

STRATEGIC PERFORMANCE MANAGEMENT SYSTEMS: IMPACT ON BUSINESS RESULTS

AL BENTO

University of Baltimore
Baltimore, MD 21201-5779

REGINA BENTO

University of Baltimore
Baltimore, MD 21201-5779

LOURDES FERREIRA WHITE

University of Baltimore
Baltimore, MD 21201-5779

ABSTRACT

This study proposes and tests a model to explain the impact on business results of a specific type of information systems: Strategic Performance Measurement Systems (SPMS). Drawing from the literatures in management, information systems, and accounting, the model proposes that SPMS information technology (IT) variables, which include both technical characteristics and technical outcomes, affect business results. Those IT variables are, in turn, affected by SPMS system variables (information quality and system design). Finally, IT and system variables are affected by organizational variables related to information processing capabilities and requirements. Using path analysis, we found empirical support for the model by analyzing data from large-scale survey with a sample of 1,990 respondents. System effectiveness and Internet usage were the two IT variables found to have the most impact on business results. Furthermore, system design had a significant role in determining all IT variables that had an impact on business results.

Keywords: Impact on Business Results, Strategic Performance Measurement Systems, Effectiveness, Usefulness, ERP, System Design, Organization Information Processing

INTRODUCTION

In spite of the substantial investments made in information systems, there is still insufficient empirical evidence of the business impact that those systems actually produce, and of the variables that may influence the nature and magnitude of such impact. This study represents an effort to fill this practical and theoretical gap in four significant ways.

First, the study focuses on the business impact of a particular type of information systems, Strategic Performance Measurement Systems (SPMS), which enable organizations to plan, measure and control their performance, so that decisions, resources and activities can be better aligned with business strategies to achieve desired results and create shareholder value. Second, it examines actual business impact in financial and operational terms, rather than the proxies for information systems impact that have been commonly used in the literature, such as user satisfaction, volume of use, and others. Third, the model proposed in this study is interdisciplinary in nature, drawing from the literatures in information systems, accounting and management to address the complex mix of technological aspects, information and control systems and organizational variables that are likely to be involved in determining the business impact of strategic performance measurement systems. Finally, the test of the model is based on substantial empirical data provided by a large-scale industry survey of 1,990 respondents.

The model proposes that the business impact of strategic performance measurement systems is affected by information

technology (IT) variables, which include both technical characteristics (Internet usage in the SPMS and the use of tools such as ERPs) and technical outcomes (SPMS effectiveness and usefulness of IT tools). Those IT variables are, in turn, affected by systems variables (such as SPMS information quality and system design purposes). Finally, the model proposes that both IT and systems variables are affected by organizational variables related to information processing capabilities and requirements. Based on Organizational Information Processing Theory (OIPT), the model includes two variables that are related to an organization's capability to process information: organizational structure (which may impede or facilitate information flow) and management decision-making style (reflecting the different exchanges of information that occur in collaborative versus command-and-control decision-making styles). OIPT also inspired the inclusion of organizational variables that affect information processing requirements, such as organizational size and geographical scope of operations.

The following sections present the model, research question and hypotheses that were used to explore the business impact of strategic performance measurement systems, the research methods that were used in the empirical test of the model, the results obtained, and their implications for research and practice.

MODEL, RESEARCH QUESTION AND HYPOTHESES

Strategic Performance Measurement Systems are being used in a wide number of organizations to support performance planning, measurement, and control. SPMS "are designed to present managers with financial and nonfinancial measures covering different perspectives which, in combination, provide a way of translating strategy into a coherent set of performance measures" [11, p. 396]. SPMS typically provide information on financial and nonfinancial performance measures in an effort to both report on past performance and help managers influence future performance. Financial measures assess the short-term impact of managerial decisions in areas such as revenue growth, asset utilization, and cash flows [25, 42], while nonfinancial measures capture variables that are likely to influence future financial performance, such as customer service and quality products. The most popular form of SPMS is the balanced scorecard (BSC, first proposed by Kaplan and Norton [24]).

SPMS are expected to help organizations achieve and maintain strategic alignment in their decisions, resource allocations, and activities, in order to obtain results and increase shareholder value both in times of stability and during times of change in strategic direction. But to what extent do SPMS actually have a significant impact on business performance? Extant research on this question to date has yielded mixed results. Initial studies in performance measurement tested the impact of certain performance measures

on actual financial performance in particular industries (e.g., [4]). Over the past decade, studies focused on the performance effects of specific SPMS characteristics such as the use of more subjective nonfinancial measures (e.g., [23]), and the actual performance impact of overall SPMS adoption (e.g., [10]). Van der Stede, Chow and Lin [47] provided intriguing evidence of the importance of including a diverse set of performance measures in the SPMS, finding that companies that used a higher number of performance measures actually achieved higher performance. Farrell, Kadous and Towry [16] found that incentive contracts that included forward-looking performance measures effectively drive employee performance. On the other hand, Kaplan and Norton [26] provided anecdotal evidence that breakdowns in the SPMS actually lead to deteriorating company performance. More recently, Bisbe and Malagueño [7] found evidence that the effect of SPMS on organizational performance is reduced in situations where environmental dynamism is high. DeLone and McLean argued that information system success leads to improved company performance [see review by Petter, DeLone and McLean [37]], while others have concluded that there is no relationship between information systems and performance measurement [45]. The current study contributes to the existing knowledge about the performance effects of SPMS by proposing and testing a model that integrates IT, systems and organizational variables from the information systems, accounting and management literatures.

Thus, our study addresses the following research question: "What variables explain the business impact of Strategic

Performance Measurement Systems?" In order to answer this question, we propose the model in Figure 1, which shows that organizational variables that affect the organization's need for and ability to process information will affect the systems characteristics of the SPMS, which in turn will affect its technical characteristics and outcomes, which will then affect its business impact.

Organizational Information Processing Requirements and Capabilities

According to Organizational Information Processing Theory [17, 18, 19, 20, 39], organizations have to cope with various levels of uncertainty, defined as "the difference between the amount of information available and the amount of information required to perform the task at the desired level of performance" [17]. This difference characterizes the information processing requirements of the task. The model incorporates two organizational variables that influence the information processing requirements the SPMS must meet: scope of operations (regional, national, international, global), and organizational size (small, medium, large organizations). Both scope and size reflect the velocity and predictability of change facing an organization, and the resulting levels of uncertainty raise different levels of information requirements to be satisfied by the SPMS.

OIPT also proposes that organizations may cope with increased information processing requirements in different ways.

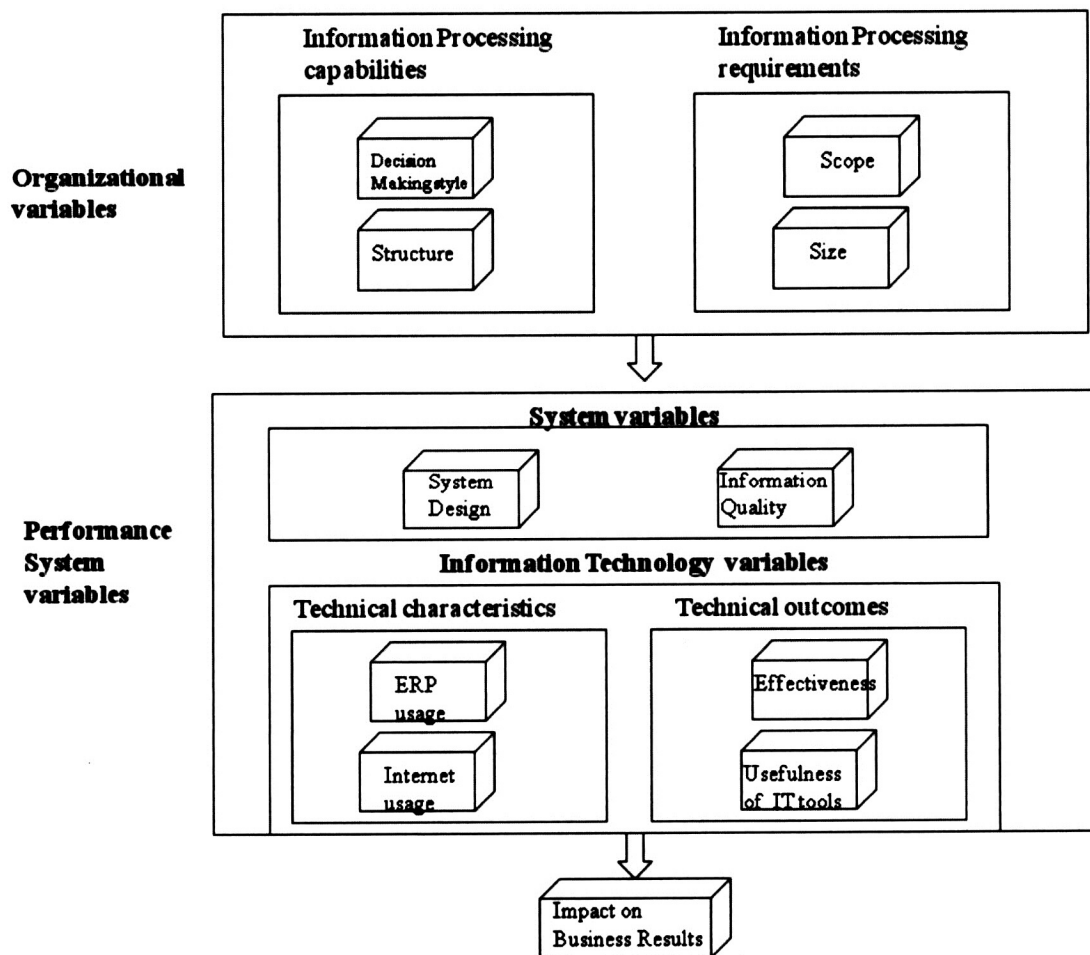


FIGURE 1 — The model: business impact of SPMS

For example, they may use buffering (e.g., extra inventory) to reduce the effects of uncertainty or they may try to increase their information processing capabilities through structural mechanisms (e.g., lateral relations) and other efforts to improve information flow. In the model, these organizational capabilities are represented by the following variables:

- **Structure** — structural arrangements to help enhance the organization's capabilities to process information: Puranam, Raveendran and Knudsen [40] argue that organization design can directly influence how subgroups (units, divisions, departments) process information and develop new knowledge;
- **Decision-making style** — the degree to which management's decision making style affects information flow by making full use of two-way lateral and vertical communications (Collaborative styles) or by relying mostly on one-way vertical communications (Command and Control styles).

Research on collaborative decision making has confirmed its potential positive impact on organizational performance, provided information and communication technologies can facilitate the organization's capability to process complex and dynamic information flows [1]. It is also evident from recent IS research [33] that a collaborative decision making style helps to promote a climate where employees increase usage of IS and engage in exploring its new features.

Systems Variables

The model proposes that the organizational information processing requirements and capabilities discussed above will affect a key system variable: the system design.

According to the management control literature, the uses for which the SMPS are designed may have a significant influence in their outcomes [11], and Mouritsen [35] has pointed out that the ability of management control systems to support change is influenced by system design. Ittner and Larcker [22] argued that SPMS research should examine the decision purposes for which a SPMS is designed, in order to allow appropriate interpretation of the outcomes of the use of performance measures, given that they might be appropriate for some purposes but not for others. As noted by Bento and White [6, p. 7], "a distinctive characteristic of SPMS implemented in the last two decades is an attempt to choose tailored performance measures that translate a particular organizational strategy into an integrated set of performance indicators. Thus, this set of measurements contributes to change management by fulfilling many purposes: not only to direct managerial action to the achievement of new strategic objectives, but also to provide feedback to managers, through a dynamic learning process, about the potential need for new strategy formulation." The survey respondents were asked about 12 potential SPMS design purposes, including uses such as evaluating individual and business unit performance, making decisions regarding capital allocation or technology acquisition, and communicating directives or strategy. The SPMS design purposes that were studied here cover all four decision contexts recommended by Ittner and Larcker [22]: cost determination (e.g., measurement of business results); information for planning and control (e.g., evaluation

of individual performance, determination of individual rewards and recognition, and communication of management directives); reduction of waste (e.g., management of operations, capital and technology); and strategic emphasis on value drivers (e.g., management of strategy, suppliers and customer relationships; delivery of information for decision-making and communication of values and culture).

The information systems literature (e.g., [2, 12, and 41]) suggests that another relevant system variable that influences IT variables is information quality (IQ). For the purpose of this study "information quality" refers to the widely accepted definition of "fitness for use" [3]. Notwithstanding the subjective and perceptual nature of the information quality concept, it has long been shown to be positively associated with the success of information systems [46] and with system effectiveness [48] including the increased use of the information, user satisfaction, and impact on individuals and organizations [12]. The literature in performance measurement points out that the information quality of most performance measures (with the exception of short-term financial measures) is perceived to be lower than their importance, and warns that researchers should take information quality into explicit consideration when studying performance measurement systems [22, 27, 28, 32]. Luft [30] highlighted that incorrect measurements (i.e., lower information quality) represent one of the most common problems in strategic performance measurement systems, leading to limited usage and reduced effectiveness. Recent information system (IS) studies, however, have not explicitly explored the impact of information quality on the effectiveness or usefulness of IT systems; rather, they have focused on how information quality impacts operations, planning, customer service, asset utilization, costs, or employee satisfaction [38].

Information Technology Variables

The model in Figure 1 shows two sets of IT variables that potentially affect the business impact of SPMS: technical characteristics and technical outcomes of the SPMS.

Information technology investments to improve technical characteristics have been made for many decades, but research on whether IT matters for improving firm performance have only recently produced encouraging results at the firm or industry levels [21]. Technical characteristics include the level of use of Internet technologies to facilitate information flow, and the types of technology used in the SPMS to generate and process information, in particular the widespread use of Enterprise Resource Planning (ERP). ERP usage has been the focus of a plethora of studies in the IS literature [14], but the relationship between ERP usage and organizational performance is still unclear [29]. Interestingly, Liu and his colleagues found that the extent to which ERP use is assimilated in organizations is related to the perceived usefulness of the information and business processes.

The model in Figure 1 also highlights the role played by another set of IT variables: the technical outcomes achieved by the SPMS. Technical outcomes include the usefulness and effectiveness of the SPMS. The literature in management information systems defines usefulness as the degree to which a person believes that using a particular system would enhance performance [43] and relates it to voluntary IS use [12, 13]. The actual use of an information system is seen in the literature as an important indicator of IT success and has been found to be strongly related to the perceived usefulness of the system [31]. Prior IS research

confirms that usefulness is a key factor influencing IS infusion and increased effectiveness [15]. The other technical outcome in the model, SPMS effectiveness, is defined here as the degree to which the system delivers its intended results [36], i.e. the degree to which the SPMS helps the organization to plan, measure and control performance. According to the performance measurement literature, effective SPMS can increase employee motivation and facilitate strategic alignment, thereby ultimately leading to performance improvements (e.g. [32]).

Business Impact

In this study we use a multi-dimensional definition of SPMS business impact, to reflect the notion that strategic performance measurement systems may influence an array of business practices, not just isolated financially-oriented activities [9]. The business impact of SPMS in Figure 1 includes a variety of potential areas of impact, such as improving internal practices (research and development, product and service innovations, cycle time reduction, process improvements), establishing alliances and joint ventures, delivering customer value (price, quality) and boosting financial results (revenue growth, productivity), as well as a double loop learning of reevaluating the strategy itself. A recent study in the IS literature lends empirical support for this approach for measuring business results: the way information technology capabilities contribute to firm performance depends first on the ability of IT to influence customer management capability, process management capability, and performance management capability [34].

In order to test the model in Figure 1, we formulated a series of hypothesis regarding the impact of SPMS characteristics and outcomes on business results. We present the most relevant hypothesis first, since without evidence of an impact on business results, there would be no reason to investigate which variables to contribute to such impact. Hence, our main hypothesis is:

H1: The business impact of SPMS is positively related to IT variables including technical characteristics (Internet usage in the SPMS and the use of tools such as ERPs) and technical outcomes (SPMS effectiveness and usefulness of IT tools).

In our study we propose that organizations with complex information processing requirements and capabilities, and where systems design cover a wide range of purposes and information quality is high, are likely to experience SPMS that is both effective and useful:

H2: SPMS effectiveness is positively related to systems variables (design purpose and information quality) and organizational variables (structure, management decision-making style, size and scope)

H3: SPMS usefulness is positively related to systems variables (system design purpose and information quality) and organizational variables (structure, management decision-making style, size and scope)

Integrating the concepts of information processing requirements and capabilities posited by OIPT with the studies from information systems and accounting literatures mentioned above, we propose the following hypotheses relating IT variables to systems and organizational variables:

H4: Internet usage is positively related to systems variables (system design purpose and information quality) and organizational variables (structure, management decision-making style, size and scope)

H5: ERP usage is positively related to systems variables (system design purpose and information quality) and organizational variables (structure, management decision-making style, size and scope)

Based on OIPT, we hypothesize that organizations with complex information processing requirements and high information processing capabilities are likely to design systems that address a wide range of purposes:

H6: SPMS design purpose is related to organizational information processing capabilities (structure, management decision-making style) and information processing requirements (organization size and geographical scope of operations).

RESEARCH METHOD

In this study we tested the model in Figure 1 using data from the Performance Measurement Practices Survey conducted by the American Institute of Certified Public Accountants (AICPA). This limits the external validity of the study results to the characteristics of the survey respondents.

The survey resulted in 3,900 valid responses from AICPA members, which were employed in: accounting and finance (74%), general management (10.3%), operations (2.5%), information technology (1.8%) and tax (1.5%). The respondents also belonged to a varied of industries: financial (17.6%), industrial (16.6%), Consumer-cyclical (13.8%), energy/utilities (9.0%), Health care (8.0%), Technology/Internet (7.5%), professional services (6.6%), not-for-profit (4.2%), Consumer-noncyclical (2.3%), basic materials (2.3%), manufacturing (2.1%), distribution/wholesale (0.2%), and other (5.3%).

Eight of the eleven variables in the model were measured with one question each, to which the participants were asked about their business unit:

- size: measured by sales (1 = up to \$20 million; 3 = over \$1 billion)
- scope: extent of geographic scope (1 = regional; 5 = global)
- structure: complexity of the business structure (1 = standalone unit; 5 = multi-divisional)
- collaborative: decision making style (1 = not collaborative; 2 = collaborative)
- information quality and effectiveness: one item each (1 = poor; 5 = excellent)
- Internet usage: extent to which this technical characteristic affected the SPMS (1 = no effect; 5 = significant effect)
- ERP usage: extent to which this technical characteristic facilitated the SPMS (1 = no; 3 = significantly)

The other three variables were measured with multiple items on a five-point Likert scale to show the extent to which each item was applicable to the respondent's business unit:

- system design purposes: 12 items dealing with purposes for which the SPMS was designed, comprised of: the

measurement of business results, the evaluation of individual performance, the determination of individual rewards and recognition, the communication of management directives, the delivery of information for decision-making, the dissemination of values and culture, the management of operations, capital, technology, strategy, suppliers and customer relationships (1 = not used, 5 = extensively used).

- usefulness of IT tools: 4 items dealing with how useful IT tools in the SPMS were for tasks such as assisting in decision support, forecasting business results, developing plans or analyzing results (1 = poor; 5 = excellent)
- impact on business results: ten items on the impact of

the SPMS on various aspects of the business such as productivity, revenue growth, research and development, innovation, cycle time, process improvement, alliances/joint ventures, strategy, pricing, operating quality (1 = no effect, 5 = significant effect).

We employed stepwise regression analysis [5] to examine the relationships among the variables described in Figure 1. Stepwise regression analysis, as a semi-automated process of testing a model by successively adding or removing variables based solely on the *t*-statistics of their estimated coefficients, allowed us to estimate the path coefficients (beta weights) that represent the strength of the relationships among the variables according to the model. The beta weights show the extent to which a change in the dependent variable is associated with a standardized change in one of the independent variables, while controlling for the other independent variables [8]. This method of analysis does not depend on the limiting assumptions required by other approaches regarding the type of data and statistical distributions, so it is better suited for the ordinal variables and perceptual data from the survey [5, 44].

First, we tested whether technical characteristics (Internet and ERP usage) and technical outcomes (effectiveness and usefulness) of the SPMS had a direct impact on business results. This first test allowed us to measure not only the impact of each IT variable on business results, but also to compare the relative magnitude of the relationships among the four IT variables and business results. Next, we performed stepwise regression analyses to investigate the system and organizational variables that help determine the four IT variables found to have an impact on business results. Finally, we examined which organizational variables are related to the one IT variable, system design, found to be the most important systems variable that influences the four IT variables which, in turn, have a direct impact on business results.

TABLE 1 — Descriptive Statistics

	Mean	Std. Deviation	N
Scope	2.37	1.16	1925
Size	1.67	.79	1898
Structure	2.78	1.27	1921
Collaborative	1.54	.49	1923
Information quality	2.97	.8	1808
System design	38.6	8.9	1867
ERP usage	1.28	.45	1767
Internet usage	2.65	1.14	1840
Effectiveness	3.11	.92	1876
Usefulness of IT tools	12.78	2.94	1732
Impact on business results	28.9	7.4	1680

RESULTS

Descriptive statistics for the eleven variables in this study appear in Table 1. Missing values caused the number of observations to range from 1,680 to 1,925. While organizational variables such as size and geographical scope varied widely, as would be expected in this large sample, respondents rated the information quality and effectiveness of the SPMS as only adequate on average (the mean rating was 2.97 for quality, 3.11 for effectiveness, out of 5). For the three variables that encompass multiple survey questions, Cronbach alphas are at or above 60%, suggesting relatively high reliability and ensuring that these variables form internally consistent scales.

We used path analysis to test the overall model, with the results displayed in Figure 2. The beta weights on the path from one variable to another indicate their impact on the other variable. In addition to the path analysis, the results of testing of each hypothesis are presented in Tables 2 to 7. The findings of significant relationships in each test provide empirical support for the

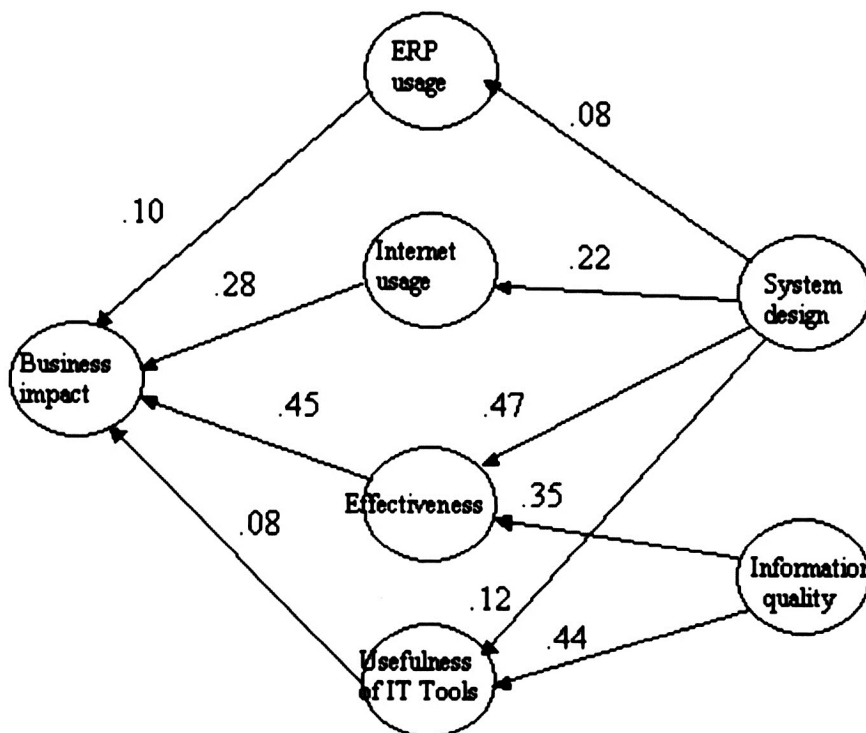


FIGURE 2 — Results: Impact on business results

six research hypotheses. These individual results, summarized in Figure 2, also support the proposed research model.

Hypothesis 1

We found significant, positive direct effects of system effectiveness and Internet use on business results (Table 2), consistent with Hypothesis 1. The effects of ERP usage and the usefulness of the IT tools, though still significantly related to the business impact of the SPMS, are less pronounced. These four variables alone explain more than one third of the cross-sectional variation in the impact on business results (adjusted R²=0.36, significant at the 0.0001 level).

Hypothesis 2

SPMS system effectiveness (Table 3) is mainly explained by the system design and information quality; the influence of the collaborative management style is marginally positive. All three variables, combined, lend support for Hypothesis 2, and explain almost half of the variation in system effectiveness at .0001 level of significance. Structure, size and scope were not significant in explaining SPMS effectiveness.

Hypothesis 3

The usefulness of IT tools used in the SPMS (Table 4) was found to be related only to systems variables (information quality and system design), in partial support of Hypothesis 3. None of the organizational variables (collaborative style, struc-

ture, scope and size) were significantly related to the usefulness of IT tools.

Hypothesis 4

The level of Internet usage (Table 5) is influenced by both system (system design) and organizational variables (collaborative style, scope and structure), as predicted in Hypotheses 4. However, information quality and organization size did not have a significant relationship with Internet usage. One possible explanation is that Internet usage is, currently, necessary for all SPMS, regardless of how large the business unit is, or the level of SPMS information quality.

Hypothesis 5

ERP usage (Table 6) is significantly related to system design and information processing requirements (size and scope), but not to information quality or any information processing variables (collaborative style and structure), in partial support of Hypothesis 5. It seems that increased ERP usage is dictated by the requirements imposed by large size and geographical scope of the business unit, and not influenced by how the organization makes decisions (decision-making style) or the quality of the information provided by the SPMS.

Hypothesis 6

System design (Table 7) is significantly influenced by a collaborative decision making style, and by organizational unit

TABLE 2 — Regression Results for Impact on Business Results

Dependent variable	Independent variables	Beta	t-statistic	Adjusted R ²	F- Statistic
Impact on business results	Effectiveness	.45***	20.45	.36***	221.48
	Internet usage	.28***	13.38		
	ERP usage	.10***	4.87		
	Usefulness of IT tools	.08***	3.49		

*** Statistically significant at the 0.0001 level (two-tail)

TABLE 3 — Regression Results for System Effectiveness

Dependent variable	Independent variables	Beta	t-statistic	Adjusted R ²	F- Statistic
System effectiveness	System design	.47***	24.51	.49***	553.08
	Information quality	.35***	18.91		
	Collaborative	.04**	2.51		

***, ** Statistically significant at the .0001 and .01 levels (two-tail), respectively.

TABLE 4 — Regression Results for Usefulness of IT Tools

Dependent variable	Independent variables	Beta	t-statistic	Adjusted R ²	F- Statistic
Usefulness of IT tools	Information quality	.44***	19.03	.25***	278.95
	System design	.12***	5.38		

*** Statistically significant at the .0001 level (two-tail).



size. This result implies that in larger organizational units, with a more collaborative culture, the SPMS is more likely to be designed for multiple purposes, ranging from traditional purposes such as measuring business results to broader purposes such as managing suppliers. This regression had the lowest explanatory power among all the other regression analyses reported in this study (adjusted $R^2=0.06$), indicating that many other variables may affect variation in system design.

CONCLUSIONS

The literature on performance measurement [10, 11, 24, 47] has shown that Strategic Performance Measurement Systems can have a significant impact on business results. Similarly, the literature on OIPT [17, 18, 19, 20, 39] suggests that organizational variables (such as size, scope, decision-making styles, and structure) relate to the organization's capability to process information and its information processing requirements. The present study explores the ability of OIPT variables to influence SPMS variables, and thus indirectly affect business results.

This study expands upon the performance management literature by integrating variables from three disciplinary areas: information systems, accounting and management to provide an interdisciplinary approach to performance management research. Our results show that IT variables, combined with system variables and organizational variables, have a significant relationship with the SPMS impact on business results across industries, geographical locations and organizational sizes.

Our empirical results serve as evidence that four IT variables contribute significantly to the business impact of SPMS: system effectiveness, usefulness of IT tools, Internet usage, and ERP usage.

Together, these four variables account for 36% of the variation in the impact on business results. This finding is noteworthy, given that business-related variables (such as operating efficiency or sales growth) should have a greater impact on business results.

Amongst the four IT variables, effectiveness is clearly the most significant (beta weight of .45), followed by Internet usage (beta weight of .28). This result implies that effectiveness (or the ability of the system to deliver intended results) is more relevant for business results than more traditional SPMS outcomes such as efficiency (by cost minimization or other means). Internet usage, as the second most significant IT variable, is also clearly important to achieving business results from SPMS.

Our results also show that all four of the IT variables found to impact SPMS business results were, in turn, significantly influenced by the system variables in the model (system design and information quality). The design purposes of the SPMS significantly influence all four IT variables found to be related to the impact of the SPMS on business results. In addition, information quality is found to significantly improve system effectiveness and usefulness of IT tools.

System design is the single most important variable in our model that determines system effectiveness and Internet usage (the two most important IT variables positively related to the impact on business results). This result is of great practical importance because it highlights the importance of a careful system design for the success of SPMS. Future research can test if system design is also relevant for the success of other types of Information Systems.

A major contribution of the present study is to relate organizational variables to SPMS variables and their impact on business results. The results of this study show that the

TABLE 5 — Regression Results for Internet Usage

Dependent variable	Independent variables	Beta	t-statistic	Adjusted R ²	F- Statistic
Internet usage	System design	.22***	9.4	.08***	37.44
	Scope	.11***	4.67		
	Structure	.08**	3.43		
	Collaborative	.04*	1.8		

***, **, * Statistically significant at the .0001, .001 and .07 levels (two-tail), respectively.

TABLE 6 — Regression Results for ERP Usage

Dependent variable	Independent variables	Beta	t-statistic	Adjusted R ²	F- Statistic
ERP usage	Scope	.23***	9.3	.08***	49.43
	Size	.10***	4.05		
	System design	.08**	3.29		

***, ** Statistically significant at the .0001 and .001 levels (two-tail), respectively.

TABLE 7 — Regression Results for System Design

Dependent variable	Independent variables	Beta	t-statistic	Adjusted R ²	F- Statistic
System design	Collaborative	.22***	9.64	.06***	56.43
	Size	.10***	4.57		

*** Statistically significant at the .0001 level (two-tail)

organizational variables considered did indeed have an impact, although limited, on the SPMS variables. The collaborative decision-making style was the variable that most influenced the system design variable. The information processing requirements (measured in our study by scope and size) have a stronger influence on the IT characteristics than on IT outcomes; conversely, the information processing capabilities (measured by a collaborative management style and structure) have a stronger relationship with SPMS effectiveness and system design.

The results showed that organization scope had an impact on Internet and ERP usage, and was in fact the variable that had the most impact on ERP usage in this study. Organization size also had a limited impact on ERP usage, as well as on system design. Both information processing capability variables were shown to have an impact on Internet usage, and having a collaborative management style was also shown to have the highest impact of the variables in this study on the design of the SPMS.

The study provides interesting implications for research and practice of information systems, particularly for SPMS. Our findings on the importance of system effectiveness and design on the impact of SPMS on business results are significant to future research, since these variables need to be considered in upcoming studies of the performance effects of SPMS. The results showing system design as the single most important influence on the effectiveness of SPMS may also show the need for future research on what other variables, other than collaborative decision-making style, may explain system design in the SPMS context.

Future interdisciplinary researchers may explore what other variables may further explain the SPMS impact on business results, and test alternative specifications of the model proposed in Figure 1, thus extending existing theories of how systems can impact performance. Given the limited ability of the organizational variables used in this study to explain the SPMS variables in the model, further research could also focus on identifying other organizational variables that would better explain the variation of the SPMS variables and their impact on business results.

The study also presents a number of insights relevant to practice. A main implication for practice is that to obtain an impact of SPMS on business results, the SPMS must be effective, rather than simply efficient. To achieve SPMS effectiveness, the system must be designed to ensure that it fulfills the purposes intended by the organization. A collaborative decision-making style will contribute towards this system design goal, ensuring the enhanced effectiveness of the SPMS.

Two other important implications for practice to obtain an impact of SPMS on business results are: (a) assure that the level of use of the Internet and ERP corresponds to the size and scope of the organization; and (b) ensure an adequate level of information quality to achieve system effectiveness and usefulness of IT tools.

REFERENCES

- [1] Adler, B.M., Baets, W. and Konig, R. "A Complexity Perspective on Collaborative Decision Making in Organizations: The Ecology of Group-Performance," *Information Management* (48:4/5), 2011, 157-165.
- [2] Bailey, J.E., and Pearson, S.W. "Development of a Tool for Measuring and Analyzing Computer User Satisfaction," *Management Science* (29:5), 1983, 530-545.
- [3] Ballou, D., Madnick, S. and Wang, R. "Special section: Assuring information quality," *Journal of Management Information Systems* (20:3), 2003, 9-11.
- [4] Banker, R., Potter, G., and Srinivasa, D. "An empirical investigation of an inventive plan that includes nonfinancial performance measures," *The Accounting Review* (January), 2000, 65-92.
- [5] Bento, A. and Bento, R. "Causal analysis in information systems research," *Journal of Information Technology Management* (15:3-4), 2004, 44-51.
- [6] Bento, A. and White, L. "An exploratory study of strategic performance measurement systems," *Advances in Management Accounting* (18), 2010, 1-26.
- [7] Bisbe, J. and Malagueño, R. "Using Strategic Performance Measurement Systems for Strategy Formulation: Does it Work in Dynamic Environments?" *Management Accounting Research* (23), 2012, 296-311.
- [8] Blalock, H. *Social statistics* (2nd ed.). McGraw-Hill, New York, 1979.
- [9] Bryant, L., Jones, D.A. and Widener, S.K. "Management value creation within the firm: An examination of multiple performance measures," *Journal of Management Accounting Research* (16), 2004, 107-131.
- [10] Burney, L. and Widener, S. (2007). Strategic performance measurement systems, job-relevant information, and managerial behavioral responses — role stress and performance. *Behavioral Research in Accounting*, 19: 43-69.
- [11] Chenhall, R. "Integrative strategic performance measurement systems, strategic alignment of manufacturing, learning and strategic outcomes: an exploratory study," *Accounting, Organizations and Society* (30), 2005, 395-422.
- [12] DeLone, W.D. and McLean, E.R. "Information systems success: The quest for the dependent variable," *Information System Research* (3:1), 1992, 60-95.
- [13] DeLone, W.D. and McLean, E.R. "The DeLone and McLean model of information systems success: A Ten-Year update," *Journal of Management Information Systems* (19:4), 2003, 9-30.
- [14] Dittkaew, N. and Sumritsakun, C. "The Consequences of Successful ERP Implementation in Thai Manufacturing Firms," *Journal of the Academy of Business & Economics* (12:1), 2012, 139-150.
- [15] Fadel, K. "User Adaptation and Infusion of Information Systems," *Journal of Computer Information Systems* (52: 3), 2012, 1-10.
- [16] Farrell, A., Kadous, K. and Towry, K. "Contracting on Contemporaneous versus Forward-Looking Measures: An Experimental Investigation," *Contemporary Accounting Research* (25:3), 2008, 773-802.
- [17] Galbraith J.R. *Designing complex organizations*, Addison-Wesley, Reading, MA, 1973.
- [18] Galbraith, J.R. *Organization design*, Addison-Wesley, Reading, MA, 1977.
- [19] Galbraith, J.R. "Organization design: An information processing view." In *Organizations as Systems* (M. Lockett and R. Spears, Eds.), The Open University Press, Milton Keynes, England, 1980.
- [20] Gattiker, T. F. and Goodhue, D. L. "Understanding the local-level costs and benefits of ERP through organizational information processing theory," *Information and Management* (41:4), 2004, 431-443.
- [21] Han, C., Lai, F., Hsieh, C. and Li, X. "Information Technology Investment and Manufacturing Worker Productivity," *Jour-*

nal of Computer Information Systems (52:2), 2011, 51-60.

- [22] Ittner, C., Larker, D. "Assessing empirical research in managerial accounting: a value-based management perspective," *Journal of Accounting and Economics* (32), 2001, 349-410.
- [23] Ittner, C.D., Larker, D.F., and Randall, T. "Performance implications of strategic performance measurement in financial services firms," *Accounting, Organizations, and Society* (28), 2003, 715-741.
- [24] Kaplan, R.S., and Norton, D.P. "The Balanced Scorecard: Measures that drive performance," *Harvard Business Review* (January-February), 1992, 71-79.
- [25] Kaplan, R.S., and Norton, D.P. *The Strategy-Focused Organization: How Balanced Scorecard Companies Thrive in the New Business Environment*, Harvard Business School Press, Boston, MA, 2001.
- [26] Kaplan, R. S. and Norton, D. P. "Mastering the Management System," *Harvard Business Review* (January), 2008, 63-77.
- [27] Kominis, G. and Emmanuel, C. "The expectancy-valence theory revisited: Developing an extended model of managerial motivation," *Management Accounting Research* (18:1), 2007, 49-75.
- [28] Libby, T., Salterio, S.E., and Webb, A. "The Balanced Scorecard: The Effects of Assurance and Process Accountability on Managerial Judgment," *The Accounting Review* (79:4), 2004, 1075-1094.
- [29] Liu, L., Feng, Y., Hu, Q., and Huang, X. "From Transactional User to VIP: How Organizational and Cognitive Factors Affect ERP Assimilation at the Individual Level," *European Journal of Information Systems* (20:2), 2011, 186-200.
- [30] Luft, J. "Nonfinancial information and accounting: A reconsideration of benefits and challenges," *Accounting Horizons* (23:3), 2009, 307-325.
- [31] Mahmood, M. A., Hall, L. and Swanberg, D. L. "Variables affecting information technology usage: A meta-analysis of the empirical literature," *Journal of Organizational Computing & Electronic Commerce* (11:2), 2001, 107-130.
- [32] Malina, M.A. and Selto, F.H. "Communicating and controlling strategy: An Empirical Study of the Effectiveness of Balanced Scorecard," *Journal of Management Accounting Research* (13), 2001, 47-90.
- [33] Maruping, L. and Magni, M. "What's the Weather Like? The Effect of Team Learning Climate, Empowerment Climate, and Gender on Individuals' Technology Exploration and Use," *Journal of Management Information Systems* (29:1), 2012, 79-114.
- [34] Mitas, S., Ramasubbu, N., and Sambamurthy, V., "How Information Management Capability Influences Firm Performance," *MIS Quarterly* (35:1), 2011, 137-151.
- [35] Mouritsen, J. "Beyond accounting change: design and mobilisation of management control systems," *Journal of Accounting and Organizational Change* (1:1), 2005, 97-113.
- [36] O'Brien, J. A. and Marakas, G. M. *Introduction to information systems*. 13th ed., McGraw-Hill/Irwin, New York, NY, 2007.
- [37] Petter, S., DeLone, W. and McLean, E. "The Past, Present and Future of IS Success," *Journal of the Association for Information Systems* (13), 2012, 341-362.
- [38] Popovic, A. and Habjan, A. "Exploring the Effects of Information Quality Change in Road Transport Operations," *Industrial Management & Data Systems* (112:9), 2012, 1307-1325.
- [39] Premkumar, G., Ramamurthy, K., and Saunders, C.S. "Information processing view of organizations: An exploratory examination of fit in the context of inter-organizational relationships," *Journal of Management Information Systems*, (22:1), 2005, 257-294.
- [40] Puranam, P., Raveendran, M. and Knudsen, T. "Organization Design: The Epistemic Interdependence Perspective," *Academy of Management Review* (37:3), 2012, 419-440.
- [41] Rainer Jr., R.K., and Watson, H.J. "The Keys to Executive Information Systems Success," *Journal of Management Information Systems* (12:2), 1995, 83-98.
- [42] Rappaport, A. "Shareholder scoreboard: the best and worst performers of the WSJ 1000," *Wall Street Journal* (Feb 28), 2005, R8.
- [43] Seddon, P.B. and Kiew, M-Y. "A partial test and development of DeLone and McLean's model of IS success," *Australian Journal of Information Systems* (4:1), 1996, 90-109.
- [44] Simon, H. A. "Spurious correlation: A causal interpretation," *Journal of the American Statistical Association* (49), 1954, 467-479.
- [45] Soudani, S. "The Usefulness of an Accounting Information System for Effective Organizational Performance," *International Journal of Economics & Finance* (4:5), 2012, 136-145.
- [46] Srinivasan, A. "Alternative measures of system effectiveness: associations and implications," *MIS Quarterly* (9:3), 1985, 243-253.
- [47] Van der Stede, W.A., Chow, C. and Lin, T. "Strategy, Choice of Performance Measures, and Performance," *Behavioral Research in Accounting* (18:1), 2006, 185.
- [48] Xu, H. "Organization's Top Management and Other System User's Perceptions Towards Data Quality Performance and Expectations," *Advances in Management* (5:4), 2012, 16-19.

ACKNOWLEDGMENTS

This research was supported by a grant from the Merrick School of Business, University of Baltimore. The authors are particularly grateful to the American Institute of Certified Public Accountants for providing access to data from the AICPA Performance Measurement Practices Survey.

A preliminary version of this manuscript was presented at the International Federation of Scholarly Associations of Management, IFSAM 2010 in Paris, July 2010.