship between organizational innovation and performance. Similarly, Subramanian and Nilakanta (1996) found that innovativeness had a positive effect on organizational performance, as measured by return on assets (ROA) and the share of deposits for each bank.

Another stream was from studies on the relationship between innovativeness and firm performance in the area of product development. For example, Kleinschmidt and Cooper (1991) investigated the role and impact of product innovativeness on profitability, as measured by success rates and return on investment (ROI). Although they examined the relationship between product innovativeness and profits at the product level, because one successful product can sometimes generate a large portion of a firm's revenues, their results indicate a positive relationship between innovativeness and profit or growth performance at the firm level.

The third stream was from studies on value innovation. For example, Kim and Mauborgne (1997) explained the logic of value innovation in five dimensions of strategy and described a few companies that grew through value innovation. These previous studies provide empirical evidence of the positive relationship between innovation and firm performance. Thus, we hypothesize that:

Hypothesis 1a: The higher the innovativeness, the greater the growth performance.

Hypothesis 1b: The higher the innovativeness, the greater the profitability performance.

Hypothesis 1c: The higher the innovativeness, the greater the market value performance.

The direct relationship between quality and firm performance

A major assumption in the quality and firm performance literature is that quality improves firm performance. We identified three major empirical studies in the literature. The first stream was from empirical studies using the Profit Impact of Marketing Strategies (PIMS) database. Most studies found superior quality had a positive relationship with higher ROI (e.g., Buzzell and

Gale, 1987; Phillips, Chang, and Buzzell, 1983; Schoeffler, Buzzell, and Heany, 1974), although Wagner (1984) found inconclusive results on the relationship between quality and ROI.

The second stream was from a series of studies on the American Customer Satisfaction Index (ACSI) model, which established the relationship between customer expectations, perceived quality, perceived value, customer satisfaction, customer complaints, and customer loyalty (Fornell *et al*., 1996). For example, Ittner and Larcker (1996) reported a positive relationship between ACSI's customer variables and financial measures such as return on assets, market-to-book ratio, and price–earnings ratio.

The third stream was from studies that examined perceived quality data from the EquiTrend Quality Assessment Database (EQA) of the Total Research Corporation. For example, Aaker and Jacobson (1994) found a positive relationship between stock return and perceived product quality in 34 companies traded on the U.S. Stock Exchange, which implies that quality is positively related to a firm's economic performance measures.

Repeated findings on quality, either measured by customer satisfaction or perceived quality, provide a growing body of evidence that the relationship between quality and firm performance is positive. Interestingly, research on quality predominantly used profitability rather than growth as a measure of firm performance. Here we examine how quality and growth as well as profitability and market value are related to each other. Thus, we hypothesize that:

Hypothesis 2a. The higher the quality, the greater the growth performance.

Hypothesis 2b: The higher the quality, the greater the profitability performance.

Hypothesis 2c: The higher the quality, the greater the market value performance.

The relationship between innovativeness, quality, and firm performance

Little research has examined how innovativeness, quality, and firm performance are related to each other. Although researchers have an interest in their underlying relationship, they usually find it difficult to collect soft data such as innovativeness and quality across a few hundred companies. Thus, it is rare to find large-scale studies that investigate their relationship, not to mention a mediation effect of innovativeness and quality.[1]

We could, however, find some indirect evidence which implied the mediation effect of quality on the relationship between innovativeness and firm performance. In a series of studies intended to identify success and failure factors of new products (Cooper, 1990; Cooper and Brentani, 1991; Cooper and Kleinschmidt, 1995, 1996), Cooper and his colleagues found that for new products or services to be successful in the market, they should carry superior quality—implying a possible mediation effect of quality on the relationship between innovativeness and market success. We found another example in the Sears' Employee–Customer–Profit (ECP) chain model, which established a chain of cause and effect running from employees' innovative behavior to an improvement in customer satisfaction, then to superior firm performance (Rucci, Kirn, and Quinn, 1998). Since customer satisfaction is to some degree correlated with the quality of products or services, we speculate that the mediation effect of quality may exist.

Additional evidence came from our own pilot tests, analyzing the results of Brown and Perry (1994) and McGuire, Schneeweis, and Branch (1990). Although none of these studies directly discussed the mediation effect of innovativeness and quality, both reported correlation coefficients between eight attributes of FRS and performance measures such as growth rates and return on equity (ROE). Based on Maruyama's simple diagnostic formula (Mauyama, 1998: 10) and their correlation coefficients, we tested two mediation models: (1) Quality → Innovativeness → Growth Model and (2) Innovativeness → Quality → Profitability Model. We found both mediation models were viable (Cho and Pucik, 2004).

[1] Although this study focuses on a mediation effect, it is necessary to discuss differences between mediation and moderation effects. Despite several useful discussions on the differences (Baron and Kenny, 1986; Holmbeck, 1997), there continue to be inconsistencies in the use of these terms. In short, if X (explanatory variable) is significantly associated with Y (response variable) before Z is introduced in the model, but if X is not significantly associated with Y after Z is introduced, then Z is a mediator variable. On the other hand, if X is expected to be related to Y, but only under certain conditions of Z, then Z is a moderator variable. Moderator effects are indicated by the significant interaction effect of XZ while X and Z are controlled. For detailed and diagrammatical explanations, please see Baron and Kenny (1986) and Holmbeck (1997).

Finally, we used the multiple regression approach of Baron and Kenny (1986) to analyze FRS and COMPUSTAT data. Because innovativeness and quality were highly correlated ($r = 0.88$), it was easy to assume that they would have a similar relationship with growth, profitability, and market value. However, to our surprise, the preliminary results from a series of the mediation test debunked the assumption. The perfect mediation held when the explanatory variable Innovativeness had no relationship with the response variable ROA while the mediator variable Quality was controlled (Innovativeness → Quality → ROA). On the other hand, the perfect mediation held when the explanatory variable Quality had no relationship with the response variable Growth Rate of Total Assets while the mediator variable Innovativeness was controlled (Quality → Innovativeness → Growth Rate). These findings provide preliminary evidence that innovativeness and quality have a different underlying relationship with growth and profitability (Cho and Pucik, 2004).

In summary, previous empirical studies and our own pilot tests lead us to examine two mediation models. Thus, we hypothesize that:

Hypothesis 3a: A firm's innovativeness mediates the relationship between quality and growth.

Hypothesis 3b: A firm's product or service quality mediates the relationship between innovativeness and profitability.

In addition, since market investors favor both innovativeness and quality, we speculate that both of them have the mediation effect on market value. Thus, we hypothesize that:

Hypothesis 3c: A firm's innovativeness has a direct relationship with market value and an indirect relationship with market value through its product or service quality.

The relationship between growth, profitability, and market value

Most studies examining innovativeness or quality (e.g., Buzzell and Gale, 1987: 28; Heskett *et al*., 1994; Rucci *et al*., 1998) have used profitability or growth as overall performance measures, without differentiating their relationship. A wide variety of researchers in strategy literature have used growth as either a sole measure of firm performance or in combination with profitability. For example, Varaiya, Kerin, and Weeks (1987) reported that profitability and growth influenced shareholder value, without differentiating profitability from growth. Woo, Willard, and Daellenbach (1992) studied sales growth, ROA, and market-to-book ratios, respectively, but did not investigate their relationship.

Considering the importance of understanding the impact of trade-offs between growth and profitability, we examine how the capital market rewards growth and profitability, speculating that growth drives both profitability and market value. Thus, we hypothesize that:

Hypothesis 4: A firm's growth has a direct relationship with market value and an indirect relationship with market value through profitability.

THE IQP MODEL

Given a documented relationship between innovativeness and growth, and between quality and profitability, innovativeness may provide a link in the relationship between quality and growth, and likewise quality may provide a link in the relationship between innovativeness and profitability. The hypothesized mediation model is as follows: Innovativeness → Quality of Products or Services → Firm Performance (hereafter, IQP model).

Theoretically, the IQP model relies on the resource-based view, organizational learning, innovation, and quality literature. Empirically, the IQP model was built on empirical evidence we observed from previous studies (Brown and Perry, 1994; Cooper and Brentani, 1991; Cooper and Kleinschmidt, 1995, 1996; McGuire *et al*., 1990; Rucci *et al*., 1998). In spite of the importance of their relationship, little research empirically examined their direct and indirect relationship.

We examine the direct relationship (Hypotheses 1 and 2), and the mediation effects of innovativeness and quality on firm performance (Hypotheses 3). Then, we examine the relationship between growth, profitability, and market value to identify an optimal path to market value (Hypothesis 4). Lastly, we examine structural equation models of the IQP model that links innovativeness and quality to three different

types of firm performance measures, i.e., growth, profitability, and market value. The IQP model implies that an optimal path may go from innovativeness to quality, then to growth or profitability, and then to market value. Then, we hypothesize that:

> *Hypothesis 5: A firm's innovativeness and its product or service quality have positive direct and indirect relationship with growth, profitability, and market value.*

Figure 1 describes two complete mediation models (Hypotheses 3a and 3b), two partial mediation models (Hypotheses 3c and 4), and the IQP Model (Hypothesis 5). James and Brett (1984) distinguished between complete and partial mediation models. The partial mediation model is called the full model; the complete or perfect mediation model is usually called the mediation model. We used 'full' and 'mediation' to simplify these terms.

METHODS

The *Fortune* Reputation Survey (FRS)

The *Fortune* Annual Corporate Reputation ranking list, or the America's Most Admired Companies, was first published in 1983. The Survey has measured U.S. firms' performance in terms of eight attributes: Quality of Management, Quality of Products/Services, Innovativeness, Financial Soundness, Long-Term Investment Value, Use of Corporate Assets, Social Responsibility, and Employee Talent. The FRS respondents are CEOs, top executives, and financial analysts in more than 40 industries of the *Fortune* 1000 companies.

Quite a few studies (e.g., Fombrun and Shanley, 1990; Fryxell and Wang, 1994) have already used

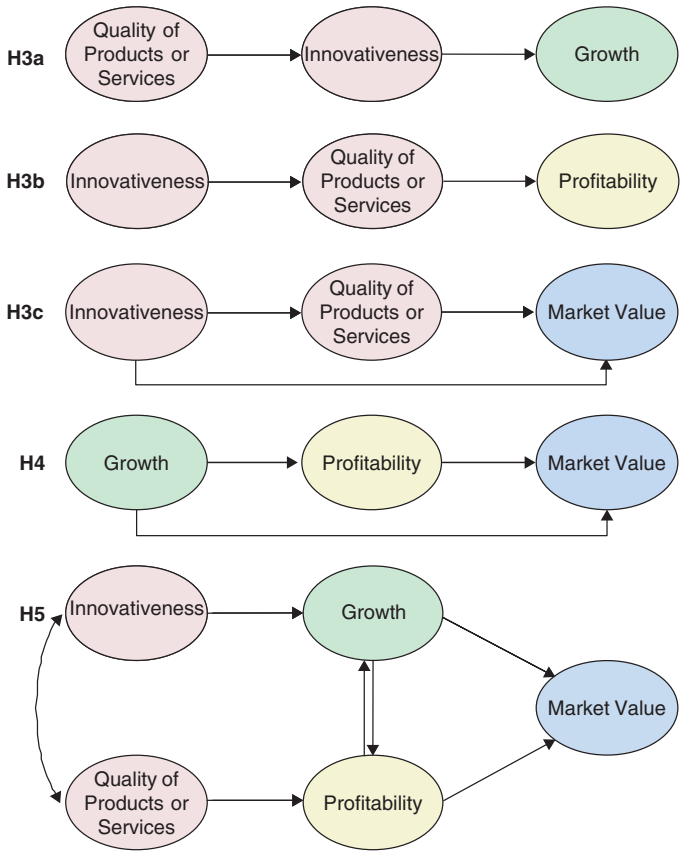

Figure 1. Summary of hypotheses: mediation model (Hypotheses 3a and 3b), full model (Hypotheses 3c and 4), and the IQP model (Hypothesis 5)

the FRS database and others have noted its usefulness (Capraro and Srivastava, 1997; Szwajkowski and Figlewicz, 1997, 1999). However, using the FRS database for research purposes is controversial, because there is perceived lack of validity and reliability of the Survey measures (Capraro and Srivastava, 1997). Thus, Baucus (1995) argued that the database should not be used at all, while others demonstrated how FRS data could be corrected to yield meaningful conclusions (Brown and Perry, 1994, 1995). Therefore, before conducting this study, we examined the reliability and validity of two constructs that we intended to draw from the FRS database: the scores of Innovativeness and Quality of Products/Services (designated as INNOV and QUAL when referring to the two FRS attributes).

The results (Cho and Pucik, 2004) showed strong construct (i.e., convergent and discriminant) and criterion related (i.e., concurrent and predictive) validity of the two attributes. In spite of the strong correlation coefficient between INNOV and QUAL scores ($r \cong 0.80$), the two appeared to represent different aspects of corporate reputation. Based on our findings, we concluded that the INNOV score manifested a level of a firm's overall innovativeness and the QUAL score manifested a level of its overall quality. Then, INNOV and QUAL scores were used as indicators of such attributes in testing the IQP model in this study.

Data

Innovativeness, quality, growth, profitability, and market value are measures of a firm's current performance position. We used the subjective performance measures of innovativeness and quality from the FRS database to test the hypothesized mediation model. This allowed us to bypass a fundamental constraint impeding previous studies, namely the absence of large-scale data on non-financial performance measures, such as a firm's innovativeness and quality.

We obtained INNOV and QUAL scores from *Fortune* magazine published in March 1999, February 2000, and February 2001 on the *Fortune* Internet site (Brown, 1999; Colvin, 2000; Diba and Munoz, 2001). We obtained accounting and market data from Research Insight Global Vantage CD-ROM, September 2001 Version, which is the PC version of COMPUSTAT. Because the survey was conducted a year before publication, we refer to the years 1998, 1999, and 2000 from now on, making it easier to match the FRS data with financial performance data of the equivalent year. The combined database allowed us to examine the relationship between innovativeness, quality, and a firm's overall accounting and market performance.

The final data set used in this study was created after applying two data screening criteria. Firstly, we did not include financial or depository institutions (Economic Sector Code 5000 in COMPUSTAT), because their operating characteristics are quite different so their returns are not comparable with those in other industries (McGahan, 1999). Secondly, we excluded the U.S. subsidiaries of non-U.S. companies.

Table 1 summarizes variable names, their operational definitions, and units of each variable. Table 2 summarizes sample characteristics. The first author created the database and analyzed the data on SAS for Windows V8.1e and LISREL 8.3.

Psychometric measures

Two variables, i.e., innovativeness and quality, were measured by the *Fortune* survey instrument. The questionnaire survey is a common method of collecting data in social sciences because not all performance measures have objective data. Therefore, we sometimes inevitably depend on psychometric (subjective or soft) data such as opinion or perception. Although using perceptual or subjective data has been advocated in the strategic management literature (Dess and Robinson, 1984; Powell, 1996), it is still rare. Dess and Robinson (1984) suggested that qualitative indices of firm performance be used to supplement objective performance measures. FRS relied on respondents' subjective evaluation of each firm's overall performance on innovativeness and quality; thus, these data were psychometric measures. We used INNOV and QUAL scores as subjective performance indices.

Econometric measures

Other than INNOV and QUAL scores, eight performance measures were econometric data, each of which showed a firm's current position in growth, profitability, and market value. With econometric data, measurement problems are missing values and outliers. Because a firm's accounting and market performance data were matched with the

Table 1. Definition of observed variables and latent variables

Variables	Definition	Unit
Observed variables		
Psychometric performance measures: INNOV and QUAL		
INNOV98	Innovativeness score in 1998 [published in 1999]	Numeric (0–10)
INNOV99	Innovativeness score in 1999 [published in 2000]	Numeric (0–10)
INNOV00	Innovativeness score in 2000 [published in 2001]	Numeric (0–10)
QUAL98	Quality of products/services score in 1998 [published in 1999]	Numeric (0–10)
QUAL99	Quality of products/services score in 1999 [published in 2000]	Numeric (0–10)
QUAL00	Quality of products/services score in 2000 [published in 2001]	Numeric (0–10)
Compound annual growth rate (CAGR): total assets, revenue, and market capitalization		
AT_CAGR	CAGR of total assets from 1998 to 2000	Percentage (%)
REVT_CAGR	CAGR of total revenues from 1998 to 2000	Percentage (%)
MKV_CAGR	CAGR of market capitalization from 1998 to 2000	Percentage (%)
Profitability ratios: ROA, ROI, and ROE		
ROA_3YA	Three-year average of return on assets (1998–2000)	Percentage (%)
ROE_3YA	Three-year average of return on common equity (1998–2000)	Percentage (%)
ROI_3YA	Three-year average of return on invested capital (1998–2000)	Percentage (%)
Market value ratios: market-to-book ratios and Tobin's q		
MB_3YA	Three-year average of market-to-book ratio (1998–2000)	Ratio
TQ_3YA	Three-year average of Tobin's *q* ratio (1998–2000)	Ratio
Latent variables		
Innovativeness	Indicated by INNOV98, INNOV99, and INNOV00	Numeric
Quality of Products or Services	Indicated by QUAL98, QUAL99, and QUAL00	Numeric
Growth	Indicated by AT_CAGR, REVT_CAGR, and MKV_CAGR	Percentage (%)
Profitability	Indicated by ROA_3YA, ROE_3YA, and ROI_3YA	Percentage (%)
Market Value	Indicated by MB_3YA and TQ_3YA	Ratio

Note: AT, REVT, MKVAL, ROA, ROE, and ROI are mnemonics used in COMPUSTAT. MKVAL was shortened to MKV here.

FRS attribute data—as with most empirical studies that use multiple-year financial performance data at the firm level—we had quite a lot of missing values.

We used three missing data techniques to handle them (e.g., Switzer, Roth, and Switzer, 1998): a mean substitution technique to calculate the 3-year average of the study variables, a pair-wise deletion technique to calculate correlation coefficients, and a list-wise deletion technique to calculate covariance coefficients for structural equation models. As a result, the sample sizes used to compute each statistic in this study were slightly different depending on the missing data techniques.

Preliminary data analyses of eight accounting and market data showed that there were some extreme outliers in the data set. Thus, we conducted an outlier deletion process. If the variable followed the normal distribution after excluding the extreme 1 percent on either side, we stopped the outlier deletion process. If not, we eliminated the next 1 percent on either side and then stopped the process completely. Thus, the outliers represented far less than 4 percent of the data.

Growth performance measures

A wide variety of researchers have used growth either as a sole measure of firm performance or in combination with profitability (Busija, O'Neill, and Zeithaml, 1997; Dess, Lumpkin, and Covin, 1997; Nohria and Ghoshal, 1994; Wiersema and Liebeskind, 1995; Woo *et al*., 1992). We measured a firm's growth performance by the three compound annual growth rates of total assets, total revenues, and market capitalization from 1998 to 2000. A compound annual growth rate (CAGR) measures the rate of movement between the first year and the last year, and then compounds this rate over 2 years. Observations between the first and the last are not considered. We obtained three compound annual growth rates directly from COMPUSTAT.

Profitability performance measures

Researchers investigating firm performance have used a variety of measures of profitability: ROA (Zajac, Kraatz, and Bresser, 2000), ROE (Delios and Beamish, 1999), and ROI (Busija *et al*., 1997;

Table 2. (a) Sample characteristics by economic sectors

Economic sector	Number of firms	Total sample (%)
Basic materials	48	9.84%
Consumer cyclical	116	23.77%
Consumer staples	86	17.62%
Health care	29	5.94%
Energy	25	5.12%
Capital goods	54	11.07%
Technology	62	12.70%
Communication services	10	2.05%
Utilities	27	5.53%
Transportation	31	6.35%
Total	488	100%

(b) Sample characteristics by firm size (3-year average of total revenues)

Firm size by revenue (U.S. $ billions)	Number of firms	Total sample (%)
Less than $1	23	4.71%
$1–$2	93	19.06%
$2–$3	69	14.14%
$3–$4	45	9.22%
$4–$5	32	6.56%
$5–$6	26	5.33%
$6–$7	23	4.71%
$7–$8	12	2.46%
$8–$9	20	4.10%
$9–$10	13	2.66%
$10–$12	23	4.71%
$12–$15	26	5.33%
$15–$20	33	6.76%
$20–$30	29	5.94%
$30–$40	17	3.48%
Larger than $40	4	0.82%
Total	488	100%

Dess *et al*., 1997; Johansson and Yip, 1994). We measured a firm's profitability performance by three profitability ratios: ROA, ROE, and ROI. Because most of these measures tend to be strongly related to one another (Keats and Hitt, 1988), we used all three profitability ratios as indicators of a firm's overall profitability performance. We obtained them directly from COMPUSTAT.

Market performance measures

We measured a firm's market performance by two market-based measures of return: market-to-book ratio and Tobin's *q* ratio. The market-to-book ratio is the ratio of stock price to book value per share (Brealey and Myers, 2000: 830). Because it reflects a firm's capability to exceed expected returns in the future and approximates the stock market's perception on the value of a firm's present and future income and growth potential (Montgomery, Thomas, and Kamath, 1984), a variety of researchers have used it as an indication of a firm's future performance potential and a measure of long-term firm performance (Combs and Ketchen, 1999; Farjoun, 1998; Keats and Hitt, 1988; Nguyen, Seror, and Devinney, 1990). We calculated the market-to-book ratio on COMPUSTAT with the formula provided by Standard & Poor's.

Tobin's *q* ratio, the second market-based measure of return, is the ratio of the market value of a firm's debt and equity to the current replacement cost of its assets (Brealey and Myers, 2000: 831; Brainard and Tobin, 1968). Chung and Pruitt (1994) established an approximate Tobin's *q* formula, which requires only basic and readily available financial data from COMPUSTAT, and this measure was operationally defined in Lee and Tompkins (1999: 23). We used their formula to calculate the approximate Tobin's *q* ratio with the data obtained from COMPUSTAT.

Research design

Previous studies that used the FRS database examined 1-year survey data (e.g., Brown and Perry, 1994; McGuire *et al*., 1990). To reduce measurement threats of a mono-year bias and a mono-method bias, we devised a multiple-year design, covering a 3-year period of performance, from 1998 to 2000, as a research time frame. We collected INNOV and QUAL data at three time points (1998, 1999, 2000) and treated each of them as one observation of INNOV and QUAL scores. Then we matched INNOV and QUAL scores with equivalent years' accounting and market data from COMPUSTAT. We examined three different aspects of firm performance, i.e., growth, profitability, and market value, to reduce any undue risk of a mono-performance measurement bias.

Cross-sectional design

As March (1991) argued, returns from exploration and exploitation vary with respect to their timing. That is, compared to returns from exploitation, returns from exploration are less certain and more

remote in time. Likewise, compared to revenue growth or profitability from quality improvement, returns from innovativeness are uncertain and more remote in time. Therefore, we designed this study so that its time frame (i.e., 3 years) could cover the short-term and medium-term effects of innovativeness and quality on measures of firm performance. Although this design did not allow us to control a potential time lag between innovativeness or superior quality and ultimate firm performance, and the 3-year period[2] was arbitrary, a multiple-year study design is superior to a single-year design. This design allowed us to reduce a chance of committing a mono-year bias that might be caused by using a certain-year database, as was the case in most previous studies with the FRS data.

Combination of psychometrics and econometrics

One of the difficulties of conducting research on intangible resources is that it is hard to measure their economic values. Empirical and quantifiable evidence of whether intangible resources contribute to firm performance is still hard to obtain because intangible resources, such as a firm's capabilities to create innovative ideas and new knowledge and to learn from experience and to improve quality, are perceived as too complex to analyze with traditional methods.

In spite of such difficulties, Megna and Klock (1993) investigated whether a firm's intangible assets contribute to firm performance in terms of profit or market share. Our study design is similar to their study design in that we also examined the relationship between intangible resources and firm performance, but different in that all of their measures had quantifiable economic values. In contrast, this study is a hybrid of psychometric and econometric approaches, because we used both perceptual evaluation of intangible resources and accounting/market performance data.

Structural equation modeling (SEM)

We applied SEM approaches to examine the IQP model as well as the mediation models, because we used both observed measures and abstract concepts of firm performance.

Measured variables and latent variables

The measured variables associated with latent variables are also known as indicators (Klem, 2000: 230). The psychometric measured variables were INNOV98, INNOV99, INNOV00, QUAL98, QUAL99, and QUAL00. Unmeasured variables, or latent variables, are also known as factors; they are abstract concepts (Klem, 2000: 228). We used the INNOV and QUAL scores from the FRS ranking list of the years 1998, 1999, and 2000 as indicators of two latent variables, which we labeled Innovativeness and Quality of Products or Services. Three latent variables from eight accounting and market data were Growth, Profitability, and Market Value.

Figure 2 describes the relationship between indicators and latent variables of the IQP model. We had 14 directly observed measures, or indicators (i.e., measurement level in rectangle) and five theoretically derived concepts, or latent variables or factors (i.e., structure level in oval) (e.g., Bagozzi and Phillips, 1982).

Two-step approach to structural equation models (SEM)

In this analysis, we combined and extended the traditional innovation → quality, innovation → firm performance, and quality → firm performance paradigms. We examined not only the mediation effect of innovativeness on the relationship between quality and growth, but also the mediation effect of quality on the relationship between innovativeness and profitability. Then we examined the relationship between growth, profitability, and market value. We examined whether growth influenced profitability or profitability influenced growth, or whether they influenced each other reciprocally. We followed the two-step approach to structural equation modeling methods as was explained in Anderson and Gerbing (1988).

Testing mediation effects in structural equation models

This procedure allowed us to determine whether the two latent variables of Innovativeness and Quality were related to Growth, Profitability, and Market Value in a similar or different manner.

[2] The 3-year time frame was based on the findings in our study (Cho and Pucik, 2004) on the predictive validity of INNOV and QUAL scores, which examined firm performance over 6 years from 1995 to 2000. The relationships between INNOV and firm performance measures were relatively stable over the years except in a few sectors such as consumer staples and technology, whose correlation coefficients dropped after four years.

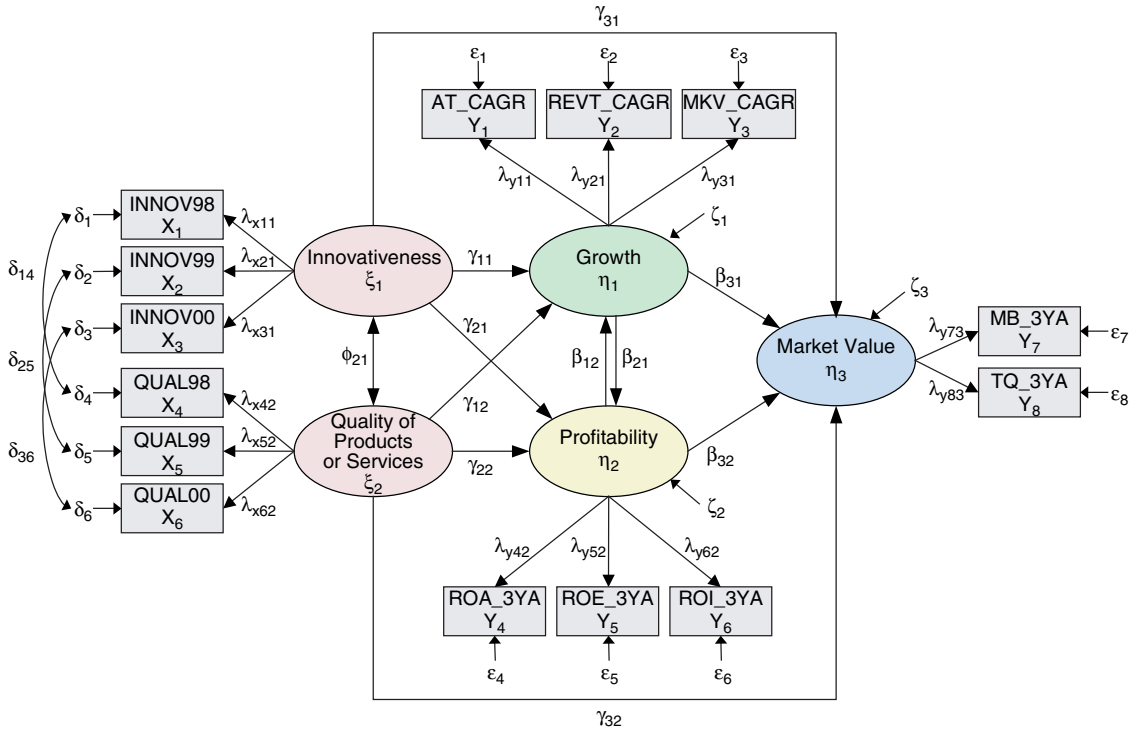

Figure 2. Structural equation model of innovativeness, quality, growth, profitability, and market value

The logic for testing mediation effects is based on Baron and Kenny (1986), Holye and Smith (1994), and Holmbeck (1997). We used the two-step SEM approach to testing the mediation effects because the SEM approach is particularly useful when multiple indicators for the latent variables are under investigation (Holmbeck, 1997). SEM methods, the most efficient and least problematic means of testing mediation (Baron and Kenny, 1986), made it possible to examine the mediation effects on firm performance. Because of the capacity to simultaneously estimate multiple equations and to include latent variables, SEM methods avoid problems of overestimation and underestimation of mediation effects by controlling for measurement errors (Hoyle and Smith, 1994).

Model respecification

One challenge in testing the mediation model was the strong correlation between INNOV and QUAL. Detailed psychometric analyses indicated that INNOV and QUAL scores were highly correlated; for example, the correlation coefficient between INNOV and QUAL in 1999 ($r_{\text{INNOV99}\times\text{QUAL99}}$) was 0.88. Therefore, we used SEM methods developed to test observed and latent variables with highly correlated measurement errors (Jöreskog and Sörbom, 1996: Ch. 5). That is, the error terms of INNOV and QUAL scores of the same year were specified to be correlated in the structural equation model because there was a tendency for the measurement errors from the same year FRS scores to be more highly correlated than those from the different year FRS scores. That is, for example, the correlation coefficient between INNOV99 and QUAL99 ($r_{\text{INNOV99}\times\text{QUAL99}}$) was 0.88, that between INNOV95 and INNOV99 ($r_{\text{INNOV95}\times\text{INNOV99}}$) was 0.64, and that between QUAL95 and QUAL99 ($r_{\text{QUAL95}\times\text{QUAL99}}$) was 0.63 (Cho and Pucik, 2004). The correlation coefficient between INNOV and QUAL measured in the same year was the strongest among the three. Similar patterns on the correlation coefficients were observed with data from different years. Thus, we developed and examined models with correlated measurement errors that were collected in the same year, but not those collected in different years. As Anderson and Gerbing (1988: 416) recommended, respecification decisions—testing models with

correlated measurement errors—were based on both statistical and content considerations.[3]

Test statistics

We report the root-mean-square error of approximation (RMSEA), known as the most sensitive index to models with misspecified factor loadings (Hu and Bentler, 1998). Values of RMSEA less than 0.05 are considered to indicate a close fit; values in the range of 0.05–0.08 indicate a fairly good fit; values in the range of 0.08–0.1 indicate a mediocre fit; and values greater than 0.1 indicate a poor fit (Hu and Bentler, 1998; Browne and Cudeck, 1993; MacCallum, Browne, and Sugawara, 1996). We also report the standardized root-mean-square residual (SRMR), known as the most sensitive index to models with misspecified factor covariance(s). As Hu and Bentler (1998) suggested, we used 'smaller than 0.05' as indicative of a close fit. We evaluated a goodness-of-fit index (GFI), an adjusted goodness-of-fit index (AGFI), a non-normed fit index (NNFI), and a comparative fit index (CFI). Any model with a fit index above 0.9 is considered acceptable (Bentler and Bonett, 1980; Hu and Bentler, 1998).

RESULTS

Table 3 summarizes the descriptive statistics of the study variables. We tested discriminant validity to examine whether six indicators of Innovativeness and Quality were one latent variable or two latent variables. The results in Table 4 showed that two distinctive latent variables existed among six indicators when we compared the results of D1 ($\chi^2 = 520.4$) with those of 3aF ($\chi^2 = 63.72$), 3bF ($\chi^2 = 44$), and 3cF ($\chi^2 = 17.61$). All fit indices from D1, D2, and D3 are very small (0.29–0.79). Thus, we concluded that the INNOV and QUAL scores represented two different constructs.

Then, we examined two hypotheses of the direct relationship between innovativeness and quality (Hypotheses 1 and 2). We accepted all hypotheses on the direct relationship and concluded there were direct relationships between innovativeness and three firm performance measures (Hypothesis 1) as well as between quality and three firm performance measures (Hypothesis 2). All test results are summarized in Table 4.

Mediation model (Hypotheses 3a, 3b, and 3c)

We examined structural equation models with the three latent variables Innovativeness, Quality of Products or Services, and Profitability in Hypothesis 3b. Model 3bF (full model) and Model 3bM (mediation model) fitted the data well. The fit indices for Model 3bM indicated that this model reached an acceptable level of goodness-of-fit, $\chi^2(22, N = 270) = 44.01$, $p = 0.004$; RMSEA = 0.061; SRMR = 0.043; AGFI = 0.928; NNFI = 0.988; CFI = 0.992. As hypothesized, the path from Innovativeness and Quality was significant ($p < 0.05$), as was the path from Quality to Profitability ($p < 0.05$). However, the direct path from Innovativeness to Profitability was not significant when Quality was included in the model. These results met a criterion for a mediation model to hold (see, Baron and Kenny, 1986; Hoyle and Smith, 1994). The second statistic to test the mediation model was the chi-square difference test ($\Delta\chi^2$). The result of the chi-square difference test—the comparison between Model 3bM and Model 3bF—provides additional evidence that the full model (3bF) did not improve the fit from the mediation model (3bM). In other words, the mediation model explains the data as much as the full model; thus, we concluded that the mediation model, including the paths from Innovativeness and Quality, and from Quality to Profitability, was simple enough to fit the empirical data. Based on the parsimonious rule, we accepted the mediation model, concluding the mediation effect of quality on the relationship between innovativeness and profitability. We found a similar pattern of results in Hypothesis 3a. Thus, we accepted the mediation model, concluding the mediation effect of innovativeness on the relationship between quality and growth.

In the case of Hypothesis 3c, we accepted the full model (3cF), because the results of the two chi-square difference ($\Delta\chi^2$) tests—the comparisons between Model 3cM1 and Model 3cF and between Model 3cM2 and Model 3cF—provide evidence that the full model (3cF) was a better fit than the two mediation models. In addition, all three

[3] We also tested structural equation models without correlated measurement errors. Then, due to high correlation coefficients between INNOV and QUAL, we respecified structural equation models with correlated measurement errors (e.g., Wheaton *et al.*, 1977, quoted in Jöreskog and Sörbom, 1996: 215–223).

Table 3. Means, standard deviations, and correlation coefficients

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mean	6.10	5.94	5.77	6.77	6.57	6.49	14.06	12.78	3.87	5.42	14.75	8.73	3.62	1.81
S.D.	0.94	1.01	1.07	0.85	0.95	0.94	20.42	18.86	40.02	6.05	18.22	10.36	4.05	1.75
N	352	380	404	352	380	404	419	426	424	477	467	477	461	447
Innovativeness														
1. Innovativeness (1998)	1													
2. Innovativeness (1999)	0.85	1												
3. Innovativeness (2000)	0.74	0.82	1											
Quality of Products or Services														
4. Quality (1998)	0.83	0.71	0.58	1										
5. Quality (1999)	0.75	0.88	0.71	0.82	1									
6. Quality (2000)	0.68	0.74	0.86	0.74	0.83	1								
Growth														
7. Total Assets	0.20	0.31	0.29	0.14	0.27	0.22	1							
8. Total Revenues	0.21	0.24	0.28	0.13	0.20	0.20	0.70	1						
9. Market Capitalization	0.24	0.29	0.43	0.09	0.19	0.30	0.43	0.44	1					
Profitability														
10. ROA	0.31	0.37	0.33	0.33	0.40	0.35	0.26	0.17	0.22	1				
11. ROE	0.22	0.26	0.23	0.19	0.31	0.23	0.11	0.07	0.14	0.60	1			
12. ROI	0.24	0.31	0.26	0.26	0.35	0.31	0.16	0.06	0.16	0.86	0.66	1		
Market Value														
13. Market-to-Book	0.39	0.45	0.35	0.38	0.44	0.37	0.21	0.16	0.24	0.53	0.40	0.43	1	
14. Tobin's *q*	0.41	0.43	0.36	0.37	0.40	0.36	0.26	0.19	0.30	0.66	0.35	0.55	0.71	1

Notes:
Missing value technique: pairwise deletion
Correlation coefficients between 0.10 and 0.14 are significant at the $p < 0.05$ level
Correlation coefficients between 0.15 and 0.17 are significant at the $p < 0.01$ level
Correlation coefficients larger than 0.18 are significant at the $p < 0.001$ level

Table 4. Structural equation modeling results

Model	Model description[a]	χ^2	d.f.	p[b]	RMSEA	SRMR	GFI	AGFI	NNFI	CFI	$\Delta\chi^2$(d.f.)[c]
Discriminant validity tests											
D1	IQ→G	520.40	23	0.000	0.289	0.067	0.691	0.396	0.656	0.780	
D2	IQ→P	542.82	23	0.000	0.290	0.047	0.690	0.394	0.674	0.792	
D3	IQ→M	468.00	16	0.000	0.332	0.033	0.686	0.294	0.625	0.786	
Direct relationship											
Hypothesis 1: N = 260											
1a	I→G	50.89	8	0.000	0.144	0.066	0.939	0.839	0.911	0.953	
1b	I→P	26.88	8	0.001	0.094	0.040	0.968	0.915	0.971	0.985	
1c	I→M	2.57	4	0.633	0.000	0.010	0.996	0.985	1.000	1.000	
Hypothesis 2: N = 260											
2a	Q→G	39.68	8	0.000	0.124	0.053	0.951	0.872	0.933	0.964	
2b	Q→P	21.17	8	0.007	0.078	0.036	0.974	0.933	0.980	0.990	
2c	Q→M	3.99	4	0.410	0.000	0.010	0.994	0.977	1.000	1.000	
Mediation models											
Hypothesis 3a (Q-I-G): N = 260											
3aF	Q→I→G & Q→G	63.72	21	0.000	0.089	0.060	0.948	0.889	0.970	0.982	
3aM	Q→I→G	64.17	22	0.000	0.086	0.060	0.948	0.893	0.972	0.983	
$\Delta\chi^2$(3a)	χ^2(M) − χ^2(F)										0.45(1)
Hypothesis 3b (I-Q-P): N = 270											
3bF	I→Q→P & I→P	44.00	21	0.002	0.064	0.043	0.965	0.925	0.986	0.992	
3bM	I→Q→P	44.01	22	0.004	0.061	0.043	0.965	0.928	0.988	0.992	
$\Delta\chi^2$(3b)	χ^2(M) − χ^2(F)										0.01(1)
Hypothesis 3c (I-Q-M): N = 257											
3cF	I→Q→M & I→M	17.61	14	0.225	0.032	0.030	0.983	0.957	0.997	0.998	
3cM1	I→Q→M	22.76	15	0.102	0.045	0.034	0.978	0.948	0.994	0.997	
3cM2	Q→I→M	23.18	15	0.080	0.046	0.035	0.978	0.947	0.994	0.997	
$\Delta\chi^2$(3c1)	χ^2(M1) − χ^2(F)										5.15(1)*
$\Delta\chi^2$(3c2)	χ^2(M2) − χ^2(F)										5.57(1)*
Hypothesis 4 (G-P-M): N = 386											
4F	G→P→M & G→P	75.15	17	0.000	0.094	0.060	0.953	0.901	0.931	0.958	
4M1	G→P→M	80.05	18	0.000	0.095	0.066	0.951	0.901	0.931	0.956	
4M2	P→G→M	258.02	18	0.000	0.186	0.177	0.856	0.713	0.701	0.808	
$\Delta\chi^2$(4.1)	χ^2(M1) − χ^2(F)										4.90(1)*
$\Delta\chi^2$(4.2)	χ^2(M2) − χ^2(F)										182.87(1)***
IQP model											
Hypothesis 5 (IQP): N = 243											
5F	IQP (full)	174.57	64	0.000	0.084	0.060	0.907	0.847	0.944	0.961	
5M	IQP (mediation)	187.34	68	0.000	0.085	0.072	0.900	0.846	0.945	0.959	
$\Delta\chi^2$(5)	χ^2(M) − χ^2(F)										12.77(4)*

Note: RMSEA, root-mean-square error of approximation; SRMR, standardized root-mean-square residual; GFI, goodness-of-fit index; AGFI, adjusted goodness of fit index; NNFI, non-normed fit index; CFI, comparative fit index; $\Delta\chi^2$, chi-square difference test.
[a] I, latent variable Innovativeness; Q, latent variable Quality of Products or Services; P, latent variable Profitability; G, latent variable Growth; M, latent variable Market Value; IQ, one latent variable by combining Innovativeness and Quality of Products or Services.
[b] p-value of χ^2 goodness-of-fit test statistics
[c] $\Delta\chi^2 = \chi^2$(M) − χ^2(F) = χ^2 (mediation model) − χ^2 (full model)
* $p < 0.05$; *** $p < 0.001$

paths were significant. Thus, we accepted the full model, concluding that innovativeness had a direct relationship with market value, and the mediation effect of quality existed in the relationship between innovativeness and market value.

Mediation model (Hypothesis 4)

To test Hypothesis 4, we estimated structural equation models with the three latent variables Growth, Profitability, and Market Value. As

shown in Table 4, the fit indices for Model 4M1 (mediation model) indicate that this model reached an acceptable level of goodness-of-fit, $\chi^2(18, N = 386) = 80.05$, $p = 0.000$; RMSEA = 0.095; SRMR = 0.066; AGFI = 0.901; NNFI = 0.931; CFI = 0.956. The chi-square difference test ($\Delta\chi^2$) was significant, which indicates that the reduction between Model 4M1 and Model 4F was 4.9, which had $p < 0.05$, evidence of an association between Growth and Market Value. However, the reduction between Model 4M2 and Model 4F was 182.87, which had $p < 0.0001$, extremely strong evidence of an association between Profitability and Market Value. Although the association between Growth and Market Value was significant, the chi-square statistics of Model 4F and Model 4M1 were much closer than those of Model 4F and Model 4M2. Therefore, we accepted the full model, concluding that the mediation effect of profitability existed in the relationship between growth and market value. Based on the results of the chi-square difference test ($\Delta\chi^2$), we conclude that a proper path would be from Growth to Profitability, and then to Market Value.

IQP model (Hypothesis 5)

To examine the IQP model, we tested two models (Model 5F and 5M). As shown at the bottom of Table 4, the test statistics of the full and mediation model are quite similar. The chi-square difference test ($\Delta\chi^2$) was significant, which indicates that the reduction from Model 5M to 5F was significant in the model. Statistically speaking, we accepted Model 5F even though it included insignificant paths. However, based on the parsimonious rule, the goodness-of-fit of Model 5M was as good as Model 5F. Therefore, we finally accepted Model 5M as the final model. Figure 3 displays standardized parameter estimates of the structural equation model and Table 5 summarizes those of the measurement model.

DISCUSSION

With SEM methods, the IQP model connecting five latent variables (Innovativeness, Quality, Growth, Profitability, and Market Value) fitted the empirical data well. The results of Hypothesis 3a showed that the impact of quality on growth was mediated by innovativeness. Quality positively affects growth partly because quality affects innovativeness, which in turn affects growth. Likewise, the results of Hypothesis 3b showed that the impact of innovativeness on profitability was mediated by quality. Innovativeness positively affects profitability partly because innovativeness affects quality, which in turn affects profitability. These findings are somewhat counterintuitive, considering that the correlation coefficient between INNOV and QUAL was on average 0.85, which could lead to an assumption that these two constructs would represent one attribute. In fact, each represents a different attribute with different underlying associations with different measures of firm performance.

The insignificant direct relationship between quality and growth when innovativeness was included in the model (3aF) provides evidence that innovativeness is a perfect mediator. Similarly, the insignificant direct relationship between innovativeness and profitability when quality was included in the model (3bF) provides evidence that quality is a perfect mediator. These two results may explain why the results of previous studies on innovativeness and quality have been inconclusive; most previous studies examined only one or two firm performance measures, and did not examine mediation effects.

The results of Hypothesis 3c showed that innovativeness had not only a direct relationship with quality, but also an indirect relationship with market value that was transmitted through quality. Similarly, the results of Hypothesis 4 showed that growth had not only a direct relationship with market value, but also an indirect relationship with market value that was transmitted through profitability. These two results indicate that innovativeness, quality, growth, and profitability have both direct and indirect relationships with market value. For the firms in our sample, innovativeness and quality are positively related to firm performance. In short, innovativeness is a driver of growth, quality is a driver of profit, and both are drivers of market value.

Combining the findings, it is obvious that companies that can balance innovativeness with quality improvement will create a virtuous circle of growth, profitability, and premium market value. However, our findings also imply that we need to recognize a limitation of innovativeness as a sole driver of profitability and a limitation of quality

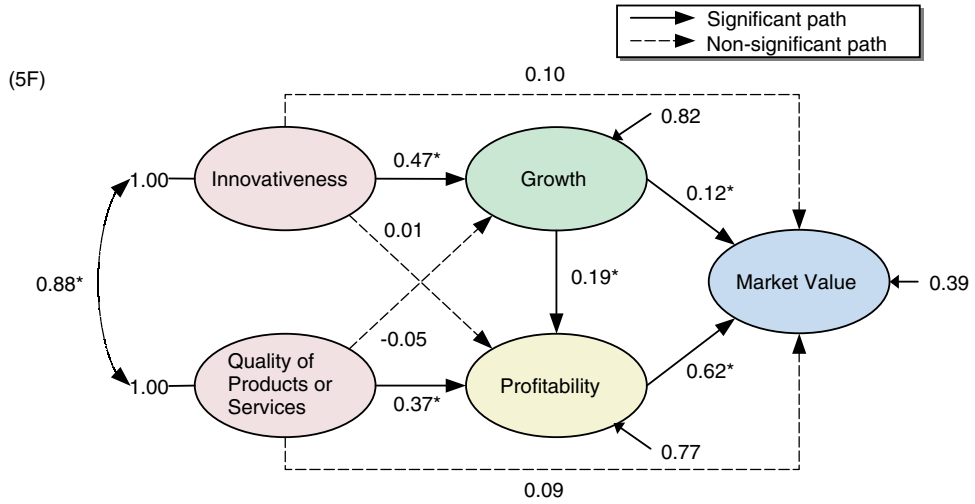

Figure 3. Standardized parameter estimates of the structural equation model (Hypothesis 5): full model (5F) and mediation model (5M). *Note*: Standardized parameter estimates of the measurement model are summarized in Table 5.

Table 5. Standardized parameter estimates of Hypothesis 5 (Figures 2 and 3)

Variables	Parameters	Standardized solution (maximum likelihood)	
		Model 5F (full)	Model 5M (mediation)
Exogenous (independent) variables			
(ξ_1) *Innovativeness*			
→ (X_1) INNOV98: Innovativeness score in 1998	λx_{11}	0.89	0.89
→ (X_2) INNOV99: Innovativeness score in 1999	λx_{21}	0.97	0.97
→ (X_3) INNOV00: Innovativeness score in 2000	λx_{31}	0.84	0.84
(ξ_2) *Quality of Products or Services*			
→ (X_4) QUAL98: Quality of products/services score in 1998	λx_{42}	0.86	0.86
→ (X_5) QUAL99: Quality of products/services score in 1999	λx_{52}	0.97	0.97
→ (X_6) QUAL00: Quality of products/services score in 2000	λx_{62}	0.86	0.86

(*continued overleaf*)

Table 5. (*Continued*).

Variables	Parameters	Standardized solution (maximum likelihood)	
		Model 5F (full)	Model 5M (mediation)
Endogenous (dependent) variables			
(η_1) *Growth*			
→ (Y_1) AT_CAGR: CAGR of total assets from 1998 to 2000	λy_{11}	0.90	0.90
→ (Y_2) REVT_CAGR: CAGR of total revenues from 1998 to 2000	λy_{21}	0.82	0.82
→ (Y_3) MKV_CAGR: CAGR of market cap. from 1998 to 2000	λy_{31}	0.62	0.62
(η_2) *Profitability*			
→ (Y_4) ROA_3YA: 3-year average ROA (1998–2000)	λy_{42}	0.97	0.97
→ (Y_5) ROE_3YA: 3-year average ROE (1998–2000)	λy_{52}	0.66	0.66
→ (Y_6) ROI_3YA: 3-year average ROI (1998–2000)	λy_{62}	0.89	0.89
(η_3) *Market Value*			
→ (Y_7) MB_3YA: 3-year average market-to-book ratio (1998–2000)	λy_{73}	0.77	0.76
→ (Y_8) TQ_3YA: 3-year average Tobin's q (1998–2000)	λy_{83}	0.96	0.98
Relationship between latent variables			
(ξ_1) Innovativeness → (η_1) Growth	γ_{11}	0.47	0.43
(ξ_1) Innovativeness → (η_2) Profitability	γ_{21}	0.01	—
(ξ_1) Innovativeness → (η_3) Market Value	γ_{31}	0.10	—
(ξ_2) Quality → (η_1) Growth	γ_{12}	−0.05	—
(ξ_2) Quality → (η_2) Profitability	γ_{22}	0.37	0.39
(ξ_2) Quality → (η_3) Market Value	γ_{32}	0.09	—
(η_1) Growth → (η_2) Profitability	β_{21}	0.19	0.18
(η_1) Growth → (η_3) Market Value	β_{31}	0.12	0.18
(η_2) Profitability → (η_3) Market Value	β_{32}	0.62	0.68
Variances and covariance			
(η_1) Growth	ψ_{11}	0.82	0.81
(η_2) Profitability	ψ_{22}	0.77	0.77
(η_3) Market Value	ψ_{33}	0.39	0.43
(ξ_1) Innovativeness ↔ (ξ_2) Quality	ϕ_{12}	0.88	0.88
Measurement errors			
(X_1) INNOV98: Innovativeness score in 1998	$\theta^{(\delta)}{}_{11}$	0.21	0.21
(X_2) INNOV99: Innovativeness score in 1999	$\theta^{(\delta)}{}_{22}$	0.06	0.06
(X_3) INNOV00: Innovativeness score in 2000	$\theta^{(\delta)}{}_{33}$	0.29	0.29
(X_4) QUAL98: Quality of products/services score in 1998	$\theta^{(\delta)}{}_{44}$	0.27	0.27
(X_5) QUAL99: Quality of products/services score in 1999	$\theta^{(\delta)}{}_{55}$	0.06	0.06
(X_6) QUAL00: Quality of products/services score in 2000	$\theta^{(\delta)}{}_{66}$	0.26	0.26
(X_7) INNOV98 × QUAL98: Correlated measurement errors in 1998	$\theta^{(\delta)}{}_{14}$	0.20	0.20
(X_8) INNOV99 × QUAL99: Correlated measurement errors in 1999	$\theta^{(\delta)}{}_{25}$	0.05	0.05
(X_9) INNOV00 × QUAL00: Correlated measurement errors in 2000	$\theta^{(\delta)}{}_{36}$	0.24	0.23
(Y_1) AT_CAGR: CAGR of total assets from 1998 to 2000	$\theta^{(\varepsilon)}{}_{11}$	0.20	0.20
(Y_2) REVT_CAGR: CAGR of total revenues from 1998 to 2000	$\theta^{(\varepsilon)}{}_{22}$	0.32	0.33
(Y_3) MKV_CAGR: CAGR of market cap. from 1998 to 2000	$\theta^{(\varepsilon)}{}_{33}$	0.62	0.62
(Y_4) ROA_3YA: 3-year average ROA (1998–2000)	$\theta^{(\varepsilon)}{}_{44}$	0.05	0.05
(Y_5) ROE_3YA: 3-year average ROE (1998–2000)	$\theta^{(\varepsilon)}{}_{55}$	0.56	0.56
(Y_6) ROI_3YA: 3-year average ROI (1998–2000)	$\theta^{(\varepsilon)}{}_{66}$	0.22	0.21
(Y_7) MB_3YA: 3-year average market-to-book ratio (1998–2000)	$\theta^{(\varepsilon)}{}_{77}$	0.40	0.42
(Y_8) TQ_3YA: 3-year average Tobin's q (1998–2000)	$\theta^{(\varepsilon)}{}_{88}$	0.08	0.04
Latent variable errors			
(η_1) Growth	$\theta^{(\zeta)}{}_{11}$	0.82	0.81
(η_2) Profitability	$\theta^{(\zeta)}{}_{22}$	0.77	0.77
(η_3) Market Value	$\theta^{(\zeta)}{}_{33}$	0.39	0.43

as a sole driver of growth. Innovation or innovativeness without a corresponding commitment to superior quality of products or services, which is crucial to increase customer satisfaction and customer loyalty, means that profitability will be limited. Quality without innovativeness, which is

crucial to create new markets or to earn new customers, means that growth will be limited. Since firm profitability was relatively high when both innovativeness and quality were high, companies would be well served if they promoted the development of both sets of intangible resources simultaneously, encouraging both innovativeness and commitment to the quality of products or services. This dual focus may not be easy to achieve, since organizational practices and resources that support innovativeness are not necessarily the same as those that support the quality of products or services. Thus, we conclude that a firm's capability to balance innovativeness with quality is in itself an intangible resource critical for sustaining growth, improving profitability, and creating superior market values. All these elements will contribute to sustainable competitiveness.

Limitations

It would be ideal if we could collect all the data after we had developed the ideas and devised the research design; in reality, however, it is expensive as well as time consuming to collect multiple-year large-scale firm-level data. Although the IQP model fitted our current data well, extreme caution should be taken in generalizing the results of this model to other situations. Thus, this study is more exploratory than confirmatory, because few empirical studies at the firm level have investigated the relationship between innovativeness, quality, growth, profitability, and market value. We hope to see more empirical studies that replicate our findings as well as extend the IQP model. We would like to summarize the limitations of this study.

The first limitation was how well the observed measures (INNOV and QUAL scores) represented the latent constructs (Innovativeness and Quality of Products or Services). Because we depended on simple operational definitions, that is, INNOV and QUAL scores from FRS as indicators of innovativeness and the quality of products or services, we are concerned about a mono-method bias. Although we tried to remedy it by using multiple-year INNOV and QUAL scores, the mono-method bias in questionnaire items (which was beyond our control) still exists. We have claimed that measuring a firm's innovativeness through the INNOV scores and the quality of products or services through the QUAL scores from *Fortune* magazine is one way to measure a firm's innovativeness and quality. We would like to see future studies that cover all breadths and diverse aspects of innovativeness and quality.

The second limitation was that we did not control industry or organizational characteristics of the firm. Because the purpose of this study was to examine overall relationship between innovativeness, quality, growth, profitability, and market value, and our preliminary analysis results from regression models showed that the effect sizes of economic sector on eight financial performance measures were small to medium (Cho and Pucik, 2004), we did not include them in testing structural equation models. However, potential stable characteristics of the company such as industry sector effects or industry life cycles should be systematically examined in the IQP model in the future to build more sophisticated mathematical models.

Since the sample from FRS consisted of the 10 largest companies by revenues within each industry, the data did not represent all the companies in general. Thus, the randomization assumption of the data was violated, lowering the generalizability of the results to different times, different countries, and different firms. In short, a non-random sample lowers the external validity of the findings of this study. Until they are replicated with other data sets with a different methodology, any generalization of the results should be treated with the utmost caution. One way to overcome this limitation is to replicate the results with different samples such as small-sized or foreign companies. Although the mediation model (IQP) is simplistic, it has the potential to be expanded. Because only a few indicators for each of these latent variables were examined, it is necessary to use other indicators and test the IQP model.

CONCLUSIONS

This study contributes to the development of theory and methodology in the strategic management area. It integrates the innovation, quality, organizational learning, and strategy literatures and highlights a critical link between these bodies of research. It was the first effort to develop and examine a structural equation model that connects all factors. The SEM approach to testing the IQP model made it possible to specify the relations of the 14 observed measures to their five derived

underlying concepts, then to specify the causal relations of these five constructs to one another, as posited by various theories or empirical findings.

It suggests a possible way out of the inconsistent results found in previous research on the relationship between innovation, quality, and firm performance. This study shows that quality alone is not sufficient to create high growth, and innovativeness alone is not sufficient to improve profitability. It appears that the impact of quality on growth is in part influenced by innovativeness, and likewise the impact of innovativeness on profitability is in part influenced by quality. The study helps to explain why an overall corporate strategy should balance the twin priorities of innovation and quality. In short, the IQP model demonstrates what needs to be done to gain sustainable competitive advantage. Since neither 'profitability without growth' nor 'growth without profitability' guarantees superior market performance, we believe that the capability to balance innovation with quality is indispensable for companies to sustain profitable growth in a fast-moving global economic environment. Finally, the results support the resource-based view of the firm, as they empirically demonstrate how a firm's intangible resources, in this case its capability to manage both innovativeness and product/service quality, can be the source of value.

We believe that this study may provide new insights on how to evaluate firm performance in terms of a firm's capability to create new knowledge and utilize it. It also shows a possible path to superior market performance and contributes to the development of more robust theories that put a firm's capability to deal with innovativeness and product/service quality at the center of its value creation processes.

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