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# **Information Technology Adoption Patterns, Debureaucratization and Economic Performance: An Empirical Study in the Insurance Industry**

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## **Introduction**

The goal of our work is to investigate how information technology contributes to performance. The specific research question can be expressed as: What is the variance in organizational economic performance that can be explained by the combination of choices in information technology adoption and debureaucratization of organizational structure? Our approach considers data collection and analyses at the firm level within a specific industry.

Traditionally, there has been a scarcity of large-scale empirical attempts in this area of investigation. Typically, much of the work relies on cross-sectional, case-based studies which provide rich contextual descriptions, but offer limited generalizability across organizations (Vitalari 1985). The few large empirical works consider IT at an overly aggregate level such as industry or total firm investments (cf. Morrison & Berndt 1990; Siegel & Griliches 1991; Strassman 1990; Roach 1989; Weill 1990; Brynjolfsson 1993; Hitt & Brynjolfsson 1994). Although these studies are important contributions, overall many of their findings are conflicting.

We believe the ambiguity in findings can be attributed partly to two shortcomings. First, is the focus on directly linking IT investments with firm performance while downplaying other contingency variables such as organizational structure (surveys by Brynjolfsson 1993 and Wilson 1995 highlight this orientation). Robey (1977) suggests that IT as the sole independent variable for questions dealing with organizational change or consequence is insufficient and suspect. Second, is an aggregation bias problem which results from considering IT using aggregate investment measures. That is, different types of IT may have varying performance implications. The paper elaborates on an alternative approach to remedy these problems.

## **Research Approach and Plan**

The relationship between information technology, organizational change and performance is likely to vary depending on the type and application of the technology. Accordingly, in our research we adopt a disaggregate and evolutionary view of "IT". In particular, we focus on mainframe/mini computer, micro-computer, and networks as fundamental components of IT infrastructure (Zachman 1987; Seger & Stoddard 1993, CSC-Index 1994). This focus is evolutionary since these technologies emerged chronologically and have typically been introduced into organizations accordingly. Our approach is concerned with the adoption patterns of these fundamental technologies over time, and their interaction with changes in organizational structure as they effect performance (as diagrammed in Figure 1 below).

Our evolutionary approach allows us to capture variations in the way different information technologies are used to enable different ways of organization. We expect that over the last fifteen years, organizations have adopted IT such as micro-computers and networks in conjunction with major changes in structure. As a result, we expect to find varying effects on performance depending on whether IT is implemented together with organizational change, ahead of it, or post facto.

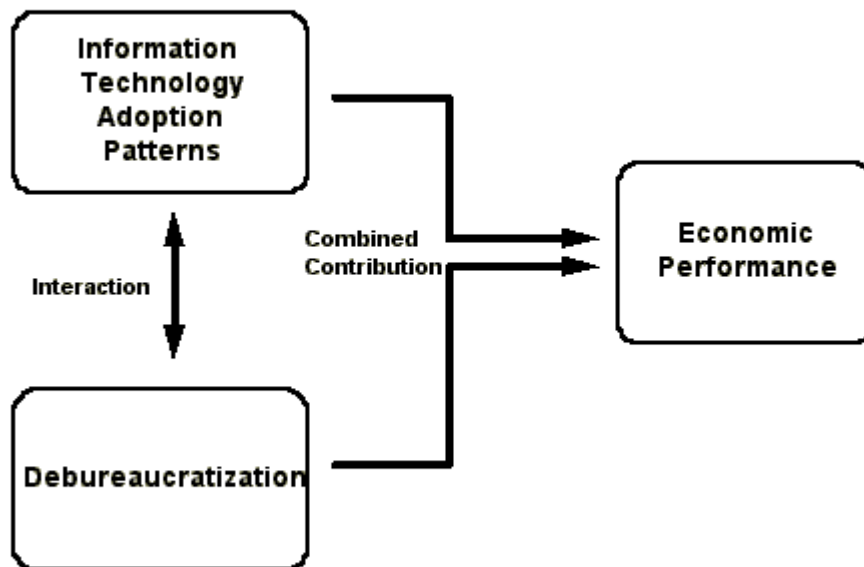
Structural changes in organization are described in terms of bureaucratization. Specifically, the characteristics related to the location and distribution of its formal roles and work units. In this research we consider span of supervisory control or maximum number of reports to an individual; the number of hierarchical levels in an organization; and administrative intensity, or the number of individuals in administrative vs. support roles (Scott 1992).

For the organizations in the sample, we collect data from public sources such as annual reports, on events affecting the structural characteristics of concern. For example, when a company declares that it is laying off "white-collar" employees, flattening its organization structure, or restructuring to consolidate divisions. These data are coded on a time line as discrete events of "debureaucratization" and superimposed on the data for information technology adoption.

Finally, economic performance is measured using both traditional financial indicators and measures we are developing based on "Added-Value-Theory" (Brandenburger & Stuart 1995). Traditional financial indicators including Return on Equity (ROE),

**Figure 1.**

**AN INTERACTIONIST MODEL OF THE EFFECT OF IT & DEBUREAUCRATIZATION ON ECONOMIC PERFORMANCE**



Return on Sales (ROS), Return on Investment (ROI) and Return on Assets (ROA) are used as broad metrics of economic performance. Industry specific measures of performance will also be considered.

**Primary Propositions**

Below we present a set of "primary" propositions we intend to test. These will also be broken down into sub-propositions which disaggregate information technology by type (mainframes/minis, micro-computers, and networks) and consider the different structural characteristics (span of control, number of hierarchical levels and administrative intensity). It is expected that as we proceed with the data analysis, these propositions will evolve and other propositions not considered below will emerge.

**P1:** The contribution of information technology to economic performance is greater for early adopters.

This proposition allows us to uncover whether companies benefit from early adoption of technology or suffer consequences of legacy choices as technologies evolve. On one hand, it seems intuitive that early implementors capture competitive advantages from technology. On the other hand, early investments in a technology may constrain a company's choices in adopting future technologies. For example, a large investment in mainframes in the early 1980's may make a company a late adopter of micro-computers.

**P2:** The contribution of an information technology to economic performance varies based on experiences with earlier information technologies.

Companies with positive experience using information technology may have more opportunities to be leaders in adopting new technologies. This in turn may perpetuate benefits from successful adoption.

**P3:** The contribution of information technology to economic performance is greater for organizations which undergo debureaucratization.

The joint contribution of IT and changes in organization structure better explain the variance in economic performance, than information technology alone.

**P4:** The order of information technology and changes in organization structure contributes to economic performance.

This proposition allows us to capture not only the contribution of IT and the contribution of change in structure to performance, but also the effect of their interaction together. It allows us to understand when the greatest benefits from the combined effects of IT and changes in organization structure can be observed. For example, when IT and change in structure occur together within a short time period there is a greater contribution to performance.

## **Operationalization and Results**

We are currently collecting data on IT from 50 companies in the insurance industry using survey methods. The data includes disaggregate investments in technology, as well as chronological data on adoption, scale of adoption, and penetration levels. Structural change and economic performance data are both being collected from public sources. Data is longitudinal and spans the last 15 years.

It is expected by the time of the conference we will have preliminary findings to address the research question and propositions. The bulk of the data analysis will use hierarchical linear regression modeling, a technique which overcomes aggregation bias and autocorrelation problems typically associated with the kind of data under consideration.

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