AN ANALYSIS OF THE PERFORMANCE IMPACT OF INFORMATION SYSTEMS DESIGN AND BUSINESS STRATEGY: THE CASE OF INFORMATION SCOPE AND ORGANIZATIONAL PROACTIVENESS

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ABSTRACT

The use of information technology no longer conveys the competitive advantage to the users that they received when the technology was introduced. Due to the large scale adoption of information technologies, the focus needs to shift away from the technology to the application and use of the information developed through by the technology. This information needs to be evaluated in the context of the business strategy of the organization. This paper examines the use of information in terms of its scope and how it relates to the proactiveness of the business. There is a well developed literature on the theoretical relationship between the scope of the information gathered and the proactiveness of the firm but there is no empirical analysis to verify the theoretical constructs. A survey of chief executive officers indicates that the coalignment of information scope and organizational proactiveness has a significant and positive impact on firm performance.

INTRODUCTION

The use of information technology has become widespread because it is powerful, widespread, and available at low or modest cost. According to Carr (2003), IT has become so omnipresent, that by itself it no longer provides an identifiable competitive advantage in business. What is important, according to Dearstyne (2004), is the creative use of the information obtained from a system rather than the technology used to create, transmit, and present the information. One way to accomplish this is to align the information systems design with the strategy that an organization is pursuing.

Scope is an important characteristic of the information obtained from an information system and is an critical element which should be considered in the design of an information system (Chenhall and Morris, 1986). Scope describes the focus, quantification, and time horizon of the information. Narrow scope information focuses on internal economic data of a historical nature stated in monetary terms. Broad scope information encompasses economic and noneconomic data stated in monetary and nonmonetary units which can be used in predicting the consequences of future events (Gordon and Miller, 1976).

Proactiveness has been discussed as an important element in strategy research. It plays an important role in the typologies of Miles and Snow (1978) and Venkatra-

man (1989). According to Miles and Snow (1978), the Prospector attempts to find and exploit new opportunities before the competition. To accomplish this, the Prospector must be constantly conducting broad environmental scanning in order to quickly identify these opportunities before the competition recognizes them. This requires the Prospector to invest in systems which allow it to continuously monitor a wide range of environmental conditions, trends and events. At the other end of the strategic continuum, Miles and Snow (1978) identified the Defender which is concerned with protecting its limited, narrow domain. It attempts to accomplish through an internal focus which concentrates on maximizing the efficiency and productivity of the organization. The external environment is viewed as being composed of a few relatively important factors, each of which are relatively static, can be easily predicted, and are not expected to significantly influence the internal operations of the firm (Miles and Snow, 1978). The systems employed by the Defender reflect this emphasis on an internal focus rather than an external one. From an information systems standpoint, the Prospector follows a very proactive strategy and is best served by a broad scope system while the Defender follows a less proactive strategy and is best served by a narrow scope system.

Venkatraman (1989) views proactiveness as being characterized by participation in emerging industries, continually searching for new market opportunities, and experimenting with potential responses to changing trends. In addition, while he views the early entry into new markets to be considered proactive, he also considers the abandonment of operations as soon as they exhibit evidence of declining profitability to be proactive.

The basic premise of this research is that the scope of the information provided by the information system must be congruent with the level of proactiveness of the strategy being pursued. Broad scope information is needed to support a strategy based on a high level of proactivity. However, if a less proactive strategy is being followed, broad scope information is not required. In fact, broad scope information will be detrimental to effective decision-making as information overload will result. According to Tushman and Nadler (1978), information overload is a major contributor to dysfunctional decision-making in organizations.

METHODOLOGY

Structural equation modeling was used to test the proposition that the coalignment (COAL) of information scope (SCOPE) and proactiveness (STPRO) has a significant impact on firm performance (PERF). A confirmatory modeling strategy (Hair et al, 2006) was followed employing a second order factor analysis. SCOPE, STPRO and PERF are first order factors and COAL is a second order factor with SCOPE and STPRO as its indicators. This results in the testing of two hypotheses , stated in the alternative:

H1: SCOPE and STPRO are significantly related to COAL, and
H2: COAL has a positive and significant relationship with PERF.

SCOPE was measured using the six-item scale developed by Chenhall and Morris (1986) to measure the scope characteristics of information provided by management accounting systems. As the management accounting system is an integral part of the overall information system of an organization, these characteristics were deemed applicable to the information obtained from the

overall system. STPRO was assessed through the five-item scale developed by Venkatraman (1989) measuring the proactiveness dimension of the Strategic Orientation of Business Enterprise (STROBE) construct. PERF was measured using an eight-item scale developed by Mahoney et al (1963) for assessing organizational performance in accomplishing eight managerial tasks: planning, investigating, coordination, evaluating, supervising, staffing, negotiating, and representing. Previous research has shown that managerial assessments of performance, as used here, are highly correlated with internally obtained objective indicators of performance (Dess and Robinson, 1984).

SAMPLING FRAME AND DATA COLLECTION

Publicly-traded firms limiting their operations to one industry, as indicated in the Disclosure database, were chosen as the sampling frame for this study. Firms operating in only one industry were selected due to the inherent problems identified by Chandler (1962) and Rumelt (1974) in analyzing the organizational responses of firms operating in multiple market segments. This resulted in 1,948 firms being identified.

The research instrument was sent to the chief executive officers of the 1,948 firms. Follow-up letters were mailed six weeks later. Anonymity of the respondents could not be guaranteed as it was deemed desirable to have the ability to identify the responding firms so the responses could be matched with other firm information for use in subsequent research.

Responses were received from 210 firms, of which 149 were useable in this research. The responding firms represented eighty-nine different industries. This resulted in an effective response rate of 7.7 percent which was deemed acceptable considering the level of the individual to whom the research instrument was sent and the fact that anonymity could not be guaranteed.

DATA ANALYSIS AND DISCUSSION

A factor analysis was performed on each of the three scales. The analysis showed that one item in the SCOPE scale and two items in the STPRO scale either loaded incorrectly, reflected cross-loadings (.40 or greater on more than one factor), or did not have a significant loading (.40 or greater) on any factor. These items were deleted.

Reliability of the modified scales was assessed through the calculation of Cronbach's alpha. All except the STPRO scale reflect a Cronbach's alpha above the threshold of .60 deemed acceptable by Nunnally (1967). This scale reflects a Cronbach's alpha value of .54, which is slightly below the acceptable value specified by Nunnally (1967). However, Novick and Lewis (1967) consider Cronbach's alpha to be a lower bound measure of reliability and provides a conservative estimate of a measure's true reliability. Therefore, all of the measurement scales were deemed to reflect adequate reliability.

Nonresponse error was evaluated through procedures suggested by Armstrong and Overton (1977) and Churchill (1991). The responses were segregated into quartiles based on the date of receipt, with late respondents being a proxy for nonrepondents. Data from early respondents (1st quartile) were compared to the data from late respondents (4th quartile). The analysis suggested that nonresponse error was not a major consideration.

The internal fit of the model was analyzed by examining the standardized loading estimates, standardized residuals, and the modification indices. The standardized loading estimates were all significant in that they exceeded the suggested critical value of 1.64 (Bagozzi and Yi, 1988). Examination of the standardized residuals and modification indices indicated that the model should be modified. Modification involved eliminating one of the items in the SCOPE scale and three of the items in the PERF scale.

The goodness of fit statistics for the modified model are shown in Table 1. An examination of the goodness of fit statistics indicates that all values surpass the critical values suggested by Bagozzi and Yi (1988).

Table 1: Goodness of Fit Statistics of the Modified Model

Statistic	Value
x^2	46.19
P-value	.70
GFI	.95
AGFI	.92
TCD	.86
RMSR	.14

GFI - Goodness of Fit Index
AFGI – Adjusted Goodness of Fit Index
TCD – Total Coefficient of Determination
RMSR – Root Mean Square Residual

As indicated earlier, acceptance of the coalignment model requires the testing of two hypotheses which were previously stated. Table 2 shows the path estimates and associated t-values for the relationships hypothesized in H1 and H2.

Table 2: Path Estimates of the Modified Model Relationships

Relationship	Parameter Estimate	t-value
SCOPE - COAL (H1)	.36	3.45
STPRO - COAL (H1)	.96	4.18
COAL - PERF (H2)	.55	4.91

The values reveal that significant positive relationships exist between SCOPE and COAL and between STPRO and COAL. Therefore, H1 is accepted. A positive and significant relationship is indicated to exist between the COAL and PERF. Therefore, H2 is accepted.

Based on the goodness of fit criteria and the acceptance of the two hypotheses, the coalignment model is accepted. These results support the proposition that the congruence of

information scope and the level of proactiveness in the firm's strategy have an impact on the organization's performance.

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