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# A RESOURCE-BASED VIEW OF THE IMPACT OF IS MATURITY ON FINANCIAL PERFORMANCE

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## Abstract

*Does the maturity of an organization's information systems (IS) unit have a measurable impact on the organization's financial performance and is that increased maturity acknowledged by the stock market? Drawing on existing IS maturity literature and organizational performance research, this paper proposes to analyze archival data to assess the impact of IT maturity achievement on key financial metrics. In addition, this paper will determine if the announcement of maturity achievement is rewarded with a "wealth impact" by the stock market.*

**Keywords:** IS Effectiveness, maturity and financial performance

## Introduction

Organizations implement technology with the intention of creating sustainable economic and strategic advantages, however the economic benefit of technology have been mixed (Brynjolfsson 1991; Santhanam 2003). Anecdotal analysis and case studies indicate that successful organizations use technology more effectively than less successful organizations. (Barney 1991; Clemons 1991; Feeny and Willcocks 1998; Karahanna and Chen 2004). Recent studies have used a resource-based view of the organization as the framework for analyzing the impact of information technology on organizational performance (Bharadwaj 2000). The resource-based view contends that resources and skills that are unique to the organization and difficult to imitate can provide a competitive advantage (Barney 1991). One example of a unique and difficult to imitate resource is an organization's internal processes, such as IS processes. Anecdotal evidence suggests that mature IS processes are associated with improved performance, however, no known empirical studies have assessed it at the organizational level. This raises a provocative question: Does improving IS maturity result in increased financial performance?

IS maturity refers to an organization's evolution from chaotic IS processes to rational, measured, and repeatable processes (Ramanujan and Kesh 2004). IS maturity focuses on reducing the cost of systems deployment and operations by implementing continuous process improvement cycles that result in time and cost savings (CMM 2004). By maturing their IS processes, organizations create deeply embedded and organizationally unique capabilities and should be able to realize improvements in organizational performance.

## Theoretical Background

Early studies in organizational success consider the organization's environment and its position within its *external* environment to be the sole predictor of success (Porter 1980). Porter's competitive analysis framework emphasizes the

attractiveness of the environment and its characteristics as the basis for competitive advantage and resulting long-term profitability (Veliyath 2000). Porter's view has been supplanted by the idea that the firm's *internal* resources provide the opportunity for competitive advantage (Wernerfelt 1984). The resource-based view of an organization asserts that the organization's ability to create rare and valuable corporate resources makes those resource difficult to imitate or appropriate by other firms which leads to higher organizational performance and competitive advantage (Barney 1991). This resource-based view has become the dominant theoretical perspective in strategic management (Bharadwaj 2000).

The resource-based view distinguishes resources from capabilities. Broadly stated, resources include an organization's tangible, intangible and personnel resources and include its plants and equipment, financial capital, personnel, brand loyalty, patents and organization culture. These resources form the basic building blocks of an organization. By contrast, capabilities refers to the ability of the firm to assemble, integrate and deploy resources, often in combination with other internal resources (Bharadwaj 2000). By linking an organization's internal resources with other resources, organizations create embedded capabilities that are highly resistant to competitive imitation (Bharadwaj 2000). These capabilities are particularly valuable when they are causally ambiguous, which refers to the inability of an imitating firm to precisely understand the attribute thus reducing its ability to imitate it (Mata, Fuerst et al. 1995). These causally ambiguous attributes include such things as deeply embedded internal processes and procedures (Nelson 1982).

Studies using a process-centric view of resources successfully link improved business processes with improved organizational performance (Hammer and Champy 1993). Practitioners use maturity as a key measure of IS process improvement. In this context, maturity refers to the evolution of an organization's processes from an initial chaotic state to a rationalized, measured and repeatable state. Initial academic research focuses on the attributes of IS maturity and is built upon early stage hypothesis work (Gibson and Nolan 1974) although the stage hypothesis was not supported in further research (King and Kraemer 1984). Subsequent academic research focuses on identifying the attributes that form IS maturity (Benbasat 1980).

The practitioner community seized on the business process revolution and applied it to IS by creating over 150 IS maturity models (Young 2003). Of the 150 models, one of the most widely adopted maturity model is the Capability Maturity Model (abbreviated CMM) developed by Carnegie Mellon, Software Engineering Institute on behalf of the US Department of Defense (Harter 2000; Young 2003). CMM is the de facto standard for application development, personnel management and process definition in the practitioner community (Young 2003). Unlike other models, CMM is highly prescriptive and requires the implementation of numerous activities to advance from an initial level of maturity to the highest level of maturity. CMM uses a five-stage maturity scale to indicate an organization's achievement of increased maturity. In CMM parlance, an organization evolves from an initial, chaotic state (Stage 1) to creating repeatable project management processes (Stage 2) to documenting and standardizing on defined processes (Stage 3) to quantitatively managing processes (Stage 4) to continuously improving optimized processes (Stage 5) (CMM 2004).

Research linking maturity to improved outcomes is limited. One study, using the stage hypothesis model to assess IS maturity, reports that increasing IS maturity leads to an improved ability to increase firm performance through achievement of its global technology-based initiatives (Karimi and Gupta 1996). An analysis of the relationship between process maturity, quality and cycle time for software development projects shows that higher levels of process maturity, as measured by CMM, improve product quality but also increase development effort (Harter 2000). Research conducted at the project level shows that improving maturity results in improved project performance, however the study notes that observable benefits were not obtained at each maturity level (Jiang 2004). No known studies compare maturity impacts on financial ratios. It is logical to expect that increased maturity would result in improved internal cost ratios since organizations should be able to develop and implement less costly systems. Similarly, revenue ratios should be improved by increased maturity since the systems developed using mature processes should be more responsive to the needs of the business. With better cost and revenue ratios, profitability should also improve. However, previous research implies that this improvement may not be a straight line improvement, rather the improvement may be most dramatic at early maturity levels and flatten out at higher maturity levels.

Does the stock market view maturity as a transformational announcement? Positive stock market reaction has been linked to CIO announcements (Chatterjee, Richardson et al. 2001), improved IT capability (Santhanam 2003), IS investment (Dos Santos 1989) and other IS related competitive maneuvering (Dehning 2003). If increased organizational maturity results in improved organizational performance, the stock market should react positively to announcements of IS maturity achievement, however, no known studies have assessed this.

### ***Summary and Hypotheses***

Thus the review of literature suggests that:

- An organization's internal processes can be a source of competitive advantage because they are difficult to imitate by competing firms. Maturing IS processes are likely to impact the financial performance of the organization however significant incremental impact is only achieved for early to moderate levels of maturity.
- *Proposition 1: The relationship of IS organizational maturity achievement to financial performance will be curvilinear.*
- IS maturity results in improved financial performance and investors value positive transformational IS activities when attainment of a particular level of maturity certification is announced.
- *Proposition 2: The market will reward the achievement of all levels of maturity certification.*

The research model for this paper follows.



**Figure 1 - Research Model**

## **Methodology**

The methodology described in this section follows an archival framework and is consistent with recommended scholarly practices (Gray 2004).

### ***Dependent Variable: Financial Performance***

The dependent variable in this analysis is financial performance. A review of the literature reveals several ways to assess financial performance. An organization's performance can be measured using financial measures (e.g. profitability, sales growth etc), operational indicators (e.g. market share), stock price or using a combination of factors. An argument is made that using secondary sources to operationalize financial data improves the operationalization of the dependent variable (Venktraman 1986). Within the domain of financial performance, numerous financial ratios are available, and the ratios fall into four major categories: profitability ratios, cost ratios, growth ratios and valuation ratios (Venktraman 1986).

We follow previous literature and use the thirteen most common financial ratios to measure financial impact and sustainability (Karahanna and Chen 2004). Because each financial ratio covers a different dimension of financial performance, the financial ratios are assessed individually rather than as a single composite construct. These financial ratios are commonly used in both strategic management and MIS literature (Venktraman 1986) and are available from the

*Compustat* database. The theoretical support of these financial measures is demonstrated in prior literature (Karahanna and Chen 2004) and are shown in the table below.

**Table 1 – Financial Measures (source: Karahanna and Chen)**

Financial Ratio	Calculation	Supporting Literature
<i>Profitability ratios:</i>		
ROA	[Net income + Interest (1-Tax rate)] / Total assets	Bharawaj, 2000; Santhanam & Hartono, 2003; Gilley & Rasheed, 2000; Anderson & Segars, 2001; Tam 1998; Weill 1992; Cron & Sobol, 1983
ROS	Net income/Sales	Bharawaj, 2000; Santhanam & Hartono, 2003; Gilley & Rasheed, 2000; Markus and Soh, 1993; Cron & Sobol, 1983; Anderson & Segars, 2001
OI/A	Operating income / Total assets	Bharawaj, 2000; Santhanam & Hartono, 2003
OI/S	Operating income/Sales	Bharawaj, 2000; Santhanam & Hartono, 2003; Anderson & Segars, 2001; Markus and Soh, 1993
OI/E	Operating income / total # of employees	Bharawaj, 2000; Santhanam & Hartono, 2003; Weill, 1992
<i>Cost ratios</i>		
COGS/S	Cost of goods sold / Sales	Bharawaj, 2000; Santhanam & Hartono, 2003
SG&A/S	Selling and general administrative expenses / Sales	Bharawaj, 2000; Santhanam & Hartono, 2003
OEXP/S	(COGS + SG&A) / Sales	Bharawaj, 2000; Santhanam & Hartono, 2003
<i>Growth ratios:</i>		
SALESGR	Ending values/ Beginning values	Richard 2002; Brown & Perry, 1994; Weill 1992; Venkatraman & Ramanujam, 1985; Cron & Sobol, 1983
NIGR	Ending values/ Beginning values	Venkatraman & Ramanujam, 1985
EPSGR	Ending values/ Beginning values	Kurakto et al., 2001
<i>Valuation ratios:</i>		
P/E	Year-end Stock Price / Earnings	Brown & Perry, 1994
MKT/BK	Year-end Market value / Book Value	Brown & Perry, 1994; Montgomery et al., 1984; Kudla, 1980

There are several limitations to using financial ratios to assess firm performance including the ratios' sensitivity to changes in accounting practices. (Bharadwaj 1999). However, we believe that using financial ratios and stock price performance better enables us to compare the immediate "wealth impact" and long-term financial impact of maturity on financial performance thus this analysis uses financial ratios and stock price as the reflective indicators of financial performance.

### Sample Selection

There are numerous models for assessing IS organizational maturity however the Capability Maturity Model (CMM) is perhaps the most widely accepted model of IS maturity within industry. CMM uses a five-stage model that traces IS process maturity from an initial chaotic state to one with optimized and continuously improved processes. Because of its widespread use in the practitioner community and its general consistency with other maturity measures, we use CMM to measure IS maturity. CMM measures have high face validity within the business community and the description of CMM maturity levels is well-known within practitioner circles. Other academic studies have also use CMM to assess IS process maturity (Harter 2000; Jiang 2004).

The initial source of data for this analysis is a list of 2500 firms that publicly announced their maturity levels after having an external appraisal performed. The announcements cover the period from 1995 to 2003 and were captured and reported by CMM for a period ending in April 2003. Numerous firms report their certification at several levels during that time period thus longitudinal and cross-sectional data is available for analysis. This study recognizes that CMM maturity level is often used as a pre-requirement for outsourcing vendors to qualify for government contracts (Gartner Group: Feiman 2002). Because this study is interested in the financial impact of maturity and not marketing impact, consulting firms are eliminated from the sample, yielding a sample of 1000 organizations.

### ***Financial Ratio Methodology***

This analysis is both cross-sectional and longitudinal. For the cross sectional analysis, we will analyze financial ratios at each maturity level. Since the distribution of industries within any given maturity level is not random, this analysis will use a randomized sample of 30 financial services organizations per maturity level as the sample for this analysis. This creates a sample size of 150 organizations. The financial service industry was selected for this analysis since it has a high reliance on information technology and more consistently announces its CMM achievement than in other industries.

Using a randomized approach controls for confounding variables, such as industry and time. We will use the *Compustat* database to determine the organization's financial performance over a five year period starting from the date of their maturity announcement. Ratios will be gathered for each organization and will be averaged by maturity level for analysis.

Numerous organizations met and reported several achievements of maturity at multiple levels thus a longitudinal analysis will also be conducted. Using the same sources of data as for the cross-sectional analysis, the longitudinal analysis will examine the changes in financial performance for the five years following each announcement for each of the organizations that reported more than one maturity level achievement.

### ***Event Study Methodology***

Do investors recognize the value of achieving IT organizational maturity? Using an event study methodology, studies show that positive abnormal stock price reactions to CIO job announcements (Chatterjee et al. 2001). Event studies are widely used in accounting, finance and management studies (Ball 1985; Brown 1985). Other studies have also used event analysis to measure the stock market impact of IT investment announcements (Dos Santos 1989) and transformational information technology investments (Dehning 2003).

We also use an event study methodology to assess stock market reaction to the announcement of maturity certification. Our sample population is the same 150 organizations used in the financial ratio analysis. Using publicly available maturity certification achievement announcements that have been gathered by CMM as Day-0 measures, we analyze stock price prior to the announcement (Day-1), day of the announcement (Day-0) and the day after the announcement (Day+1) to determine the stock price change. Outlier data will be examined to determine if any confounding company announcement (e.g. notice of acquisition) impacted the stock price.

## **Summary and Conclusions**

We believe that a study on the relationship between IS organization maturity and financial performance makes an important contribution to both IS researchers and practitioners. In terms of theoretical contributions, we seek to understand if increased IS maturity improves organizational performance. We believe that this relationship, although assumed, will benefit practitioners by determining if maturity matters, how much it matters, and how long before the affects are observable.

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