Does Superior Knowledge Management Increase Shareholder Value?

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ABSTRACT: Accounting systems researchers have long had an interest in "knowledge management" (KM), where KM can be referred to as the processes managers use to create and leverage knowledge within the firm. In addition, the Big 4 are large providers of KM services and managers currently invest tens of billions of dollars annually in KM. However, despite case study and survey evidence that KM improves firm performance, skeptics argue that KM is simply the latest business fad. We are unaware, however, of any systematic evidence that finds KM improves accounting performance or increases shareholder value. We attempt to fill this void by examining the stock market reaction to companies receiving the "Most Admired Knowledge Enterprise" (MAKE) award, which recognizes companies with superior KM. We find that MAKE winners experience positive abnormal returns around the award announcement, and that the magnitude of the abnormal returns is correlated with future operating performance. We also find that MAKE winners report superior operating performance relative to their peers subsequent to the receipt of the award, and that analysts make significant upward revisions to winners' earnings forecasts during the month following the award. In addition, we find that the award winners continue to experience positive abnormal stock returns for several months after receiving the award, consistent with the initial reaction being incomplete. Taken together, our findings are consistent with superior KM increasing shareholder value through improved future operating performance. We contribute to the literature by being the first to identify the existence and valuation implications of KM for shareholders.

Keywords: *knowledge management; knowledge; information systems.*

Data Availability: *data are available from public sources indicated in the text.*

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I. INTRODUCTION

Accounting systems researchers are interested in a broad set of issues related to "knowledge management" (KM) (e.g., Leech and Sutton, 2002; O'Leary, 2002; McCall, Arnold, and Sutton, 2008), and the Big 4 auditing firms are now major providers of KM services (e.g., PwC's Global Best Practices service). In addition, managers' expenditures on KM have grown dramatically in recent years, from $400 million in 1994 to $34 billion in 2007, and are expected to exceed $150 billion in 2012 (GIA, 2008). However, while case study and survey evidence suggests that KM can improve financial performance (e.g., Barclay and Murray, 1997), skeptics argue that KM is simply the latest management fad. We are unaware, however, of any systematic evidence that superior KM improves firm performance or enhances shareholder value. The purpose of this study, therefore, is to test whether KM increases shareholder value by examining the stock market reaction and future performance of companies receiving the "Most Admired Knowledge Enterprise" (MAKE) award.

MAKE awards are granted annually by an international organization of KM professionals to recognize companies that excel in using KM to create organizational wealth (APO, 2007). While KM does not have a single agreed upon definition in the literature, it essentially addresses the comment by Hewlett Packard's Chairman that "I wish we knew what we know at HP" (O'Dell and Grayson, 1998). The notion underlying this quote is that companies contain vast amounts of knowledge that go unused. The objective of KM is to capture, leverage, and reuse this knowledge, as well as create new knowledge. To achieve this, KM activities commonly

include sharing best practices, identifying internal experts, and facilitating the exchange of information among employees (Barclay and Murray, 1997; O'Leary, 2007).

Economic theory arguing that knowledge plays a central role in generating firm value dates back to the first half of the last century (Schumpter, 1934; Hayeck, 1945). More recently, case study and survey evidence across several business disciplines suggests KM improves firm performance (e.g., Nonaka, 1991; O'Leary, 2001; Alavi and Leidner, 2001; Schultz and Jobe, 2001).[1] Despite this theory and evidence, some skeptics argue that KM is simply the latest fad created by management consultants to extract high fees from naïve managers (McCune, 1999; Wah, 1999). We are unaware, however, of research that systematically tests whether superior KM is associated with improved future performance and increased shareholder value. Accordingly, our study examines whether superior KM increases shareholder value, where superior KM is evidenced by the receipt of a MAKE award.

MAKE awards are issued by Teleos, an independent research firm, in conjunction with the KNOW Network, a global organization of KM professionals (APO, 2007). MAKE winners are selected by panels of KM experts using the Delphi research methodology, a process developed by Rand Corporation to improve decision-making by expert groups (Dalkey, 1969).[2] The panelists include KM experts from public and private organizations, as well as executives from global corporations (including Chief Knowledge Officers, Chief Information Officers, and Chief Learning Officers). The panel's objective is to identify firms that excel at transforming enterprise knowledge into superior products and services that increase shareholder wealth, or in

[1] The Appendix discusses an example of successful KM at Siemens Corporation.
[2] Evidence suggests that the Delphi method results in group decisions that are superior to the decisions of the individual members (Dalkey, 1969).

the case of non-public and not-for-profit organizations, increase societal capital. MAKE winners include public, non-public, and not-for-profit organizations.[3]

If managers expect KM to improve performance, they have incentives to independently inform the market of their KM activities. However, not all KM efforts are successful, and when poorly done, KM may actually reduce shareholder value (Malhotra, 2004). This means market participants are likely to find it difficult to predict which firms' KM activities will succeed in creating additional firm value, and which will fail. Because the MAKE awards represent the aggregate wisdom of a group of independent KM experts, they are likely to be more credible than management's self-assertions. If so, we expect the market to react favorably to the announcement of the MAKE awards.

Our first test examines the abnormal stock returns of the MAKE winners during the five-day window surrounding the award announcement date.[4] Because superior KM is expected to result in superior operating performance, and because winning a MAKE is expected to provide new information to the stock market about firms' KM abilities, we expect a positive stock market reaction to the announcement. Our sample consists of all US publicly traded MAKE winners from 2001 through 2008 with available data, comprising 247 MAKE awards issued to 46 distinct firms. Our event study test finds a significantly positive mean abnormal return of 1.25% during the five days surrounding the award announcement date, consistent with the MAKE awards providing new information to the market about firms' superior KM abilities, and with the market expecting superior KM to result in superior operating performance.

[3] Examples of public companies winning a MAKE award include Apple, Caterpillar, Google, Siemens, and 3M. Examples of non-pubic and not-for-profit firms winning a MAKE award include the BBC, the Hong Kong Police Department, the Korean Water Resources Agency, KPMG, and the US Navy.

[4] While firm specific investments in KM are unavailable, our research design (i.e., using MAKE award winners), allows us to identify a set of firms with superior KM.

Our second test analyzes whether the magnitude of the abnormal event returns found in our first test is associated with future operating performance. If the stock market reaction during the announcement window reflects market expectations that superior KM practices result in higher future operating performance, we expect a positive association between the MAKE announcement abnormal returns and future performance. We test this prediction by regressing three future performance measures on the abnormal stock returns around the announcement date. The three performance measures are return-on-assets (ROA), return-on-equity (ROE), and cash flows from operations scaled by total assets (CFO), and are measured over the four quarters following the MAKE award announcement quarter. After controlling for market expectations of future performance, we find a significantly positive association between both of our accounting-based performance measures, ROA and ROE, and the five-day abnormal stock returns. This is consistent with the abnormal returns around the announcement date being a rational response to information about future superior operating performance of firms that excel at KM.

Our third test examines our prediction that MAKE winners outperform their peers. This analysis compares our three performance measures (ROA, ROE, and CFO) during the four quarters following the receipt of the award with matched portfolios of peer firms. After controlling for past performance, we find that the MAKE winners outperform their peers on each performance measure. This finding corroborates our stock market analysis and is consistent with superior KM resulting in superior future operating performance.

Our fourth test analyzes whether equity analysts revise their annual earnings forecasts upward for MAKE winners. Because we expect the MAKE award to provide new information to the market about the winners' future performance, we expect equity analysts to revise their beliefs about the MAKE winners' future performance. We find that during the month following the MAKE award announcement month, the proportion of analysts that revise their earnings-per-

share (EPS) forecasts upward is significantly higher than the proportion of analysts that revise their EPS forecasts downward. We also find that surrounding the award announcement month analysts revise their EPS forecasts for MAKE winners significantly higher than for their peers. These findings lend support to the evidence that the MAKE awards convey new information to the market about the winners' superior KM abilities, which in turn results in higher future performance.

Our final test investigates abnormal stock returns over 12-month periods subsequent to annually rebalanced portfolios constructed on past year MAKE winners. It is only relatively recently that companies have begun to make large investments in KM, and the MAKE awards are relatively new. If the market is still learning about the benefits of KM and the credibility of the awards, the short window returns around the award announcement dates are not expected to fully anticipate winners' superior future performance. We find that abnormal returns are significantly positive over a 12-month period following the portfolio construction date. These findings are consistent with the market still learning that the MAKE awards identify firms that excel at KM and that KM leads to superior future performance.

Taken together, our results provide evidence that MAKE winners experience an increase in shareholder value due to expected superior operating performance. To the extent that the award provides market participants with new information about firms that excel at KM, our results are consistent with superior KM increasing shareholder value. Our results contribute to the case study and survey literature that suggests superior KM practices improve firm performance. Consistent with much of this research, our study is the first to provide systematic evidence that superior KM improves shareholder value. More particularly, we add to the stream of accounting systems research that is interested in KM issues. While this prior literature investigates a wide variety of KM topics, such as how KM impacts decision-making among its

users (e.g., Dowling, Leech, and Moroney, 2008; McCall, Arnold, and Sutton, 2008), we add to this body of research by investigating the valuation implications of KM.[5]

The next section discusses the motivation for the study, and Section III discusses the sample selection. Section IV presents our analysis and results, Section V presents sensitivity analysis, and section VI summarizes our conclusions.

II. MOTIVATION

Economic foundations of knowledge management

Economists have acknowledged the economic importance of knowledge as early as Schumpeter (1934). Schumpeter (1934) observes that the process of combining and creating intellectual capital is the foundation for economic development, and this perspective has become the starting point for a large body of research. The economics literature that addresses knowledge creation and its applications has broadened into a large number of areas since Schumpeter (1934). Hayek (1945) identifies an issue that motivates much of the KM literature when he observes "the knowledge of the circumstances of which we must make use never exists in concentrated or integrated form, but solely as the dispersed bit of incomplete and frequently contradictory knowledge which all the separate individuals possess." This observation has been generalized to the firm-level, where coordinating knowledge that is widely distributed across individuals is a major challenge.

[5] We note that our study complements but is distinct from the research that investigates the valuation implications of information technology (IT), such as enterprise resource planning (ERP) systems (e.g., Hayes, Hunton, and Reck, 2001; Hunton, Lippincott, and Reck, 2003). Systems such as ERP are transaction-based, and while they may facilitate KM activities they are fundamentally different from KM, as widely noted in prior literature (e.g., Borghoff and Pareschi, 1998; McDermott, 1999; Wah, 1999; Gao, Li, and Clarke, 2008). Importantly, KM is not transaction-oriented, focusing instead on issues related to knowledge creation, use, and reuse.

Prior research on knowledge management

KM researchers tend to adopt a knowledge-based perspective of the firm, which originates in the strategic management literature (e.g., Nonaka and Takeuchi, 1995). This perspective argues that firms create value primarily from combining and applying resources through the use of firm-specific knowledge, which are termed knowledge-based assets, and which reside primarily with the firm's employees. Knowledge-based assets are costly to imitate and therefore can provide the firm with a sustainable long-term competitive advantage. This literature also observes that the business environment is characterized by rapid shifts in product markets, high levels of competition, and fast changing technologies (Alavi and Leidner, 2001). Successful companies are able to adapt by creating new products and embracing new technologies. A major implication of these arguments is that all business enterprises are primarily in the business of innovation, and success ultimately lies in a company's ability to manage knowledge.[6] Importantly, this means that a firm's survival does not just depend on its knowledge at a particular point in time, but on its ability to create new knowledge, with this new knowledge fueling innovation (Nonaka, 1991). This view suggests that knowledge is renewable and can be systematically managed within the firm. Issues related to efficiently managing knowledge within the firm are also referenced in the management accounting and decision making literature (e.g., Zimmerman, 2003).[7]

KM research has flourished over the last two decades and permeates a wide variety of academic business disciplines. Using primarily case study and survey methodologies, this research presents anecdotal evidence that KM can significantly improve firm performance. Much

[6] Nonaka (1991) argues that Honda, NEC, and Sharp are examples of such companies.

[7] We also note that the concept of KM is distinct from organization capital. While organization capital refers generally to the assets generated by information within the firm (Prescott and Visscher, 1980), KM refers more specifically to the processes through which organizations generate value from their intellectual and knowledge-based assets. Penman (2009) also notes that "knowledge capital" and "organization capital" are distinct internally generated intangible assets.

of this literature attempts to identify the factors associated with successful KM initiatives (e.g., O'Leary, 2001; Schultz and Jobe, 2001). A KM case study related to Siemens Corp. is summarized in the appendix. This case discusses Siemens Corporation's response to a dramatic increase in global competition and poor financial health in the late 1990's. Among other things, Siemens developed "knowledge communities" that allow globally dispersed business units to share best practices within the organization for solving customer problems. In particular, this system reuses customer solutions across different developing economies, and as these economies develop, it leverages solutions from more developed economies. Siemens management reports this KM system increased 2001 sales by $122 million at a cost of under $8 million.[8]

Within the accounting literature, accounting systems researchers study a broad range of topics related to KM, including how accounting systems can be exploited for use in KM, and how KM potentially impacts decision-making behavior among its users. For example, O'Leary (2002) describes how massive data warehouses created from transaction information generated by ERP systems can be harnessed to generate usable knowledge, using knowledge discovery approaches, and how that knowledge can be effectively managed within the organization. Many new KM systems are specifically designed to facilitate an organization's use and reuse of knowledge. In a behavioral experiment, McCall, Arnold, and Sutton (2008) investigate whether dependency on KM systems adversely impacts KM users' ability to independently acquire and use knowledge. The study compares the problem-solving abilities of KM users with users of traditional reference materials (such as textbooks and manuals). Interestingly, the study finds that KM users with access to their KM systems outperform users of traditional reference materials, but when their KM systems are absent, the users of traditional references materials outperform

[8]Another interesting example of successful KM is the "prediction markets" developed by Google that have been highly accurate in forecasting a variety of company developments, including product launch dates and product success rates (Sunstein, 2006).

the KM users. Thus, this study concludes that KM users exhibit distinctly different knowledge acquisition behaviors compared to users of more traditional reference materials. Dowling, Leech, and Moroney (2008) also use evidence from a laboratory experiment to investigate KM. They examine whether auditors' use of decision support systems impact the auditors' ability to identify business risks within their clients. They find that reliance on decision support systems reduces auditors' ability to recognize the relevant business risks faced by their clients in the absence of the support systems. Thus, the study provides some evidence on the long-term consequences of KM in the context of providing decision support to auditors.

In summary, the prior research in the area of KM is quite diverse and far reaching. We attempt to add to this prior research by investigating the systematic performance and valuation implications of KM, an aspect of KM that has not been previously explored in the literature.

Information conveyed by winning a MAKE award

If firms that excel at KM outperform their peers, managers of those firms have incentives to inform market participants of their superior KM abilities. Indeed, there is ample evidence that managers routinely provide market participants with information about their KM activities.[9] However, while anecdotal evidence suggests that KM helps many firms outperform their peers, evidence also suggests that some firms are unsuccessful in implementing KM systems. For example, in a collection of case studies that attempt to learn why some firms do not benefit from their KM activities, Malhotra (2004) documents several cases of poorly conceived or designed KM systems that do not improve firm performance. If it is difficult for the market to discern, *ex ante*, which firms' KM initiatives are likely to succeed and which are likely to fail, the MAKE award, which summarizes the opinions of KM experts, can help the market identify the firms

[9] For example, companies may include discussion of their knowledge management activities in presentations made to securities analysts (e.g., Carrig, 2005).

most likely to succeed. The MAKE award potentially plays the role of verifying a firm's KM activities are successful in improving firm performance. If so, the market should react positively to the MAKE award announcements.

We note, however, that the stock market does not always react positively to the announcement of companies receiving awards, and that firms that receive awards do not always outperform their peers. Several prior studies examine the stock market reaction to awards such as the Malcolm Baldrige Award and the J. D. Power and Associates Award (e.g., Hendricks and Singhal, 1997; Przasnyski and Tai, 2002; Balasubramanian, Mathur, and Thakur, 2005). The results from this prior literature are mixed, with some studies finding a significant reaction to the awards and other studies not finding a significant reaction to the awards. Not finding a stock market reaction to published news of awards examined in other studies suggests that simply focusing the market's attention on the award winners is not likely to drive our results.[10]

III. SAMPLE SELECTION

The MAKE winners are chosen by expert panels using the Delphi method, a technique developed by the Rand Corporation to obtain consensus decisions from groups of experts (Dalkey, 1969). The panels comprise leading KM experts, Fortune 500 executives and organizational learning experts, from a balanced mix of publicly held, privately held, and not-for-profit organizations (APO, 2007; Chase 2007). There are no more than four panelists from any one organization and the panels range from 750 to 3,000 members. The objective of the Delphi method is to aggregate the divergent beliefs of the individual experts and converge on a

[10] We also note that our study is distinct from the prior literature that examines intangible assets. While research on intangibles focuses primarily on the valuation implications of intangibles such as R&D and brand names, KM is conceptually different from R&D and brand names. Specifically, R&D pertains to a relatively well-defined activity within the firm (i.e., research), and brand name represents a relatively specific aspect of firm value (i.e., branding), while knowledge management relates to a much broader set of activities and aspects of firm value.

collective decision. The selection process consists of three or four rounds of anonymously sharing the experts' views among themselves, where the experts' identities are not revealed to one another. In the first round, each panelist nominates one or more organizations (public, non-public, or not-for-profit) based on eight characteristics that indicate superior KM, along with information to support their nominations.[11] In the second round, the first round choices and supporting explanations are anonymously shared among the panelists and another set of nominations is made. Firms that are short-listed by 10% or more of the panelists are included in the third round and the panelists are asked to formally score each of the third round finalists on a Likert scale from one to ten based on the eight characteristics that indicate superior KM. The scores are equally weighted across the eight characteristics and the firms with the highest scores are selected as the winners.

MAKE winners are announced through emails to the KNOW Network members, followed by the issuance of a public press release. The winners are announced by geographical region periodically throughout the year, with no pre-determined announcement dates.[12] Winners include a variety of organizations, including public corporations, government entities, non-public business enterprises, and not-for-profit organizations. We begin our data collection by searching the Factiva and Lexis-Nexis databases for news announcements of the MAKE winners. This search identifies 425 MAKE winners, with the earliest winners announced during 2001.[13] After excluding MAKE winners that do not have data in the CRSP database (primarily non-listed

[11] The eight criteria are: 1. Creating a knowledge driven enterprise culture; 2. Developing knowledge workers through senior management leadership; 3. Delivering knowledge-based products/services/solutions; 4. Maximizing enterprise intellectual capital; 5. Creating an environment for collaborative knowledge sharing; 6. Creating a learning organization; 7. Creating value based on customer knowledge; 8. Transforming enterprise knowledge into organizational wealth.

[12] MAKE awards are issued by various geographic regions (e.g., North America, Asia, and Europe) as well as an overall global award. Thus, firms may win more than one MAKE award per year if they win an award in their geographic region and a global award.

[13] The KNOW Network website reports that the first MAKE award was announced in 1998, but during our analysis we were only able to identify sporadic news announcements prior to 2001. Thus, we begin our sample with the 2001 awards.

companies such as Ernst & Young and not-for-profit organizations such as NASA), we reduce our sample to 222 observations. We then obtain press release dates directly from Teleos for another 25 publicly traded MAKE winners that we cannot identify in the Factiva and Lexis-Nexis databases.[14] This process results in a final sample of 247 MAKE awards issued to 46 distinct companies from 2001 through 2008.

We obtain stock returns, prices, and shares outstanding data from the Center for Research in Security Prices (CRSP). We obtain analysts' earnings forecasts from the US Institutional Brokers Estimate System (I/B/E/S), Summary History – Summary Statistics (with Actuals) dataset. The accounting data are for all US firms, obtained from the annual and quarterly Compustat North America Merged Fundamentals, XPF Tables, datasets. We use the following accounting data items and variable definitions: Stockholders' Equity (Compustat item SEQQ), Net Income (Compustat item NIQ), Total Assets (Compustat item ATQ), Sales (Compustat item SALEQ), Cash Flows from Operations (Compustat item OANCFY), Book-to-Market (Compustat items SEQQ/(PRCCQ*CSHOQ)), Return on Assets (Compustat items NIQ/ATQ), Cash Flows from Operations over Total Assets (Compustat items OANCFY/ATQ), and Return on Equity (Compustat items NIQ/SEQQ). Our industry classification is based on the 12 industries in Campbell (1996).

Table 1 provides descriptive statistics of the MAKE awards by industry and year. Panel A presents the number of MAKE awards by industry. The Consumer Durables industry has the largest number of MAKEs, with 30%, followed by Services with 27%. The Capital Goods industry has the third largest number of MAKEs, with 21%, and the Petroleum industry has the

[14] Teleos issues a press release publicly announcing the MAKE winners. To establish the validity of the 25 press release dates obtained directly from Teleos, we compare the dates of the MAKE announcements of a sample of 97 Teleos press releases for which we also have news announcements and find that the Teleos dates match the news announcement dates in all but three cases, and in those cases the press release dates are within one day of the news announcement dates.

fourth largest number of MAKEs with 10%. The remaining industries receive 6% or less of the awards.[15] Panel B of Table 1 lists the number and percentage of MAKE winners in our sample by year, and indicates that the number of MAKE winners increases over time.

Table 2 lists descriptive statistics for our distinct MAKE winning firms using data from the Compustat database. We report quarterly statistics on each sample firm based on their average values over the period 2001-2008, equally-weighted by firm and winsorized at the first and ninety-ninth percentile. Table 2 reports that the sample firms tend to be reasonably large, with median assets of over $34 billion and median sales of over $8 billion. Our sample firms are also financially healthy, with median quarterly ROA of 1.9%, median quarterly ROE of 4.7%, and median quarterly CFO of 8.5%.[16]

IV. ANALYSES AND RESULTS

Stock market reaction to winning a MAKE award

Our first analysis tests our prediction that the stock market reacts positively to the announcement of the MAKE winners. As in DeFond, Hann, and Hu (2005), we test our prediction using a standard event-study methodology with cumulative abnormal returns (CAR) computed over a five-day event window, beginning two days before the announcement through two days after the announcement (e.g., Binder, 1998). We employ a five-day window because the MAKE awards are announced to members of the KNOW Network via email one or two days prior to the official press release date, which suggests news of the awards may be leaked prior to

[15] The distribution of distinct firms across industries is Capital Goods (28%), Services (20%), Consumer Durables (13%), Finance/Real Estate (17%), Construction (11%), Basic (4%), Petroleum (2%), Transportation (2%), and Utilities (2%) industries.

[16] Firm-level investments in KM are only sporadically available on a project-by-project basis. The estimates in GIA (2008) are industry-wide and include only sales revenues generated from sales of KM software and KM management services. KM impacts a wide variety of activities across many functional areas and total firm level expenditures are unavailable. Thus, we are unable to systematically examine KM dollar investments at the firm-level.

the official announcement date. In addition, the MAKE awards are relatively new and the benefits of KM may be relatively unclear to market participants, suggesting that market participants may be slow to react to the announcements. Specifically, we compute CAR as follows:

$$CAR_{[-2,+2]} = \sum_{t=-2}^{t=+2} \overline{AR_t} \tag{1}$$

where:

$\overline{AR_t} = \frac{1}{N_t} \sum_{i=1}^{i=N_t} AR_{it}$; $AR_{it} = R_{it} - E(R_{it})$; and t = (–2, –1, 0, +1, +2);
R_{it} is the return of the sample firm i on day t;
E(R_{it}) is the corresponding market return from CRSP on day t.

We report two t-statistics that test the statistical significance of the CAR, one using the time-series mean abnormal returns as in Brown and Warner (1980, 1985), and the other using the calendar-time abnormal returns as in Jaffe (1974) and Mandelker (1974). The t-statistics using the time-series approach are computed as follows:

$$t = \sum_{t=-2}^{t=+2} \overline{AR_t} \Bigg/ \left(\sum_{t=-2}^{t=+2} S^2[\overline{AR_t}] \right)^{1/2} \tag{2}$$

where:

$$S^2[\overline{AR_t}] = \left(\sum_{t=-244}^{t=-6} \left[\overline{AR_t} - \overline{AAR} \right]^2 \right) \Big/ 238 ; \; \overline{AAR} = \sum_{t=-244}^{t=-6} \overline{AR_t} \Big/ 239 .$$

We use 239 days (–244 through –6) in the estimation period to derive the standard deviation and restrict the analysis to firms with at least 120 daily returns in the estimation period. Because a portfolio average abnormal return is used in the calculation of the standard deviation, the test statistic takes into account cross-sectional dependence in the abnormal returns.

To implement the calendar-time test we first sort all firms into portfolios by event calendar date. Next we estimate a portfolio standard deviation from the time series of portfolio

abnormal returns in the estimation period, and use it to standardize the portfolio return. Our calendar-time p-value from this test is based on a cross-sectional t-test of the standardized portfolio abnormal return. We calculate the calendar-time t-statistic as follows:

$$t = CAAR_{[-2,+2]} \Big/ \left(S_{CAAR_{[-2,+2]}} \Big/ \sqrt{N} \right) \tag{3}$$

where:

$$S^2_{CAAR_{[-2,+2]}} = \frac{1}{N-1} \sum_{i=1}^{N} \left[\left(\sum_{t=-2}^{t=+2} \overline{AR_t} \right)_i - \frac{1}{N} \sum_{j=1}^{N} \left(\sum_{t=-2}^{t=+2} \overline{AR_t} \right)_j \right]^2 ; \; CAAR_{[-2,+2]} = \frac{1}{N} \sum_{j=1}^{N} \left(\sum_{t=-2}^{t=+2} \overline{AR_t} \right); \text{ and}$$

i, j are firm indices.

Table 3 reports the results of the stock market reaction analysis. Consistent with our prediction, we find a positive portfolio mean abnormal return for the MAKE winners of 1.25%, which is significant at p = 0.049 using the time-series abnormal return t-statistic from Brown and Warner (1980, 1985), and at p = 0.029 using the calendar-time abnormal return t-statistic from Jaffe (1974) and Mandelker (1974).[17] To assess the economic significance of our findings, we evaluate the impact of the market reaction on firms' equity value. Evaluated at the mean and median market value of equity for our sample firms of $72,066 and $50,191 million (see Table 2), our findings are consistent with an increase in market value of $900.8 and $627.4 million per sample firm, respectively. Overall, our findings are consistent with the MAKE awards providing new information about which firms excel at KM, and with market participants expecting firms that excel at KM to exhibit superior future operating performance.

The association between the market reaction and future performance

Our second analysis tests our prediction that the abnormal returns around the MAKE award announcements are associated with superior future performance. We assess future

[17] P-values of 5% or less are considered statistically significant, and all significance levels are one-tailed where we have predictions and two-tailed otherwise.

performance using three performance measures: ROA, ROE, and CFO. Each measure is averaged over the four quarters following the quarter in which the MAKE award is received, with data obtained from the Compustat Quarterly database. We use the average of all available quarters for firms with less than four quarters of available data following the receipt of the award. We then regress each of the future performance measures on the cumulative abnormal stock returns during the five days surrounding the announcement of the award, using two models as follows:

$$\textit{Model 1: } FuturePerformance_{if} = \alpha + \beta_1 CAR_{it} + \varepsilon_{if} \quad (4)$$

$$\textit{Model 2: } FuturePerformance_{if} = \alpha + \beta_1 CAR_{it} + \beta_2 ExpectedPerformance_{if} + \varepsilon_{if}$$

where:

CAR_{it} = Cumulative abnormal return for firm i over period t, which equals the five days surrounding the award announcement day (day –2 through day +2).

$FuturePerformance_{if}$ = ROA, ROE, or CFO, for firm i, over future period f. Period f refers to the average of the four quarters following the quarter in which the MAKE award is received.

$ExpectedPerformance_{if}$ = Analyst expectations of future ROA, ROE or CFO, for firm i over future period f.

We include expected future performance in our second model as a control for market expectations of future performance at the time the awards are announced. Thus, Model 2 tests whether the MAKE awards reflect information about future performance that is incremental to the market's expectations immediately prior to the award announcement. We conservatively choose a one-year time horizon to capture future performance. A one-year horizon is also consistent with prior accounting and finance studies that examine future performance in similar settings (e.g., Sloan, 1996). While KM may impact more than one year's future performance, it should impact at least one year. We operationalize expected future ROA and ROE as the I/B/E/S consensus annual earnings per share forecast divided by four (because our dependent variable is average quarterly performance), scaled by total assets per share and by stockholders' equity per

share, respectively. We operationalize expected future CFO as the I/B/E/S consensus analyst forecast of annual cash flows from operations per share divided by four (because our dependent variable is average quarterly performance), scaled by total assets per share. We measure total assets and stockholders' equity during the quarter in which the MAKE award is announced or, in the case of missing data, the quarter with data immediately before the MAKE winning quarter. To mitigate the effects of outliers, we winsorize the expected and future performance variables at the first and ninety-ninth percentile. Also, we cluster the regression residuals by firm and year to control for potential cross-sectional and time-series correlation (Petersen, 2008; Gow, Ormazabal, and Taylor, 2010). A significantly positive coefficient on β_1 is consistent with our expectation that the event period abnormal returns are associated with higher future performance.

Table 4 presents the results of estimating the two models for the three performance measures. The number of observations in this analysis drops to 202 (from the 247 in our event study test) for Model 1 primarily because the 37 MAKE winners in 2008 (see Table 1, Panel B) received their awards in October and November 2008, and we lack future performance variables for these observations. Because analyst forecast data are not available in I/B/E/S for all 202 observations, there is a slight loss of observations for estimating Model 2 (195 for ROA and ROE, and 170 for CFO). Consistent with our prediction, Table 4, Panel B, reports that for Model 1 the coefficient on CAR is significantly positive at p = 0.026 or less for all three future performance measures. That is, all three regressions find a significantly positive association between future operating performance for the MAKE winners and abnormal stock returns around the announcement of the MAKE awards. Table 4, Panel B, also reports that for Model 2 the coefficient on CAR is significantly positive for future ROA (p = 0.009) and ROE (p = 0.001), but not for CFO (p = 0.378).

Taken together, our findings in Table 4 corroborate the findings in our first analysis by providing evidence that the positive stock market reaction to the MAKE award announcements is due to the market's expectation that the award winners will exhibit better-than-expected future performance. Because we expect the MAKE awards to identify firms with superior KM abilities, this is consistent with the market expecting firms that excel at KM to exhibit superior operating performance.

Future performance of award winners compared to their peers

Because the MAKE awards are expected to identify firms with superior KM abilities, we expect the MAKE winners to outperform their peers, on average, subsequent to the receipt of the award. We investigate this by comparing the MAKE winners' performance with the performance of two sets of peer firms. The first set of peers contains all of the other firms in the MAKE winners' industry during the quarter in which the MAKE is awarded. The second set of peers is more closely matched, consisting of the portfolios of all of the firms that are in both the same industry and one percentile of total assets as the MAKE winners during the winning quarter. We compare the performance of the winning and peer firms based on the three performance measures we use in Table 4 (ROA, ROE, and CFO). Because the first peer group is matched only on industry, we compare the MAKE winners with this group by estimating the following regression model that adds control variables capturing past performance, total assets, and the book-to-market ratio:

$$FuturePerformance_{it} = \alpha + \beta_1 Winner_{it} + \beta_2 PastPerformance_{it} + \beta_3 Assets_{it} + \beta_4 BTM_{it} + \varepsilon_{it} \quad (5)$$

where:

$FuturePerformance_{it}$ = ROA, ROE, and CFO, for firm *i* over period *t*, which equals the average of the four quarters following the quarter in which the MAKE award is received. Where four quarters are not available we use all available quarters.

$Winner_{it}$ = An indicator variable indicating the observation is a MAKE winner.

$PastPerformance_{it}$ = ROA, ROE, and CFO, for firm *i* over period *t*, averaged over the four quarters prior to the quarter in which the MAKE is awarded. Where four quarters are not available we use all available quarters.

$Assets_{it}$ = Total Assets of firm *i* over period *t*, measured during the quarter in which the MAKE is awarded. When quarterly Compustat data is missing, we use the most recent quarterly or annual data prior to the quarter in which the MAKE is awarded.

BTM_{it} = Book-to-Market ratio of firm *i* over period *t*, measured during the quarter in which the MAKE is awarded. When quarterly Compustat data is missing, we use the most recent quarterly or annual data prior to the quarter in which the MAKE is awarded.

We cluster the regression residuals by firm and year to control for potential correlations among the error terms. We include control variables for past performance, size, and the book-to-market ratio because these variables are potentially related to future operating performance. For the regression model in Equation (5), and the related univariate analysis described below, we winsorize the continuous variables at the first and ninety-ninth percentile. A significantly positive coefficient on the indicator variable capturing MAKE winners is consistent with the winning firms outperforming the matched peer firms over the quarters following the announcement of the MAKE award.[18]

Table 5 presents the results of this analysis, where we analyze the same 202 MAKE winning observations we use in Model 1 of Table 4. Panel A presents descriptive statistics for the 202 MAKE winning observations used in the analysis, Panel B presents descriptive statistics for the 51,030 peer firms matched on industry alone, and Panel C presents descriptive statistics for the 202 peer firm portfolios matched on industry and same percentile of total assets. All descriptive statistics are based on quarterly data. Panel A indicates that mean future ROA, ROE, and CFO is 2.9%, 6.2%, and 10.1%, respectively, for the 202 MAKE winning observations.

[18] A potential alternative approach to this test is to employ propensity score matching methodology to indentify a finer control sample. Since the true propensity score function in our case is unknown, implementing propensity score matching requires an estimate of this function (Rosenbaum and Rubin, 1983). This is typically accomplished using a logit model where the independent variables are grounded in theory. Although the eight criteria KNOW Network members use when selecting firms with superior KM potentially provide such theory, reasonable proxies for the criteria are unavailable. Matching on a propensity score estimated using independent variables not driven by theory often yields inappropriate matches.

Panel B indicates that the peer firms matched on industry alone are smaller and perform more poorly, on average, when compared to the MAKE winners. In addition, the book-to-market ratios of the peer firms tend to be larger than for the MAKE winners. Panel C indicates that the peer firms matched on industry and size yields a significantly closer match to the MAKE winners in Panel A. In particular, these matched firms are larger and more profitable than the peers matched on industry alone.

Panel D of Table 5 presents the regression analysis comparing the MAKE winners with the peer sample matched only on industry. The results reveal a positive coefficient on the indicator variable capturing MAKE winners in all three regressions, with a significance of $p < 0.001$. Thus, we find that when compared to the peers in their industry, the MAKE winners report significantly higher future performance, after adding past performance, size, and the book-to-market ratio as control variables. Panel E presents a univariate analysis of the peer group matched on industry and size. This analysis indicates that mean and median performance, across all three performance measures, is significantly higher among the MAKE winners than among the peer firms. Thus, the analysis in Table 5 is consistent with the MAKE awards identifying firms that outperform their peers subsequent to receiving the MAKE award. This is consistent with firms that excel at KM outperforming their peers.

Analyst earnings forecast revisions following award announcements

Equity analysts are financial intermediaries that are potentially interested in the valuation implications of the MAKE awards. Thus, in addition to investigating the stock market's reaction to the announcement of the MAKE awards, we also investigate the reaction of equity analysts. We predict that equity analysts make upward revisions to their annual earnings forecasts for the MAKE award winners during the month following the announcements. Finding that analysts

make upward revisions to their forecasts in response to the awards is consistent with the awards providing analysts with new information about the award winners' expected future performance.

We perform two analyses to test the reactions of analysts. Our first analysis tests whether the average number of upward earnings forecast revisions is larger than the average number of downward earnings forecast revisions for the MAKE winners during the month following the announcement of the award. If the MAKE awards provide new information about improved future performance, we expect to find significantly more upward revisions than downward revisions. Using the I/B/E/S database we compute the total number of upward and downward revisions for all observations with available data, divided by the number of MAKEs with available data. Specifically, we calculate the following two ratios, where time *t* is the award month:

$$\begin{aligned} Measure\ 1 &= \frac{Number\ of\ Upward\ Revisions_{t+1}}{Number\ of\ Awards} \\ Measure\ 2 &= \frac{Number\ of\ Downward\ Revisions_{t+1}}{Number\ of\ Awards} \end{aligned} \tag{6}$$

Table 6, Panel A, reports the results of this test. This analysis restricts our sample to observations with consensus forecasts in the I/B/E/S database during the month after the award month, which reduces our sample to 190 observations. Panel A indicates that an average of 3.04 analysts per MAKE winner revise upwards (Measure 1), and an average of 1.90 analysts per MAKE winner revise downwards (Measure 2), and that the average number of upward revisions is significantly greater than the average number of downward revisions at p = 0.009. Thus, we find that the average number of upward forecast revisions is larger than the average number of downward forecast revisions for the MAKE award winners during the month following the announcement of the award.

Our second test investigates analyst EPS forecast revisions of MAKE firms relative to a control sample. We first match each MAKE award observation with a matched portfolio of firms in the same industry, year, quarter, and percentile of total assets, where each portfolio contains an average of 6.4 matched peer firms. Next we calculate the revisions in analyst consensus EPS forecasts over the period month +1 relative to month –1 (–1, +1), where the award month is defined as month 0. We scale the analyst EPS forecast revisions by the analyst consensus EPS forecast from the first month of each period and winsorize at the first and ninety-ninth percentile for both the MAKE firms and the peer portfolios. We then compute the mean and median of the scaled revisions, and conduct a two-sample t-test and a two-sample Wilcoxon z-test to compare the means and medians, respectively, between the MAKE firms and the matched control portfolios.

Table 6, Panel B, reports the results of this test. The sample size for the test period is constrained by the availability of I/B/E/S data for both the treatment firm and the matched portfolios, and requires forecasts for both the month before and the month following the announcement. Thus, the sample size is reduced to 159 award observations.[19] The first row reports the mean and median revision for the award firm observations and indicates that both the mean and the median are significantly positive, with values of 0.033 (p = 0.024) and 0.004 (p = 0.001), respectively. The next row reports the mean and median revision for the control matched portfolios and indicates they are both insignificant at conventional levels. The last row in Panel B reports the differences in the mean and median revisions between the award firm observations and the matched portfolios. This analysis finds that the mean and median MAKE firms' revisions are significantly higher than the matched portfolios' revisions, with values of 0.033 (p = 0.035)

[19] Note that the forecasted annual earnings during the month prior to the award announcement month must also be for the same year as the forecast during the month subsequent to the award announcement month. This restriction results in dropping seven observations.

and 0.013 (p = 0.021), respectively. Thus, Panel B indicates that equity analysts make significantly larger upward revisions to MAKE winners than to their peers during the months immediately surrounding the award announcement month.

In summary, for MAKE winners during the month following the award announcement the average number of upward analyst forecast revisions is larger than the average number of downward revisions; and analyst EPS forecast revisions for MAKE winners are significantly higher than for their peers. Taken together, these findings present evidence that the MAKE awards communicate information to equity analysts indicating the winners will exhibit higher future performance than previously anticipated. Because we expect the MAKE awards to identify firms with superior KM abilities, this is consistent with equity analysts expecting firms that excel at KM to exhibit superior operating performance.

Subsequent abnormal stock returns of award winners

It is only recently that companies have begun to make large investments in KM, and the MAKE awards are relatively new. Therefore, the market may still be learning about the benefits of KM and the credibility of the MAKE awards. If so, the market may not impound all of the value relevant information about the award winners around the announcement date. If so, and if the MAKE winners outperform their peers, we expect abnormally high stock returns for the MAKE winners to persist subsequent to the announcement of the awards, as the market learns of their superior performance. Thus, our final analysis examines the risk-adjusted one-year-ahead returns of the MAKE winners.

We examine the subsequent stock market performance of the MAKE winners using an asset pricing test that examines the Fama-French intercepts (alphas) from a monthly time-series model of MAKE portfolios (e.g., Fama and French, 1993; Barth, Konchitchki, and Landsman,

2010). Specifically, we form portfolios on July 1st of each year, where each portfolio consists of all MAKE winners during the preceding twelve months. Figure 1 presents a timeline for the construction of our portfolios relative to the announcement of the MAKE winners. We then calculate the portfolio average return in excess of the risk-free rate for each month during the subsequent twelve months, and regress these monthly portfolio returns on the three Fama-French factors, excess return on the market (MKT), small-minus-big (SMB), high-minus-low (HML), and a momentum factor (MOM). Specifically, we estimate the following model:

$$(Ret - R_f)_{pm} = \alpha_p + \beta_1 MKT + \beta_2 SMB + \beta_3 HML + \beta_4 MOM + \varepsilon_{pm} \quad (7)$$

where:

$(Ret - R_f)_{pm}$ = Month *m* equally-weighted return in excess of the one month Treasury Bill, R_f, to portfolio *p* formed each July 1st and includes all MAKE winners in our sample during the preceding 12 months.

MKT= the monthly return on the stock market minus the return on the one month Treasury Bill.

SMB and *HML* = the respective monthly return to the size (Small-Minus-Big) and book-to-market (High-Minus-Low) factor mimicking portfolios as described in Fama and French (1993).

MOM = the monthly return to the momentum factor mimicking portfolio (Jegadeesh and Titman, 1993; Carhart, 1997).

A significantly positive intercept in this regression indicates the MAKE winners report abnormal stock returns over the year following the MAKE awards portfolio formation date.

Table 7 presents the results of this analysis. The sample size is 90 observations, corresponding to the number of months in the analysis (6 months of returns for 2001, and 12 months of returns for 2002-2008). We find that the coefficient on the intercept is significantly positive, with a value of 0.9% ($p = 0.005$). This finding indicates that MAKE winners continue to experience abnormal stock returns, on average, during the year following the MAKE awards portfolio formation date. This finding is consistent with market participants not fully impounding the information about the awards around the award announcement date.

V. SENSITIVITY TESTS

Alternative analysis of abnormal short window returns

We repeat the analysis in Table 3 using firm-level instead of portfolio-level returns. In untabulated tests we continue to find significantly positive abnormal returns during the short window centered on the MAKE announcement day. Thus, our interpretation from our analysis in Table 3 remains unchanged using this alternative measure of returns.

We also investigate the robustness of our inferences to the choice of the statistical tests we use to examine the stock market reaction in Table 3. Specifically, instead of the time-series and calendar-time t-tests we use to calculate the p-values, we use the standardized abnormal return Z-test following Patell (1976), which estimates a separate standard error for each security-event and assumes cross-sectional independence. In addition, we use a nonparametric generalized sign test that, instead of assuming a probability for a positive abnormal return of half, adjusts for the fraction of positive versus negative abnormal returns in the estimation period. In untabulated analysis we continue to find a significantly positive stock market reaction to the MAKE award. Thus, our inferences in Table 3 remain unchanged using these two alternative tests.

Alternative analysis of future performance

Table 5, Panel E, reports an analysis using a univariate test. We test the robustness of this analysis by using a regression specification as in Table 5, Panel D. Specifically, we regress future performance for our sample of MAKE winners and peer firm portfolios (matched on industry and same percentile of total assets), on an indicator variable for MAKE winners, past performance, total assets, and the book-to-market ratio. In untabulated analysis we find a

significantly positive coefficient on the MAKE winner indicator variable. Thus, our inferences in Table 5, Panel E, remain unchanged using a multivariate analysis.

We also test the sensitivity of our results in Table 5, Panel D, and the alternative regression specification of Table 5, Panel E (described above), to the inclusion of past performance by repeating the regression analyses after omitting the past performance variable. In untabulated results we find that the coefficient on the indicator variable for MAKE winners remains significantly positive in both specifications. Thus, our inferences regarding the multivariate analysis of Table 5, Panels D and E, are unchanged when we drop past performance from the analysis.

Alternative specification for future returns

We repeat our future return tests in Table 7 using the Fama-French three-factor model (i.e. after dropping the momentum factor). In untabulated analysis we find that the coefficient on the intercept remains significantly positive. Thus, our interpretation from our analysis in Table 7 remains unchanged with this alternative specification.

Analysis of winners with more than one award

Because it is possible to win a MAKE award more than once, we investigate whether the market continues to react positively to firms that have previously won an award. We partition our sample into first-time winners (46) and non-first-time winners (201), and calculate portfolio-level CARs over the five-day window surrounding the award announcement. We find that the market reaction for the 201 non-first-time winners is significantly positive (0.89%), but significantly smaller (at p=0.01) than the market reaction for the first-time winners (1.56%). This indicates that the market reacts positively to non-first-time winners, although not as strongly as to first-time winners. There are several reasons why the market reacts positively to firms that

have previously won an award. Winning multiple MAKE awards may indicate that the winning firm is continuing to make new investments in KM initiatives and that management is excelling at implementing these new initiatives. If the benefits from the new KM initiatives are incremental to the benefits from the prior KM initiatives, the market is expected to react favorably to multiple winners. In addition, over the period of our analysis the market is likely to still be learning that KM improves performance, and that the MAKE selection process reliably identifies firms that excel at KM. This is consistent with our analysis that finds that the winners continue to experience positive abnormal returns during the year following the award. This suggests that the market may not fully impound the benefits of superior KM performance during the initial winning of the award, but that subsequent wins reinforce the market's confidence that management indeed excels at KM. Finally, because KM is relatively new, it is likely to be improving over the period of our analysis, such that the benefits from KM, and the competition to win a MAKE award, are increasing over time. If so, the benefits from KM activities are likely to be relatively greater for the firms that win the award a subsequent time.

Potential effects of the post-earnings-announcement drift

Prior research documents that post earnings announcement returns are positively associated with announcement returns for extreme portfolios constructed on the magnitude of the announcement surprise (e.g., Ball and Brown, 1968; Bernard and Thomas, 1989, 1990). Because our sample firms are relatively healthy and may perform well, we examine whether the abnormal event returns surrounding the MAKE award date are a potential manifestation of the post-earnings-announcement drift. To test this, we repeat the analysis in Table 3 using seven days prior to the MAKE award as our event date. We find a negative portfolio mean abnormal return of –0.36% with $p = 0.347$ using the Brown and Warner (1980, 1985)'s time-series t-statistic and

p = 0.425 using the calendar-time t-statistic from Jaffe (1974) and Mandelker (1974). This analysis suggests that the abnormal returns we observe in Table 3 are not from confounding post-earnings-announcement returns.

VI. SUMMARY AND CONCLUSIONS

While literature across several business disciplines presents case study and survey evidence that firms with superior KM abilities outperform their peers, we are aware of no prior research that systematically links KM with firm performance and shareholder value. We fill this void by examining the share price reaction to the announcement of MAKE awards that recognize firms that exhibit superior KM. We find that during the five days surrounding the award announcement, MAKE winners experience 1.25% abnormal stock returns, and that these returns are positively associated with MAKE winners' subsequent operating performance. We also find that equity analysts are relatively more likely to make significant upward revisions to MAKE winners' earnings forecasts during the month following the award, and that MAKE winners surpass their peers in terms of both operating performance and stock price performance during the year subsequent to winning the award. Overall, our findings are consistent with superior KM improving shareholder wealth through superior future operating performance.

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TABLE 1
MAKE Award Distribution by Year and Industry

This table reports the number of MAKE awards awarded between 2001 and 2008 by industry (Panel A) and by year (Panel B) for firms with available CRSP data. Industries are based on the 12 Campbell (1996) industry classifications.

Panel A: MAKE Awards by Industry

Industry	N	%
Consumer Durables	75	30
Services	66	27
Capital Goods	52	21
Petroleum	24	10
Basic	16	6
Construction	7	3
Finance/Real Estate	5	2
Transportation	1	<1
Utilities	1	<1
Total	247	100

Panel B: MAKE Awards by Year

Year	N	%
2001	12	5
2002	9	4
2003	22	9
2004	41	13
2005	41	17
2006	47	19
2007	38	15
2008	37	15
Total	247	100

TABLE 2
Descriptive Statistics

Descriptive statistics for distinct MAKE award winning firms with available Compustat data. Statistics are quarterly average values for each of the 46 distinct MAKE firms over the period 2001-2008, equally-weighted by firm in millions of dollars. Variable definitions: Stockholders' Equity (Compustat item SEQQ), Net Income (Compustat item NIQ), Total Assets (Compustat item ATQ), Sales (Compustat item SALEQ), Cash Flows from Operations (Compustat item OANCFY), Book-to-Market (Compustat items SEQQ/(PRCCQ*CSHOQ)), Return on Assets (Compustat items NIQ/ATQ), Cash Flows from Operations over Total Assets (Compustat items OANCFY/ATQ), and Return on Equity (Compustat items NIQ/SEQQ).

	Mean	Median	Standard Deviation	25th Percentile	75th Percentile
Stockholders' Equity ($MM)	24,032	16,620	25,769	5,650	33,066
Net Income ($MM)	1,080	706	1,117	229	1,361
Total Assets ($MM)	121,925	34,396	271,851	14,367	95,482
Sales ($MM)	15,613	8,574	17,553	3,890	22,958
Cash Flows from Operations ($MM)	4,830	2,706	7,207	882	5,995
Market Value of Equity ($MM)	72,066	50,191	71,853	21,214	85,663
Book-to-Market	0.379	0.291	0.245	0.215	0.494
Return on Assets	0.024	0.019	0.020	0.009	0.038
Cash Flows from Operations/Assets	0.092	0.085	0.054	0.050	0.130
Return on Equity	0.065	0.047	0.084	0.028	0.075

TABLE 3
Market Reaction to Announcement for 247 MAKE Award Winners

This table reports abnormal return around the announcement of news for firms that excel at KM. Portfolio abnormal returns are the five-day cumulative abnormal returns surrounding the announcement day for 247 MAKE award winners using standard event study methodology (Binder, 1998). The CARs are computed as follows:

$CAR_{[-2,+2]} = \sum_{t=-2}^{t=+2} \overline{AR_t}$, where: $\overline{AR_t} = \frac{1}{N_t} \sum_{i=1}^{i=N_t} AR_{it}$; $AR_{it} = R_{it} - E(R_{it})$; and t = (–2, –1,0,+1,+2); R_{it} is the return of the sample firm i on day t; and E(R_{it}) is the corresponding market return from CRSP on day t.

P-values are based on t-statistics computed using the time-series mean abnormal returns as in Brown and Warner (1980, 1985), and the calendar-time abnormal returns as in Jaffe (1974) and Mandelker (1974). We calculate the time-series t-statistic as follows:

$t = \sum_{t=-2}^{t=+2} \overline{AR_t} \Big/ \left(\sum_{t=-2}^{t=+2} S^2[\overline{AR_t}] \right)^{1/2}$, where: $S^2[\overline{AR_t}] = \left(\sum_{t=-244}^{t=-6} \left[\overline{AR_t} - \overline{AAR} \right]^2 \right) \Big/ 238$; $\overline{AAR} = \sum_{t=-244}^{t=-6} \overline{AR_t} \Big/ 239$.

We calculate the calendar-time t-statistic as follows:

$t = CAAR_{[-2,+2]} \Big/ \left(S_{CAAR_{[-2,+2]}} \Big/ \sqrt{N} \right)$, where: $S^2_{CAAR_{[-2,+2]}} = \frac{1}{N-1} \sum_{i=1}^{N} \left[\left(\sum_{t=-2}^{t=+2} \overline{AR_t} \right)_i - \frac{1}{N} \sum_{j=1}^{N} \left(\sum_{t=-2}^{t=+2} \overline{AR_t} \right)_j \right]^2$;

$CAAR_{[-2,+2]} = \frac{1}{N} \sum_{j=1}^{N} \left(\sum_{t=-2}^{t=+2} \overline{AR_t} \right)$; and i, j are firm indices.

Portfolio-Level Abnormal Returns	1.25%
p-value (time-series)	(0.049)
p-value (calendar-time)	(0.029)

TABLE 4
Relation Between Future Performance and Abnormal Returns around the MAKE Announcement

Panel A reports descriptive statistics for the future performance of MAKE winning firms over the average of the four quarters following the quarter in which the MAKE is awarded and the expected future performance of MAKE winning firms as of the day the MAKE award is announced. Panel B reports results from estimating a model of $FuturePerformance_{if}$, defined as ROA, ROE, and CFO for firm *i* over future period *f*, regressed on firm-level cumulative abnormal return, CAR, during the five days surrounding the MAKE award announcement (-2,+2). Period *f* refers to the average of the future four quarters following the quarter in which the MAKE award is received. When less than four quarters of data are available, we use all available quarters. CAR is computed as follows:

$CAR_{[-2,+2]} = \sum_{t=-2}^{t=+2} \overline{AR_t}$, where: $\overline{AR_t} = \frac{1}{N_t} \sum_{i=1}^{i=N_t} AR_{it}$; $AR_{it} = R_{it} - E(R_{it})$; and t = (–2, –1,0,+1,+2); R_{it} is the return of the sample firm *i* on day *t*; and $E(R_{it})$ is the corresponding market return from CRSP on day *t*. The expected performance variable, $ExpectedPerformance_{if}$, is expected ROA, ROE, and CFO for firm *i* over future period *f*, calculated as the I/B/E/S consensus analyst annual earnings per share forecast divided by four (because our dependent variable is average quarterly performance), scaled by total assets per share or by stockholders' equity per share for expected ROA or expected ROE, respectively. Expected CFO is the I/B/E/S consensus analyst forecast of annual cash flows from operations per share divided by four (because our dependent variable is average quarterly performance), scaled by total assets per share. Total assets and stockholders' equity are measured during the quarter in which the MAKE award is announced or, in the case of missing data, the quarter with data immediately before the MAKE winning quarter. P-values are in parentheses. Regression residuals are clustered by firm and year to control for potential cross-sectional and time-series correlation.

$$\textbf{Model 1: } FuturePerformance_{if} = \alpha + \beta_1 CAR_{it} + \varepsilon_{if}$$

$$\textbf{Model 2: } FuturePerformance_{if} = \alpha + \beta_1 CAR_{it} + \beta_2 ExpectedPerformance_{if} + \varepsilon_{if}$$

Panel A: Descriptive Statistics

	Mean	Median	Standard Deviation	25th Percentile	75th Percentile	N
Future Return on Assets	0.029	0.025	0.024	0.011	0.044	202
Future Return on Equity	0.062	0.056	0.046	0.034	0.086	202
Future Cash Flows from Operations over Assets	0.101	0.097	0.057	0.061	0.138	202
Expected Return on Assets	0.025	0.020	0.017	0.012	0.039	195
Expected Return on Equity	0.056	0.046	0.041	0.029	0.071	195
Expected Cash Flows from Operations over Assets	0.034	0.031	0.019	0.018	0.046	170

Panel B: Regression of Future Performance on Abnormal Returns around the MAKE Award Announcement Date

	Predicted Sign	Dependent Variable					
		Future Return on Assets		Future Return on Equity		Future Cash Flows from Operations over Assets	
		Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
α		0.029 (<0.001)	0.004 (0.042)	0.062 (<0.001)	0.013 (0.001)	0.101 (<0.001)	0.042 (<0.001)
CAR	+	0.108 (0.004)	0.069 (0.009)	0.169 (0.026)	0.151 (0.001)	0.211 (0.013)	0.031 (0.378)
Expected Performance	+		1.034 (<0.001)		0.873 (<0.001)		1.809 (<0.001)
N		202	195	202	195	202	170
Adj. R^2		0.030	0.561	0.020	0.625	0.021	0.392

TABLE 5
Future Performance Tests

This table reports results from four-quarters-ahead performance of MAKE winners compared to two matched samples: one based on industry only and the second based on industry and same percentile of total assets, both measured during the MAKE winning quarter. Panel A presents descriptive statistics of variables included in the analysis for the 202 MAKE winners with available Compustat data during the MAKE winning quarter. Panel B presents descriptive statistics for 51,030 MAKE peer firms matched on industry only. Panel C presents descriptive statistics for 202 MAKE peer portfolios matched on industry and same percentile of total assets. Panel D reports results from comparing future performance of the MAKE winners with that of the MAKE peer firms matched on industry only. This analysis regresses *FuturePerformance* on an indicator variable (*Winner*) which is equal to 1 when the observation is a MAKE winner and zero otherwise, and control variables for past performance (*PastPerformance*), total assets (*Assets*), measured in billions of dollars, and the book-to-market (*BTM*) ratio. *FuturePerformance* is ROA, ROE, and CFO averaged over the four quarters subsequent to the winning quarter, and *PastPerformance* is the related performance measure averaged over the four quarters prior to the quarter in which a MAKE is awarded. When less than four quarters of data are available, we use all available quarters. P-values are in parentheses. Regression residuals are clustered by firm and year to control for potential cross-sectional and time-series correlation. Panel E reports results from comparing future performance of the MAKE winners with the MAKE peer firms matched on industry and same percentile of total assets. This analysis performs a univariate comparison of ROA, ROE, and CFO across the two samples. P-values are in parentheses.

Panel A: MAKE winners (N = 202)

	Mean	Median	Std Dev	25th Percentile	75th Percentile
Future Return on Assets	0.029	0.025	0.024	0.011	0.044
Future Return on Equity	0.062	0.056	0.046	0.034	0.086
Future Cash Flows from Operations over Assets	0.101	0.097	0.057	0.061	0.138
Past Return on Assets	0.029	0.022	0.023	0.011	0.043
Past Return on Equity	0.059	0.053	0.043	0.036	0.080
Past Cash Flows from Operations over Assets	0.102	0.099	0.056	0.060	0.138
Total Assets	113,442	48,516	239,654	14,746	98,008
Book-to-Market	0.311	0.244	0.199	0.143	0.479

Panel B: MAKE Peer Firms Matched on Industry Only (N = 51,030 peer firms)

	Mean	Median	Std Dev	25th Percentile	75th Percentile
Future Return on Assets	–0.025	0.004	0.094	–0.028	0.018
Future Return on Equity	–0.100	0.011	0.424	–0.053	0.035
Future Cash Flows from Operations over Assets	–0.015	0.022	0.163	–0.032	0.065
Past Return on Assets	–0.024	0.003	0.091	–0.029	0.018
Past Return on Equity	–0.057	0.011	0.253	–0.052	0.035
Past Cash Flows from Operations over Assets	–0.013	0.021	0.149	–0.034	0.064
Total Assets	3,776	145	40,713	31	752
Book-to-Market	0.595	0.455	0.552	0.263	0.734

TABLE 5
Continued

Panel C: MAKE Peer Firms Matched on Industry and Asset Percentile (N = 202 peer portfolios)

	Mean	Median	Std Dev	25th Percentile	75th Percentile
Future Return on Assets	0.015	0.014	0.011	0.008	0.020
Future Return on Equity	0.031	0.037	0.040	0.019	0.049
Future Cash Flows from Operations over Assets	0.065	0.062	0.027	0.049	0.077
Total Assets	95,152	39,363	173,375	13,489	129,801
Book-to-Market	0.816	0.443	2.061	0.352	0.578

Panel D: Regression of Future Performance for MAKE winners (N = 202) and MAKE Peer Firms Matched on Industry Only (N = 51,030 peer firms)

$$\boldsymbol{FuturePerformance}_{it} = \alpha + \beta_1 \boldsymbol{Winner} + \beta_2 \boldsymbol{PastPerformance}_{it} + \beta_3 \boldsymbol{Assets}_{it} + \beta_4 \boldsymbol{BTM} + \varepsilon_{it}$$

	Dependent Variable		
	Future Return on Assets	Future Return on Equity	Future Cash Flows from Operations over Assets
α	–0.006 (<0.001)	–0.059 (<0.001)	–0.004 (<0.001)
Winner	0.015 (<0.001)	0.066 (<0.001)	0.020 (<0.001)
PastPerformance	0.678 (<0.001)	0.723 (<0.001)	0.814 (<0.001)
Assets	2.010E–05 (<0.001)	1.134E–04 (<0.001)	1.430E–05 (<0.001)
BTM	–5.205E–03 (<0.001)	3.663E–04 (0.936)	–7.786E–04 (0.502)
N	51,232	51,232	51,232
Adj. R^2	0.432	0.187	0.561

Panel E: Univariate Analysis of Future Performance MAKE Winners (N =202) Compared with MAKE Peer Firms Matched on Industry and Percentile of Total Assets (N = 202)

	Knowledge Management Firms		Knowledge Management Peer Portfolios		Difference in Means	Wilcoxon Sign Ranked Test
FuturePerformance	mean	median	mean	median	p-value	p-value
Future Return on Assets	0.029	0.025	0.015	0.014	(<0.001)	(<0.001)
Future Return on Equity	0.062	0.056	0.031	0.037	(<0.001)	(<0.001)
Future Cash Flows from Operations over Assets	0.101	0.097	0.065	0.062	(<0.001)	(<0.001)

TABLE 6
Analyst Forecast Revisions Following MAKE award

This table reports results from analyses of analyst forecasts. Panel A reports the average of each firm's proportion of revising analysts who revise their annual EPS forecast upward during month *t+1*. Panel B reports a comparison in the change of the mean consensus annual EPS forecast from month *t*–1 to month *t*+1 between MAKE winning firms and a control group of peer firms matched on same industry, year, quarter, and one percentile of total assets.

Panel A: The Direction of Analyst Forecast Revisions (N =190)

$$\textbf{Measure 1} = \frac{\textbf{Number of Upward Revisions}_{t+1}}{\textbf{Number of Awards}}$$

$$\textbf{Measure 2} = \frac{\textbf{Number of Downward Revisions}_{t+1}}{\textbf{Number of Awards}}$$

Mean number of analysts per MAKE winner that revise upward (Measure 1)	3.037
Mean number of analysts per MAKE winner that revise downward (Measure 2)	1.900
P-value for difference in means	(0.009)

Panel B: Comparison of the Magnitude of Analyst Forecast Revisions Surrounding the Award Month for MAKE Winners versus a Control Sample of Matched Peer Firms (N = 159)

	Mean	P-value from a two-sample t-test for comparison of means	Median	P-value from a two-sample Wilcoxon z-test for comparison of medians
Test Sample: MAKE Winners	0.033	(0.024)	0.004	(<0.001)
Control Sample: Matched Peers	<0.001	(0.472)	0.000	(0.918)
Difference (Test – Control)	0.033	(0.035)	0.013	(0.021)

TABLE 7
Future Abnormal Returns for Portfolios Constructed on MAKE Winners

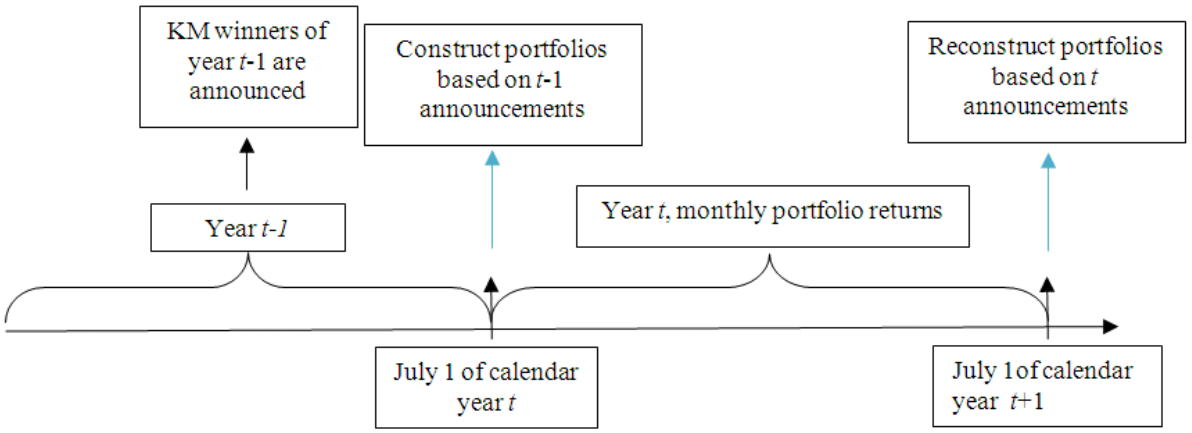
This table reports results from estimating future abnormal returns for portfolios constructed on MAKE winners during 2001-2008. Portfolios are constructed on July 1st of each year, and include all MAKE winners during the preceding 12 months. Monthly return data are obtained from CRSP, and portfolio monthly returns are calculated each month as the equally-weighted monthly returns for all firms in the portfolio. Portfolios are rebalanced every year, and portfolio monthly returns in excess of the monthly risk-free rate, $(Ret - R_f)_{pm}$, are regressed on the four Fama-French and Momentum factors: Excess Return on the Market (MKT), Small-Minus-Big Return (SMB), High-Minus-Low Return (HML), and Momentum (MOM). The monthly risk-free rate is the return on the one month Treasury Bill.

$$(Ret - R_f)_{pm} = \alpha_p + \beta_1 MKT + \beta_2 SMB + \beta_3 HML + \beta_4 MOM + \varepsilon_{pm}$$

Variable	Coefficient	t-statistic	p-value
α	0.009	2.870	0.005
MKT	1.292	14.880	(<0.001)
SMB	0.012	0.100	0.921
HML	–0.663	–4.830	(<0.001)
MOM	0.007	0.090	0.926
N	90		
Adj. R^2	0.813		

FIGURE 1
Timeline for Test of Future Risk-Adjusted Returns for Portfolios Constructed on MAKE Winners

The figure plots the timeline for the analysis of one-year ahead abnormal returns for portfolios constructed on MAKE winners. The first portfolio, constructed on July 1, 2001, includes all firms that receive a MAKE award during the prior 6 months. Portfolios are reconstructed on July 1 of each year *t* based on KM award winners during the prior 12 months. Our sample includes the monthly observations from July 2001 through December 2008 (N = 90). Each firm's monthly returns are obtained from the CRSP Monthly Stock File, and the monthly portfolio returns are obtained by averaging all firms' returns in each month during the test period. The monthly portfolio returns are regressed on the four Fama-French and Momentum factors: excess return on the market (MKT), Small-Minus-Big Return (SMB), High-Minus-Low Return (HML), and Momentum Factor (MOM).



APPENDIX

Siemens ShareNet

In the late 1990's Siemens began implementing knowledge management as a means of responding to increasing competition and deregulation.[20] Siemens had recognized that so-called "knowledge islands" had developed within their organization based on organizational and hierarchical barriers; business, process, project, and functional barriers; and local time, culture, and language barriers. As a result, Siemens had "poor reuse" of solutions generated for customers and there was "limited" best practice sharing in sales. In order to mitigate these limitations, Siemens took the approach of generating support for "knowledge communities" that cut across and integrated those many knowledge islands. In addition, they set out to capture and disseminate their best practices across Siemens world-wide organization.

The core idea was that knowledge management initially would focus on sales and marketing. Siemens saw that countries in similar stages of economic development and regulatory environments would have similar needs. They also noted that as markets developed, solutions could be leveraged from more economically developed countries to developing countries. As a result, they developed Sharenet, a system that allowed users to enter best practices in the form of "solutions objects" and "environmental objects." In addition, the system permitted "urgent requests" that allowed sales people to ask other sales people if they had a solution for a specific problem. For example, ShareNet is credited with dramatically reducing Siemens' costs of laying an underground communications cable in the Amazon jungle. Using ShareNet, Siemens' South American unit was able to discover what Siemens' African unit had learned a few years earlier while laying a similar cable in the jungles of Senegal.

[20] See, for example, Nielsen and Ciabuschi (2003).

The resulting system allowed Siemens to address questions such as “What sales deals have we lost or won recently?” “Why and how did we win them?” and “Who in Siemens is the expert on a specific topic?” Ultimately, in the fiscal year 2000-2001, the system resulted in an incremental $122 million in revenue at a system cost of $7.8 million.