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A Case for Auditing Strategic Information Systems

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ABSTRACT

Business strategy represents the choice of how to compete for competitive advantage (Porter, 1980, Porter, 1985). And Strategic Information Systems (SIS) shape (Rackoff et al., 1985, Wiseman, 1985) and enable (Bensaou and Venkatraman, 1995) that business strategy. SIS has been the focus of a large body of research and anecdotal descriptions (Chan and Huff, 1992, Porter and Millar, 1985, Wiseman, 1985, Ghosh, 1998, Magretta, 1998, Shapiro and Varian, 1999).

There may be as few as 1.5 thousand PhD degree-holding researchers in Management Information Systems or Business Data Processing fields, while we may place the number of accountants and auditors (including Certified Information Systems Auditors or CISAs) closer to 1.2 million. In order to determine whether specific configurations of information technology reasonably implement the premises of a firm's competitive strategy, we think the SIS literature is mature enough to support CISAs compiling competent and sufficient evidential matter supporting certain frameworks, constructs and measurements described in the business strategy literature.

Keywords

Strategic Information Systems, Auditing, Certified Information Systems Auditors.

INTRODUCTION

Despite existing research, managers still face ambiguity surrounding some important competitive decisions; heavy investment in SIS is risky but provides potentially high payoff in the long term for a few successful early adopters (Weill, 1990). Information systems researchers have been repeatedly advised to ground their research in relevant reference disciplines (Keen, 1980). So, we link strategic firm types (Miles and Snow, 1978) with SIS planning content because the internal consistency between these is positively related with firm performance (Das et al., 1991). That is, the better the fit between SIS planning content and strategic firm types, then the better the organizational outcomes (Fry and Killing, 1989) such as financial performance (Chan and Huff, 1992) or competitive performance (Hambrick, 1983). See figure 1.

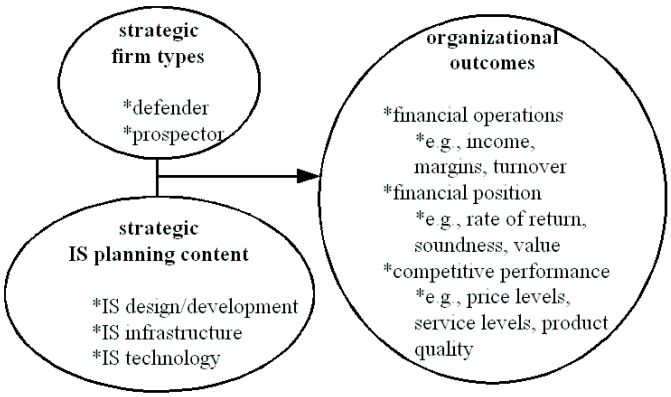

Figure 1. Conceptual Model

STRATEGIC FIRM TYPES

Defensive behavior manifests in terms of emphasis on cost reduction and efficiency seeking methods in order to defend their core technology (Thompson, 1967), or preserve their domain of products and markets (Miles and Cameron, 1982). With a focus on process innovation, investments in information technology are used to enable efficient, low cost manufacturing, cost control, and support and monitoring of efficiency in value chain activities (Miller, 1986) for high volume products with low margins.

In contrast, proactive behavior manifest in relation to participation in emerging industries, continuous search for market opportunities and experimentation with potential responses to changing environmental trends (Miles and Snow, 1978). A firm using a differentiation strategy focuses on product innovation and uses investments in information technology to enable flexible manufacturing, unique and customizable product designs, inventory management, and support for effective linking of value chain activities to meet customer demands of quality, responsiveness, and preferences (Porter, 1980, Besanko et al., 1996, Miller, 1986).

Miles and Snow identified three recurring viable strategic firm types (Hambrick, 1983). Defenders represent an extreme of a cost leadership continuum, while prospectors represent the same for product differentiation (Porter, 1980, Chan and Huff, 1992). A third category, analyzers, lie between these two extremes on both dimensions (Das et al., 1991). We can interpolate analyzer behavior from that of defenders and prospectors, so we do not explicitly address them separately here. Miles and Snow also identified a fourth organizational type called reactors, who for lack of a conscious strategy (Das et al., 1991), represent strategic failure. We are unable to, and perhaps uninterested in, characterizing the situational behavior of reactor firms, and omit them from further consideration.

STRATEGIC IS PLANNING CONTENT

To the extent that a firm is an information processing mechanism, its information processing capabilities can also be enabled through the development and design of its information systems (Chan and Huff, 1992). Therefore, the functionality of a firm's information systems should enable the information needs demanded by its chosen competitive strategy, and by linking the specific IS functionality to the needs of a chosen strategy, the selected functionality becomes an integral enabler of achieving the strategy.

IS infrastructure refers to the technical, administrative, and organizational internal systems through which information resources are managed (Das et al., 1991). Technical systems include formalized procedures for controlling the operation of a MIS, while organizational systems represent managerial choices about the size, structure and coordination within a MIS. Finally, administrative systems govern employee behavior in the MIS area (Das et al., 1991).

IS technology refers to the dominant computer-based technology (hardware, software, communications, etc.) used by the firm in its information systems (Das et al., 1991). We are generally interested in the type of technology, the level of computerization, and the sources of technology. Technology types include transaction orientation versus decision support, or centralized versus decentralized; technology sources refer to either internally developed versus externally purchased or licensed (Das et al., 1991).

IS STRATEGIC ALIGNMENT AND FIT

Strategic alignment (Henderson and Venkatraman, 1992, Henderson and Venkatraman, 1991) has two dimensions: “strategic fit” and “functional integration”. We can describe strategic fit in terms of the coherence between overall strategy (e.g., strategic firm type) and supporting infrastructure and processes. Similarly, functional integration is the coherence between specific business functions at the strategy level and analogous ones at the infrastructure-process level.

THE METHODOLOGICAL PATH TO AUDITNG FOR A MATURE SIS LITERATURE

Consider a grid defined by two axes with two levels each. With it, we can organize the principle research methodologies for collecting information to use as evidence. We can also select from these alternative methodologies based on the evolution of our existing knowledge as reflected by the richness of our academic literature.

On the vertical axis, we might consider how much evidence that we need or how much that we have. On the horizontal axis, we might represent what we already know about the relationships in our data. If we do not know the inter-relationships in our data, then we may only engage in unstructured, exploratory evidentiary search. On the other hand, when we know how our data fits together, we can collect structured evidential matter to confirm our pre-existing data expectations. See Figure 2.

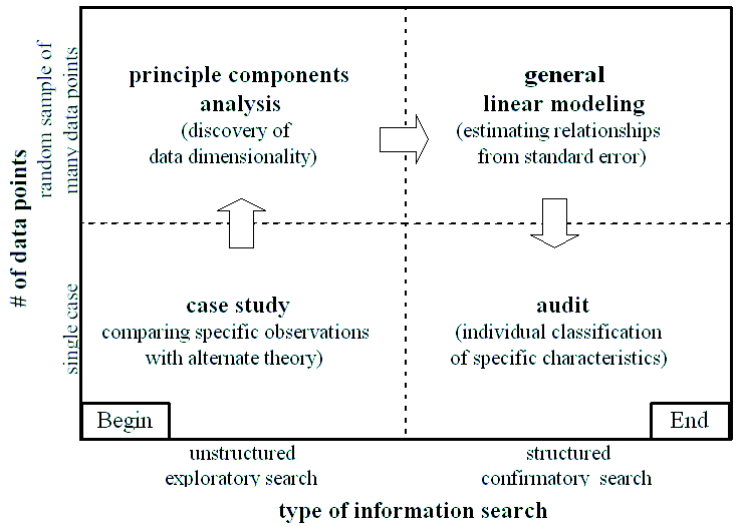

Figure 2. Alternative Research Methodologies

The combination of levels across these two axes defines the principle research methodologies available to the CISA for generating evidential matter. To illustrate, towards the beginning of an investigation, when we know very little about particular issues and characteristics of a firm within its environment, we opt for a case study qualitative methodology that allows us to focus on a single firm and compare our observations of it with some pre-existing body of theory (Glaser and Strauss, 1967). The case study approach can provide great depth of understanding in corporate strategy (Harrigan, 1983).

Then, in order to gain an ability to generalize our knowledge to other similar firms, we move to collecting a set of data from each of many firms. Via a quantitative principle components analysis, we want to know which of our data seems to be measuring the same characteristic across our many sample firms. This is important for two reasons. First, we have more confidence in our measures when there are multiple effective ways to measure a particular firm trait. Second, when several pieces of data measure the same firm characteristic, we can collect less data and still measure the same firm characteristics. It is important to note that our interest lies with extracting a few principle components (concepts) from each of a large group of data. And it is still more important to note that we may not establish the generalizability of our extracted knowledge without successfully projecting it onto a population of other similar subjects.

Next, linear modeling of our data allows us to specify the *average* relationships *between* those concepts we discovered within a large group of data with principle components analysis. This is what our theories must explain.

AUDIT EVIDENCE AS A SURREGATE FOR SOCIAL SCIENCE EPISTEMOLOGY

When our theory tells us what to expect, the conditions under which it arises, and what form it shall manifest, we are ready to apply this knowledge to a single case (firm). That is, we aim to evaluate specific instances of average relationships between aggregated concepts for a specific case in order to classify that specific case according to some criteria, but when researchers conduct studies across several industries, environmental factors may have a much greater influence on firm performance than strategic variables that top management can directly control (Lenz, 1981). This means that we need to apply general rules to specific cases (firms). This is an audit.

Since 1991, U.S. Universities have awarded 868 doctoral degrees in MIS/Business Data Processing (Sanderson et al., 1999). At this rate, we can probably boast of approximately 1,450 MIS scholars as of May 2005. In contrast, The U.S. Department of Labor, Bureau of Labor Statistics estimates that there were 1.2 million accountants and auditors (including CISAs) in 2002. So, it is easy to imagine rich opportunities for research and significant advances in knowledge if the some of the 1,450 could enlist some of the 1.2 million. This would be feasible if the 1.2 million were already substantially trained and predisposed to the prevailing MIS epistemology.

They are.

Since 1975, auditing literature has seen only one major attempt to derive an objective model for evaluating the evidential support needed by auditors to formulate specific conclusions (Toba, 1975). That model indicates that all audits entail one "ultimate" (general) proposition, say proposition "X". In the case of financial statements, proposition "X" might amount to "financial statements present fairly the financial position and results of operations of a company under examination". Then, two elementary propositions determine the type of audit opinion that an auditor would render on proposition "X". The first of these, proposition "Y", is concerned with the degree of conformity of the client's accounting (information tabulation) practices with Generally Accepted Accounting Principles. The second, proposition "Z", is concerned with the auditor's evaluation of the client's system of "procedural integrity", or internal accounting control.

More specifically, in the case of SIS implementations, proposition "X" could be: "our information processing technology reasonably supports our corporate strategic firm type". Now, proposition "Y" becomes "pursuant to relevant academic literature, our strategic defender (prospector) firm type designation ensues from our defensiveness (proactiveness) and from our orientation towards low cost (product differentiation)". Likewise, proposition "Z" becomes "our SIS planning provides for the enrichment of IS development, design, infrastructure, and technology in proportions that are consistent with our strategic firm type".

More generally, proposition "Y", the degree of conformity with accepted practices, is implemented by a complete taxonomy of available data assertions together with directives to consider each during the conduct of each audit (AICPA, 1980). Assertions are representations by management that are embodied in financial statement components, but are substantially similar to those social scientists use connected with their case studies, principle components analysis and general linear models. For example, when CISAs seek to confirm management's *existence* assertion (*AU326.04),* they are pursuing what social scientists would call *internal validity.* This is the effort to establish whether the treatment of interest has caused the results that we see. When CISAs move to confirm management's *completeness* assertion (*AU326.05),* social scientists think of *statistical conclusion validity.* Incomplete specification of statistical relationships usually bias results. Likewise, management's *valuation* assertion (*AU326.07)* is similar *external validity.* Social scientists want to know whether the amount of a measured effect reasonably robustly holds over a variation in persons or research settings. Finally, when CISAs think of the *presentation* assertion (*AU326.04),* social scientists would refer to *construct validity.* This is the question of whether we have labeled phenomena properly.

Social scientists (and audit epistemology) use the term *validity* to refer to the approximate truth of an inference. When we say something is valid, we make a judgment about the extent to which relevant evidence supports that inference as being true or correct; usually, that evidence comes from both empirical findings and the consistency of these findings with other sources of knowledge, including past findings and theories (Shadish et al., 2002). In fact, the taxonomy of validity assertions that auditors (including CISAs) are accustomed to complying with (AICPA, 1980) is a super-set of the framework of four types of validity that academicians care about (Shadish et al., 2002).

CONCLUSION

CISAs are uniquely qualified to audit of SIS. There is no paucity of guidance in this mature literature, and CISAs are already trained in both information systems theory and in audit epistemology. We have only to coordinate and adapt these pieces, pursuant to established canons of financial statement auditing into the form of strategic information system audit programs and procedures.

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