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Does measuring intangibles for management purposes improve performance? A review of the evidence

Christopher D. Ittner*

Abstract—Despite the development of dozens of frameworks and techniques for measuring intangible assets, an open question is whether the internal measurement of intangible assets for management purposes is associated with higher economic performance. This paper provides an overview of the statistical evidence on the performance consequences of intangible asset measurement. Although the bulk of these studies provide at least some evidence that intangible asset measurement is associated with higher performance, many are limited by over-reliance on perceptual satisfaction or outcome variables, inadequate controls for contingency factors, simple variables for capturing complex measurement practices, and the lack of data on implementation practices. I conclude by offering suggestions for improving and extending studies on the performance consequences of intangible asset measurement.

Key words: intangible assets; intellectual capital; non-financial performance measures; balanced scorecard; performance evaluation.

1. Introduction

The belief that intangible assets have become key drivers of economic performance has prompted a growing number of firms to emphasise intangible asset measures for internal decision-making and control purposes. At the same time, an increasing number of measurement frameworks such as the Balanced Scorecard (Kaplan and Norton, 1996), Performance Prism (Neely et al., 2002), and Intangible Assets Monitor (Sveiby, 1997), among many others, have been developed by academics and consultants to guide these measurement efforts. A key question is whether greater measurement of intangible assets for management purposes actually improves economic performance, and whether any performance benefits are contingent on the firm's organisational environment and specific measurement practices.

This paper provides a broad overview of statistical evidence on the links between the internal measurement of intangible assets (typically using non-financial indicators) and economic performance, with particular emphasis on studies examining actual economic results rather than survey respondents' self-assessments of measurement system satisfaction or organisational performance. This evidence takes two general forms: (1) large-sample, cross-sectional studies investigating

whether firms making greater use of intangible asset measures for decision-making or compensation purposes are associated with higher accounting performance and stock returns; and (2) quasi-experimental, company-level analyses examining whether accounting performance improved after the adoption of measurement systems with greater emphasis on intangible assets. Consistent with Franco and Bourne's (2004) review of the performance measurement literature, the evidence indicates that the strength of the statistical relations between intangible asset measurement and organisational performance declines as the sophistication of the analysis increases. The majority of cross-sectional studies support the hypothesis that greater use of intangible asset measures for internal purposes is positively associated with organisational performance, with stronger results using self-reported performance rather than actual accounting or stock market returns. These studies also suggest that the performance benefits from intangible asset measurement are contingent on the extent to which the measures and their relative importance are appropriate for the organisation's chosen strategy, value drivers, and competitive environment. Quasi-experimental analyses of performance effects in individual companies, on the other hand, provide mixed evidence on the benefits from intangible asset measurement, with some finding positive relations and some finding no relation between intangible asset measurement and economic performance.

The mixed evidence in company-specific, quasi-experimental studies is consistent with research indicating that many individual firms find it difficult

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to link improvements in their intangible asset measures to financial gains (e.g. Ittner and Larcker, 2003, 2005). Research suggests that these difficulties may have more to do with implementation problems than with the lack of benefits from intangible asset measurement. Studies find that technical and organisational barriers prevent many firms from identifying appropriate measures or assessing the economic benefits from intangible asset measurement. I therefore review the factors found to hinder the ability of firms to achieve or assess the economic benefits from improvements in intangible asset measures.

The remainder of the paper is organised as follows. The next section provides a brief discussion of the reasons for measuring intangible assets, followed by a review of studies on the economic benefits from the internal measurement of these assets. As part of this review, I examine studies on the influence of 'causal business models' or 'strategy maps' on the benefits from intangible asset measurement. A growing number of commentators argue that causal models or strategy maps are critical components of effective performance measurement systems (e.g. Kaplan and Norton, 2004; Ittner and Larcker, 2003; Marr et al., 2004). I then review studies on the technical and organisational barriers that can prevent firms from achieving economic benefits from intangible asset measurement. The final section offers my conclusions and some suggestions for future research.

2. The internal measurement of intangible assets

Intangible assets represent expenditures on and development of non-physical assets that are drivers of future economic performance and firm value. Andriessen's (2004a) review of the performance measurement literature identifies seven primary reasons for internal measurement of intangible assets: (1) focusing attention ('what gets measured gets managed'); (2) improving the management of intangible resources; (3) creating resource-based strategies; (4) monitoring effects from actions; (5) translating business strategy into action; (6) weighing possible courses of action; and (7) enhancing the management of the business as a whole.

A wide variety of techniques have been developed to measure intangible assets and achieve these objectives. Andriessen (2004b), for example, identifies more than 30 related measurement techniques in the performance measurement literature, divided into those focused on the financial valuation of intangible assets and those focused on non-financial indicators of intangible asset development.

Despite surveys finding widespread international adoption of various intangible asset measurement techniques, research on the benefits of these

techniques is limited. The majority of published papers are normative and provide little or no evidence on the benefits of these techniques. Much of the limited research on performance effects is conducted by consulting firms and/or is based on survey respondents' perceptions of the benefits their organisations have received from intangible asset measurement. As a result, the intangible asset measurement literature has been criticised for being overly focused on developing new techniques rather than on assessing the techniques' impact. Given this criticism, I attempt to synthesise the results from existing performance tests, to identify limitations in this research, and to offer suggestions for future research.

3. Studies on the economic benefits from intangible asset measurement

3.1. Cross-sectional studies using perceived performance outcomes

One method for assessing the performance effects from intangible asset measurement is conducting a cross-sectional study that examines whether firms making greater or more appropriate use of intangible asset measures or measurement techniques such as the Balanced Scorecard achieve higher performance. A key research design issue is deciding how to evaluate the importance placed on intangible asset measures (Ittner et al., 2003). One approach is to assess the diversity in the types of performance measures used by the organisation, under the assumption that greater measurement diversity ensures that important information on the wide variety of intangible assets that are present in most companies is not ignored.

A second approach examines the weight placed on traditional financial measures relative to the weight on non-traditional measures in areas such as customers, employees, innovation, and quality. The assumption underlying this approach is that over-reliance on traditional financial measures leads firms to become myopic and to under-emphasise development of critical intangible assets.

A more sophisticated approach attempts to assess the 'match' or 'fit' between the firm's sources of competitive advantage and its reliance on intangible asset measures. Following agency and contingency theories on the choice of performance measures (e.g. Brickley et al., 1997; Fisher, 1995), this approach assumes that intangible asset measures are not equally beneficial in all settings, and that the emphasis placed on these measures should vary with the importance of intangible assets to firm success.

A final approach examines whether specific measurement techniques, particularly the Balanced Scorecard, are associated with higher performance. In this approach, researchers assess either the

extent to which survey respondents claim to use measures related to the four Balanced Scorecard perspectives (even though Kaplan and Norton (1996) state that a Balanced Scorecard consists of more than measurement in these four perspectives), or the extent to which respondents claim to use a Balanced Scorecard (based on a simple yes/no response or a scale such as 'not at all' to 'extensive use'), with little attention paid to the particular measures or methods (such as the development of 'strategy maps') used when implementing the technique.

A second major research design issue is whether performance outcomes are assessed using managers' perceptions of measurement system or organisational success, or using actual economic results. Most studies using perceptual outcomes find significant positive associations between self-reported intangible asset measurement and perceived performance. For example, Lingle and Schiemann (1996) report that firms claiming to make regular use of a diverse set of measures and having management agreement over strategic success factors achieve statistically higher self-reported industry standing, financial performance relative to competitors, and progress in managing change efforts. Likewise, Hoque and James (2000) find a significant positive association between perceived organisational performance and the use of a diverse set of measures related to the four Balanced Scorecard categories. Hall (2008), in turn, analyses the factors mediating the relation between comprehensive performance measurement systems and managers' self-reports of their own performance (rather than that of their organisations), and concludes that the effect of comprehensive measurement systems on a manager's rating of his or her performance arises from increased role clarity and psychological empowerment.

Similarly, studies on the Balanced Scorecard frequently examine whether scorecard systems are related to measurement system satisfaction (e.g. Banker et al., 2001; Chenhall and Langfield-Smith, 1998; Kaplan and Norton, 2001; Rigby, 2001; Sandt et al., 2001). These studies typically find greater satisfaction with or higher perceived performance from Balanced Scorecards than from other measurement practices.

Other studies examine whether perceived performance is associated with the 'match' or 'fit' between the importance of intangible assets to the firm's competitive success and the organisation's reliance on intangible asset measures. Abernethy and Guthrie (1994), Chong and Chong (1997), and Bouwens and Abernethy (2000), among others, support the hypothesis that diverse measurement systems have a stronger positive association with self-reported performance in firms following

innovation- or differentiation-oriented strategies (which are likely to be related to the importance of intangible assets) than in other firms. Olson and Slater (2002) and Hoque (2005) also find perceived overall performance relative to competitors positively associated with the extent to which the organisation matches its use of measures in the four Balanced Scorecard categories to its strategy and competitive environment. These studies support the hypothesis that intangible asset measures are not equally beneficial in all settings. Instead, these measures appear to be more effective when intangible assets are more important drivers of long-term economic success.

Although most studies using perceptual outcome measures find significant positive associations with intangible asset measurement, a smaller subset finds mixed results. In a more sophisticated cross-sectional study, Widener (2006) develops a structural equations model linking the importance of human, structural, and physical capital to self-reported financial performance through the types of performance measures employed. She finds only partial support for her hypothesis that various performance measurement practices mediate the associations between intangible assets and perceived financial performance. In particular, Widener finds that human and structural capital have direct effects on financial performance in non-manufacturing firms, as well as indirect effects through the use of employee and operational measures. In manufacturing firms, human capital has no significant effect on firm performance, structural capital has direct and indirect effects (through employee measures), and physical capital only has an indirect association with performance through the use of employee measures (even though employee capital has no significant effect). Van der Stede et al. (2006) report that firms following quality-oriented strategies use more objective and subjective performance measures than other firms, but that only subjective measures increase perceived performance in quality-oriented firms. Hyvonen's (2007) results indicate that the use of 'contemporary' performance measures (i.e. non-financial measures, qualitative measures, Balanced Scorecards, and customer surveys) leads to higher perceived customer-related performance in firms that do not follow a customer-focused strategy, but not in those following a customer-focused strategy, contradicting theories that intangible asset measurement systems are more effective when intangible assets (such as the customer asset examined in Hyvonen's study) are more important to organisational success.

Although studies using perceptual outcome measures provide preliminary evidence on the benefits from intangible asset measurement and useful insights into some of the factors influencing

its effectiveness, they suffer from three limitations that are unique to this research design. First, the same respondent typically answers questions on both the performance measurement system and organisational outcomes. This can lead to 'common method bias' (Podsakoff et al., 2003), with the strong positive associations driven by the tendency of respondents to answer all questions in a survey in a similar manner (e.g. all high or all low) or the possibility that perceptions about one set of questions (such as performance) bias responses to another (such as performance measurement practices).

Second, the perceptual outcome scales often leave considerable room for interpretation. For example, surveys commonly ask respondents to rate performance relative to competitors or internal expectations on a scale from 1 = 'significantly below' to 5 = 'significantly above'. However, differences in the choice of competitive peers, internal targets, or the interpretation of 'significant' can lead to substantially different responses. In addition, the outcome measures often relate to unspecified 'overall' performance or are based on self-reported performance on multiple financial and non-financial dimensions (with the measures equally-weighted or weighted based on the performance dimensions' perceived importance). For example, Hoque and James (2000) measure performance (ranging from 1 = 'below average' to 5 = 'above average') using equally-weighted responses to survey questions on the organisation's performance on both financial (return on investment (ROI) and return on sales (ROS)) and non-financial dimensions (capacity utilisation, customer satisfaction, and quality). But these three non-financial dimensions may not reflect the intangibles measures used by the organisation (in fact, only customer satisfaction performance is directly related to the four categories of scorecard measures examined in their study) and equal weighting may not reflect their actual (or even perceived) importance to economic value improvement.

Moreover, research indicates that improvements in non-financial performance dimensions do not always translate into improved economic results (e.g. Ittner and Larcker, 2005). The lack of significant economic gains from improvements in intangible asset measures can occur for a variety of reasons, such as an ineffective strategy, poor measures, inappropriate improvement targets, gaming of measures and targets, and organisational barriers that prevent improvements from reaching the bottom-line. As a result, a positive association between intangible asset measurement and perceived improvements in intangible performance dimensions does not necessarily imply improved economic performance.

3.2. Cross-sectional studies using actual economic outcomes

An alternative cross-sectional research design links intangible asset measurement to actual accounting performance or stock returns. Studies using actual economic results are far fewer in number than studies using perceptual outcome measures. Similar to Hyvonen's (2007) results using perceived performance, Ittner and Larcker's (1995) investigation of quality-oriented measurement practices in automobile and computer firms finds that greater reliance on non-traditional measurement techniques (i.e. 'bottom-up' data gathering, non-financial and team-based rewards, and frequent reporting of quality information) is positively associated with return on assets (ROA) in organisations making less extensive use of formal quality improvement practices, but finds no significant association in organisations with extensive quality management programmes. The evidence in the Ittner and Larcker (1995) and Hyvonen (2007) studies suggests that alternatives to formal intangible asset measurement may be available for providing the information and incentives needed to support well-developed customer- and quality-oriented strategies.

In a related study, Ittner and Larcker (1997a) find that quality-based rewards have a significant positive association with ROS (but not ROA) in the computer industry, but have no significant effect on accounting performance in the automobile industry. Taken together, the results in these studies provide only mixed support for claims that intangible asset measurement improves performance.

Said et al. (2003) provide stronger evidence that the use of intangible asset measures in reward systems is associated with higher economic performance. Their study uses proxy statement disclosures by US firms to investigate whether the use of or weight on non-financial measures in CEO bonus contracts is related to firm performance. They find that firms using both financial and non-financial measures in bonus contracts, and those placing greater weight on non-financial measures, have significantly higher current and future stock market returns, as well as higher future ROA. Moreover, their results again indicate that the performance effects from non-financial measures are contingent on the extent to which the emphasis placed on these measures is appropriate for the firm's operational and competitive characteristics. If too much or too little emphasis is placed on intangible asset measures given the firm's characteristics and strategic objectives, economic performance is lower.

The significant contemporaneous relations with stock returns but not accounting returns in the Said et al. (2003) study may indicate that the market an-

anticipates future operating improvements from intangible asset measurement, and impounds this expectation into current stock price. Ittner et al. (2003) find similar differential effects when accounting or stock returns serve as their outcome variables. Using a sample of US financial services firms, they examine the cross-sectional associations between several publicly-available economic measures (ROA, sales growth, one-year stock returns, and three-year stock returns) and survey-based responses on performance measurement practices. Unlike most studies, their survey instrument incorporates a wide variety of performance measurement uses (problem identification and action plan development, capital investment evaluation, managerial performance evaluation, and external disclosure) and ten specific categories of tangible and intangible 'value driver' measures, rather than a general variable reflecting the relative importance of financial and non-financial measures. They find that firms using a diverse set of measures have higher stock returns, particularly when measurement diversity is greater than that of firms with similar strategies or value drivers. ROA, on the other hand, is not statistically associated with intangible asset measurement practices, even in the subsample of firms with more mature measurement systems. Although Balanced Scorecard users report higher satisfaction with their measurement systems, ROA in scorecard users is statistically *lower* and stock returns are not statistically different than non-users, providing no support for the claimed economic benefits from Balanced Scorecard implementations.

One explanation for the lower ROA in the self-proclaimed scorecard adopters examined by Ittner et al. (2003) is that underperforming firms are more likely to adopt measurement innovations such as the Balanced Scorecard in the hopes of improving performance, and that these adopters' systems were not in place long enough at the time of the study to yield economic results. However, additional analysis does not support this conjecture. Ittner et al. (2003) find that Balanced Scorecard users reporting no significant changes in their measurement systems in the past two years do *not* have significantly higher economic performance *or* satisfaction, suggesting that even the higher satisfaction from scorecard systems may be short-lived.

Braam and Nijssen's (2004) examination of Balanced Scorecard practices in Dutch firms also finds higher perceived performance but lower accounting performance when Balanced Scorecard usage is greater. In particular, firms with 'measurement-focused' scorecard use (defined as intensive use of a comprehensive measurement system) report statistically lower change in ROI and no significant difference in perceived company per-

formance, while those with 'strategy-focused' scorecard usage (defined as the interaction between an innovation-oriented strategy and the use of a measurement-focused scorecard) report higher perceived performance but *no* significant difference in accounting return changes. Like Ittner et al.'s (2003) results, this evidence raises questions regarding the validity of studies using perceptual outcome measures such as satisfaction or perceived performance.

In sum, cross-sectional studies using actual economic outcomes provide some evidence that intangible asset measurement is associated with higher performance, though the results tend to be weaker than those using perceptual outcome variables (particularly with respect to Balanced Scorecard usage). Consistent with agency and contingency theories, cross-sectional studies using both perceptual and actual outcome measures generally find that performance is enhanced when the emphasis on intangible asset measures is aligned with the organisation's sources of competitive advantage. Thus, it is unlikely that intangible asset measures are equally valuable in all settings, and may actually be detrimental in some circumstances.

While generally supporting the claim that intangible asset measurement can be beneficial, the results in all large sample, cross-sectional studies must be approached with caution. One difficulty is accurately assessing complex performance measurement practices using a survey instrument and a single respondent per firm, the dominant source of data in these studies. For example, measurement choices include not only the specific types of measures and their relative importance, but also the specific techniques used to measure these attributes (e.g. financial or non-financial measures; survey responses, counts, percentages, or time-based measures; quantitative or qualitative measures; relative or absolute measures, etc.) and the performance targets set for the measures. Compensation plans (the most frequently examined measurement use) also have many important attributes other than the measures in the plan (such as the amount of pay at risk and the presence of performance hurdles or payout caps) that are likely to influence their performance effects. In some cases, it is hard to even specify the specific attributes that distinguish a given measurement framework or technique. For example, what exactly constitutes a 'Balanced Scorecard', and how can a researcher determine whether a company is using one or not? Ittner et al. (2003), for example, find that financial services firms that claim to use a scorecard do not place statistically greater emphasis on non-financial measures and are no more likely to have developed a 'strategy map' (which Kaplan and Norton (1996) argue is a fundamental element of a Balanced Scorecard) than those that

do not claim to use a scorecard. Without more extensive details on firms' measurement systems, it is hard to conclude that the use of intangibles measures, rather than other related measurement or incentive system attributes, drives any observed performance effects.

Difficulties assessing measurement practices using a survey are compounded by the fact that many survey-based studies do not specify the specific decision context the measures are used for (e.g. capital investment, business performance evaluation, problem-solving, or rewards), making it difficult to determine whether respondents considered the same contexts when giving their answers. This can be a significant problem since theoretical studies indicate that the optimal use of a specific performance measure for one purpose need not be optimal for another.

Even when more targeted survey questions are used, the ambiguity may not be resolved. Consider a question on the organisations' use of intangible asset measures for evaluating managerial performance. Does greater use of intangibles measures for managerial performance evaluation refer to termination decisions, salary increases, bonuses, promotions, or some mix of the four? Campbell's (2008) study of a US fast food chain, for example, finds managers' bonuses more strongly associated with financial measures, but promotions more strongly associated with non-financial measures that may be better indicators of success in subsequent positions. His results suggest that even a question on the use of different measures for managerial performance evaluation may yield different answers depending upon the specific context considered by the survey respondent.

A second limitation is the potential lag between measurement system implementation and any resulting performance effects. One of the primary reasons for measuring intangible assets is capturing information on key drivers of long-term performance that is not captured in current accounting measures. However, researchers (and companies) rarely know how long it takes (or is expected to take) before changes in intangible asset measures yield economic results, making it difficult to specify the appropriate lag in empirical models. HassabElnaby et al.'s (2005) examination of compensation contracts for US executives also finds that many firms abandon the use of non-financial measures within one to two years, which may not be long enough to motivate managers to optimally choose the long-term investment level in intangible assets. If intangible asset measures are *leading* indicators of firm performance, the implementation of intangible asset measurement systems may have little short-term effect on performance. Although Said et al. (2003) examine both current and future performance and Ittner et al. (2003)

provide evidence on the performance effects of more mature systems that have not been changed significantly in the past two years, none of the preceding studies gathers data on when the systems or measures were actually implemented.

A bigger concern is causality. Even though a significant positive statistical association is found between intangible asset measures and performance, it may simply reflect correlation rather than causation. As noted earlier, the choice of performance measures is only one of many elements in performance measurement systems, and it is possible that these other elements, rather than the specific performance measures, drive any performance differences. Similarly, performance measurement systems are often implemented together with other organisational innovations, strategic changes, or reorganisations which, if not controlled for in the statistical model (as many studies do not do), can lead to erroneous inferences. More broadly, performance measurement systems are endogenous choices that numerous studies have found to be associated with factors such as industry, strategy, performance improvement techniques, regulation, and interdependencies (e.g. Banker et al., 1993; Bushman et al., 1996; Ittner et al., 1997). If the predictor variables are endogenous choices and their determinants are not included in the statistical model, the variables will be correlated with the true (but unobserved) error term in the statistical model. As a result, regression parameter estimates will be inconsistent because of correlated omitted variable problems. Though some of the preceding studies make attempts to account for these issues, causality and endogeneity remain serious concerns that future studies must make greater effort to address.

3.3. *Quasi-experimental, company-specific studies*

A small subset of researchers have traded off the enhanced generalisability of large sample, cross-sectional studies for the greater research control available in quasi-experimental studies using company-specific time series data. In these studies, performance is compared before and after the implementation of the intangible asset measurement system, with a sample of non-adopters used to further control for time series trends and other common factors that potentially influence performance in all of the units but are unrelated to the new systems (Cook and Campbell, 1979). Banker et al. (2000), for example, examine the implementation of an incentive system containing non-financial measures in a US hotel chain. In addition to controlling for a number of location-specific demographic factors that are likely to influence hotel performance, the authors use franchisees of the hotel chain (which did not implement the new system) to control for other factors that may impact

on all members of the chain (e.g. advertising campaigns or economic changes). They find statistically significant improvements in both customer satisfaction and financial performance in adopters of the new system, with their many controls providing greater confidence that the gains were driven by the new incentive system.

Davis and Albright (2004) use a similar research design to investigate whether branches of a Canadian bank that implemented a Balanced Scorecard achieved higher financial performance than branches in the same bank that did not implement such a system, with the adopters and non-adopters representing distinct geographic regions. Although financial performance was similar in the two sets of branches prior to the scorecard implementation, the adopters achieved significantly higher financial performance after implementing scorecards. Surprisingly, the performance gains were achieved within *one month* of the scorecard implementation date and did not increase further in subsequent months – surprising because the non-financial measures in Balanced Scorecards are claimed to overcome the overly short-term focus of financial measures in traditional performance measurement systems. If improvements in the non-financial Balanced Scorecard measures lead to financial performance improvements in one month, the need for these measures to overcome the (perceived) short-term bias in financial performance measures is unclear since any improvements in non-financial measures are reflected in financial measures on an almost contemporaneous basis, defeating the need for leading indicators. However, since the adopting and non-adopting branches were not matched on important factors such as size, location, and customer base (and the authors do not control for these factors in their statistical tests), and because the paper does not report whether improvements in the financial measures (which were also used in the previous measurement system) were associated with changes in the new non-financial scorecard measures, it is hard to conclude that the gains were due to intangible asset measurement rather than to a ‘Hawthorne Effect’ from increased emphasis on a new performance measurement system.

In contrast to the positive results reported by Banker et al. (2000) and Davis and Albright (2004), quasi-experimental studies by Neely (2007) and Griffith and Neely (2007) reach conflicting conclusions regarding the benefits from Balanced Scorecard systems. Neely (2007) uses data from two sister divisions of a UK wholesale electronics chain, one of which implemented a scorecard and one which did not. Although the implementing division achieved improvements in sales and profits, statistically similar improvements are also found in a geographically matched set of stores in the sis-

ter division, providing no support for the performance benefits from the Balanced Scorecard.

Griffith and Neely’s (2007) results are mixed. Their sample consists of branches belonging to two UK divisions of a heating and plumbing distributor. One division implemented a new incentive plan using the Balanced Scorecard and the other retained the existing profit-based plan. After matching on postal code and controlling for other factors expected to result in differences in division performance (due to one division focusing on commercial customers and the other focusing on retail customers), they find that the Balanced Scorecard did not increase profits in all implementing branches. Instead, costs increased faster than sales in some of the implementing units. However, the Balanced Scorecard appears to have had a favourable effect in branches with more experienced managers, indicating that different decision-makers are not equally prepared to take advantage of the extra information provided in scorecard systems.

Although existing small sample, quasi-experimental studies are few in number, may not generalise to broader samples, focus exclusively on incentive plans, and provide only mixed support for claims that intangible asset measurement improves performance, they offer some of the most powerful tests of the claimed benefits from intangible asset measurement and highlight some of the implementation problems associated with these measures. Similar studies can greatly improve our understanding of intangible asset measurement and its implications.

3.4. *Intangible asset measurement and causal business models*

Recent work on intangible asset measurement increasingly argues that a key element of effective measurement systems is the development of explicit ‘causal business models’ or ‘strategy maps’. Causal business models represent the hypothesised cause-and-effect relations between investments in intangible assets and economic performance, as expressed or assumed in the company’s strategic plan. Proponents of causal business modelling claim that the explicit development of these models forces organisations to answer the question, ‘How are intangible assets supposed to improve our firm’s financial performance?’. By providing managers with the company’s expectations regarding the links between improvements in intangible assets and economic results, explicit causal business models are claimed to improve communication of strategic goals, increase the focus on intangible assets, improve performance measure choices and decision-making, and enhance performance evaluation (e.g. Kaplan and Norton, 2004; Marr et al., 2004). However, the use of causal busi-

ness models is not universally embraced. Norreklit (2000, 2003), for example, questions the cause-and-effect relations among the four Balanced Scorecard perspectives, as well as the top-down control model embedded in the modelling process.

Consistent with the claimed benefits from explicit causal business models, experimental studies show that providing causal models to employees can reduce the over-emphasis on short-term financial measures in performance evaluations (Banker et al., 2004), enhance accountants' evaluation of benchmark data that require the assessment of cause-and-effect relations (Vera-Munoz et al., 2007), and reduce conflicts between supervisors and subordinates in Balanced Scorecard evaluations (Wong-On-Wing et al., 2007).

Survey-based studies also provide preliminary evidence that the provision of causal business models can be beneficial. Banker et al.'s (2007) survey of US Chief Financial Officers finds greater satisfaction with performance measurement systems that enable employees to understand organisational linkages, while Chenhall's (2005) survey of Australian firms indicates that integrative performance measurement systems that articulate strategic and operational linkages are positively associated with perceived organisational learning. In Ittner and Larcker's (2003) survey of a diverse set of US firms, those reporting that they consistently build and verify causal business models have significantly higher publicly-reported ROA and ROE than those that do not. In a second study of US financial services firms (Ittner et al., 2003), respondents claiming to rely extensively on formal business models report statistically higher perceived measurement system satisfaction and achieve higher publicly-reported ROA, but business models are not significantly associated with publicly-reported sales growth or stock returns.

Although these studies suggest that explicit causal business models provide potential advantages, surveys indicate that most firms have not developed formal causal models, and those that do frequently do not test whether the hypothesised linkages actually hold in practice. Ittner and Larcker (2003), for example, report that only 30% of their sample develop formal causal models, and only 23% attempt to verify the causal links. Nearly 30% of the firms they surveyed place no reliance on a formal business model, and only 35% make substantial to complete use.

Small sample studies suggest that the failure to develop and validate causal business models may be one reason why some firms find it difficult to link improvements in intangible assets to economic performance. Campbell et al. (2006) examine a Balanced Scorecard implementation in a US convenience store chain and find that causal analysis of the data in the scorecard could have been used

to identify strategic problems and highlight improvement opportunities, particularly with respect to employee capabilities. However, the chain did not perform this analysis, which the authors claim could have prevented the failure of the firm's strategy. Ittner and Larcker (2003, 2005) analyse the causal models in a wide variety of manufacturing and service firms and conclude that management intuition regarding causal models is often incomplete or inaccurate, leading managers to chase strategies and metrics that may be inappropriate.

Malina et al.'s (2007) examination of a large US company's scorecard, on the other hand, finds little or no statistically significant relation between the linked performance measures in the company's causal model, yet the company expressed satisfaction with the system and firm profitability. The authors conclude that an effective management control system does not require statistically significant cause-and-effect relations when other factors create a strong climate of control.

Taken together, the limited existing evidence on causal business modelling suggests that this practice may be beneficial in some settings, but may not be a necessary condition for effectively linking intangible assets to economic performance. Future research can make a significant contribution by examining the conditions under which explicit causal models contribute to performance gains, and the specific practices for developing and validating causal models that are most effective.

3.5. Implementation issues

One important set of factors missing in most performance tests are implementation issues. Qualitative studies have identified a wide variety of implementation issues that potentially influence performance measurement outcomes (see Bourne et al. (2003) and Franco-Santos and Bourne (2005) for reviews). These issues can be broadly classified into technical and organisational factors.

Technical factors include issues such as the choice and weighting of measures, target setting, and information system capabilities. Even if an intangible asset category is important, important decisions must still be made regarding the specific measures and measurement methodologies for that category. Dozens of potential measures are available for any intangible asset dimension, and organisations must decide which of these measures to incorporate in their measurement systems. Yet empirical studies find that different methods for measuring the same dimension can have a significantly different ability to explain economic performance (e.g. Ryan et al., 1995; Sedatole, 2003), making the decision regarding the specific measures to use far from straight-forward. In addition, Hemmer's (1996) model shows how differences in the measurement of non-financial performance di-

mensions (e.g. the use of numbers vs. ratios for measuring customer satisfaction) can influence the measures' incentive effects. Difficulties determining the appropriate measures and methodologies can be even greater for intangible asset dimensions that are more qualitative in nature (Cavalluzzo and Ittner, 2004). This evidence suggests that the specific measures and measurement methodologies used by the organisation, rather than the simple measurement of intangible asset categories, have the greatest influence on economic performance.

Another important issue is setting targets for the measures. Research suggests that the relation between intangible asset measures and financial results is often non-linear, with diminishing or negative returns at higher intangibles levels (e.g. Ittner and Larcker, 1997b, 2005). For example, 100% satisfied employees and customers or maximising the number of patents are unlikely to be optimal in most companies. However, Ittner and Larcker (2003, 2005) find that many (if not most) companies make little or no attempt to determine the appropriate targets for intangible asset measures. Unless some attempt is made to determine the point of diminishing or negative returns, companies may be investing too much in improving intangible asset measures.

Other target-setting difficulties arise when different performance objectives conflict in the short-term. For example, investments in many intangible asset dimensions, such as research and development or brand building, can reduce short-term accounting performance due to expensing rules, but generally do not improve economic performance for some time. When the lags between improvements in intangible asset measures and economic performance are unclear, companies find it hard to set appropriate short-term goals for the conflicting performance dimensions (e.g. Gates, 1999).

In addition, despite the growth in computer capabilities and integrated software programs, many firms still face problems getting their disparate systems to provide timely performance measures in a consistent format that facilitates performance evaluation and data analysis, due to factors such as inconsistent identifiers, units of analysis, and timing of measurement in various databases (Bourne et al., 2003; Ittner and Larcker, 2003; Jiang et al., 2007). Cavalluzzo and Ittner (2004) find that data limitations do not influence the implementation of performance measurement innovations, but limit the self-reported use of the resulting information for accountability and decision-making purposes.

Organisational barriers may be even harder to overcome than technical barriers. One significant organisational barrier is the internal politics of performance measurement choice and use. As Waggoner et al.'s (1999) inter-disciplinary review of the performance measurement literature notes,

performance measures have a powerful effect on power distributions within organisations. As a result, organisational participants may resist changes in existing 'rules of the game' (such as the introduction of intangible asset measures) or fight for the introduction of measures that reflect their activities in a more favourable light. In many cases, power issues lead to an ever-increasing growth in intangible asset measures as managers push their own measures to ensure that their efforts are recognised and rewarded (Ittner and Larcker, 2003). Organisational disputes over who 'owns' different measures (or 'data fiefdoms') can also hamper the exchange of data across functions and hinder the company's ability to assess linkages among measures, limiting their effectiveness. If the choice and use of intangible asset measures reflect internal politics more than the development of leading indicators of firm performance, performance tests will be unlikely to detect any economic benefits from intangible asset measurement.

Finally, the influence of intangibles measurement on economic performance is likely to be influenced by management's commitment to the measures' use. Top management support can ensure adequate resources are made available for implementation and ongoing data analysis, can focus organisational attention on the measures, and can prevent short-term financial concerns from dominating decision-making and performance evaluations (Franco-Santos and Bourne, 2005).

As the implementation literature highlights, even if the use of reliable and valid intangible asset measures offers economic benefits in a given setting, technical and organisational barriers can limit these benefits, reducing a researcher's ability to identify performance gains if these issues are not incorporated into the research design and statistical models.

4. Conclusions and issues for future research

The evidence reviewed in this paper identifies some of the difficulties in assessing whether or when internal measurement of intangible assets improves economic performance. Although the bulk of studies provide at least some evidence that intangible asset measurement is associated with higher performance, many are limited by over-reliance on perceptual satisfaction or outcome variables, inadequate controls for contingency factors, simple variables for capturing complex measurement practices, and the lack of data on implementation practices. Future studies must take account of these research design issues if our understanding of the performance benefits from intangible asset measurement is to improve.

In addition, opportunities exist to extend research on the links between intangible asset measurement

and economic outcomes. First, researchers can examine whether the effects of financial or valuation-based intangible asset measures (such as human capital accounting or brand valuation) differ from those of non-financial measures (such as employee satisfaction, training, or turnover or brand awareness). To date, performance studies have not distinguished between the two types of measures, and have tended to classify any measures that are not traditional accounting measures as non-financial. Not only does this ignore the fact that many intangible asset measures can be either financial or non-financial, but also the many advances that have been made in intangible asset valuation (see Andriessen (2004b) for a review).

Another opportunity is examining a broader set of intangible asset measurement uses. The vast majority of studies examine reward and performance evaluation systems. But these measures are also used for other purposes such as decision-making, problem identification, and forecasting. Moreover, some economic theories suggest that the measures used for valuing a business need not be useful for assessing a manager's performance (e.g. Gjesdal, 1981; Paul, 1992; Feltham and Xie, 1994). Consequently, restricting the analysis to managerial performance evaluation and reward systems is likely to provide only a partial understanding of firms' measurement practices and measurement system performance consequences.

Finally, greater use of small sample or quasi-experimental studies is recommended. Although the generalisability of these studies is limited to some extent by the specific settings being examined, they offer greater opportunity to control for confounding factors than large sample, cross-sectional studies. More importantly, only through intimate knowledge of research sites can the full complexity and nuances of performance measurement implementation and use be fully understood and incorporated into the analysis and interpretation of statistical tests of performance implications.

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