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A Framework for Managing Flexibility in The Information Systems Function✧

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Abstract

Competitive pressures are forcing organizations to be agile and flexible. Response to changing environmental conditions is an important factor in determining corporate performance. Organizational flexibility is in turn closely related to the management of information systems. Organizations with flexible IS functions are in a position to be more responsive and take advantage of changes in both their internal and external environments. Conversely, inflexibility in IS can inhibit organizational growth and put a company in a competitive disadvantage.

This paper argues that IS flexibility is a multi-dimensional concept. Grounded theory methodology is used to empirically derive a taxonomy of several types of flexibility and flexibility management strategies.

Introduction

Current business environments often require organizations to be agile and flexible (Kulatilaka and Marks) in order to be responsive to changing business requirements. Flexibility of organizations is often related to their Information Systems (IS). For example, the ability of an organization to rapidly change its product mix is likely to be influenced by the degree of integration of manufacturing activities supported by the IS (computer integrated manufacturing).

Earlier research has argued that flexible organizations require flexible infrastructures (Lucas and Olson, 1994). However, describing, measuring and managing flexibility of the IS architecture is difficult (Kumar, 1999). Past research on flexibility in the IS domain has dealt with the concept in a one-dimensional way. Our proposition is that IS flexibility is a multi-dimensional concept. In order to manage it effectively, we need to understand the various dimensions, the linkages and tradeoffs between them, and the possible strategies for proactively managing flexibility.

This research aims at providing an enhanced understanding of IS flexibility. The paper attempts to build a theory for analyzing flexible IS functions. Several types of flexibility that are desirable in an IS function are identified, defined, and illustrated. The relationships between different IS activities and different types of flexibility, as well as strategies for achieving IS flexibility, are explored.

The following specific research questions are addressed:
(i)   What does IS flexibility mean? What are the different types of IS flexibility?
(ii)   How can the different types of IS flexibility be managed?

Theoretical Foundations

The Concept of Flexibility

The OM literature recognizes the fact that manufacturing flexibility is an important part of organizational flexibility and performance (Sethi and Sethi, 1990). Also, there is considerable emphasis on the fact that the term flexibility means different things to different people, and the need to understand the context in which flexibility is used. Several types of manufacturing flexibility have been identified in the literature (Table 1).

Table 1. Manufacturing Flexibility	
Type of Flexibility	**Description**
Volume	Ability to vary production volume
Expansion	Ability to vary maximum production volume (capacity)
Process	Ability of a manufacturing process to produce different types of parts without major process changes
Machine	Different operations that can be performed on a machine without prohibitive effort in switching from one operation to another
Operational	Ability of a particular part to be produced in one of many ways
Product	Ability to alter the product mix with existing equipment and major setup
Routing	Ability to produce a part by alternate routes through the system

IS enable organizations to adopt flexible strategies (Clemons and Weber, 1994; Duncan, 1995; Allen and Boynton, 1991). One common argument is that present day IS allow companies to adopt a wider and more finely tuned (flexible) set of strategies than those suggested by Porter (1985). However, the IS literature does not clearly distinguish between different types of flexibility.

Organizations and IS Flexibility

The nature of organizations and the environment in which they function can have a major impact on IS. Changing environmental or market conditions, such as increased competition or new governmental regulations,

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can result in the need to develop or modify systems and impact the volume of IS activity by changing project deadlines and resource requirements. The nature of the business and its dependence on information technology can influence the degree of flexibility required of IS. For example, a financial institution that is extremely dependent on information technology would require a high degree of flexibility to operate in spite of system failures. Corporate strategy can also impact the degree of flexibility required from IS. For example, a company that frequently introduces new products and services would require a different degree of IS flexibility compared to a company that uses cost leadership as a strategy but does not frequently modify its product mix. It is therefore desirable to build some degree of flexibility into the IS function but the importance and nature of flexibility is organization and function-specific.

Methodology

This research uses grounded theory (Strauss and Corbin, 1997) to identify different types of IS flexibility, to relate them to specific IS activities, and to determine strategies for gaining IS flexibility. We start with the taxonomy of manufacturing flexibility in Table 1, and ask the following question: "Is this taxonomy valid in the context of the IS function?" We look for empirical evidence of validity by analyzing secondary data in the form of published descriptions and case studies from practitioner and academic literature. The theory (taxonomy of flexibility) is refined based on empirical evidence. Constant iteration between theory and practice is undertaken in order to refine the taxonomy of flexibility. A match between empirical evidence and theory reinforces the theory. At times, empirical evidence that is not supported by theory results in additions to theory (e.g., a new type of flexibility, or a modification of the definition of a type of flexibility).

Data Collection

We have surveyed the literature on manufacturing, management, organizational, and IS flexibility and collected a variety of secondary data. We have developed a preliminary taxonomy of types of IS flexibility. We are currently developing a framework relating these to IS activities and strategies. Preliminary results are provided in the following section.

Analysis & Results

Information Systems Flexibility Taxonomy

The IS function can be actively managed to ensure IS flexibility. Such flexibility can benefit the entire organization. IS flexibility is a multidimensional concept. Table 3 identifies different types of IS flexibility based on our analysis of secondary data so far.

Table 3: IS Flexibility	
Volume Flexibility	• **What**: Ability to vary the short-term quantity of products/services • **Why** Important: Deadlines for reports, special business events, new projects • *Example*: Ability to assign person-hours to an unplanned project
Location Flexibility	• **What:** Ability to vary the location of execution and delivery of IS services • **Why** Important: Globalization; System malfunction; Mobile workforce • *Example*: Ability to provide system access from multiple geographically dispersed devices
Systems Development Flexibility	• **What:** Ability to easily change the specifications of a systems development project • **Why** Important: Changes in business conditions; Better understanding of requirements as project progresses • *Example:* Using rapid application development tools to quickly modify system features
Operating Flexibility	• **What**: Ability to meet commitments by varying the mix of IS resources • **Why** Important: Personnel turnover or absenteeism, hardware or software failure • *Example*: Using backup systems and procedures to minimize downtime
Output Customization Flexibility	• **What:** Ability to vary the frequency, content, and distribution of system output • **Why** Important**:** Multiple system stakeholders and variability in user requirements • *Example*: Web sites that customize content for different users
Staffing Flexibility	• **What**: Ability to hire the best people available or people with specialized skills • **Why** Important: Business location, Company reputation & size • *Example*: Use of outsourcing to get highly skilled programmers to work for small company at remote location

Framework for Managing IS Flexibility

We will present a framework describing types of IS flexibility for various IS functional activities, the need for flexibility, and representative strategies for the management of flexibility. This is work in progress and Table 4 contains illustrative examples based on analysis of collected data using the Grounded Theory methodology.

<div align="center">**Table 4: IS Activities, Flexibility, and Strategies**</div>

IS Activity	Flexibility Type	Causal Conditions / Need for Flexibility	Flexibility Strategy	Example/Quote
• Data Architecture Planning	• Volume • Output Customization	• Need to satisfy users who have different data requirements at different points in time.	Broker based publish and subscribe data architecture	• Use of CORBA based architecture to distribute data objects selectively.
• Project Management	• Staffing	• Need to "get smart enough, fast enough to keep abreast of rapid change." • Need to adapt to fast-paced global markets and technology changes leading to new projects. • Need to "get around" constraining staffing policies.	Interim (Project) Hiring	• Firm hires contract project managers. "Try-before-you-buy" tactic.
• Systems Operation • Systems Integration • Network Management	• Operating • Systems Development	• Need for flexible connectivity to disparate systems	• Use of Internet-based network with gateways to other systems. • Emphasize scalability, redundancy, and reliability in network design.	• "Our [Internet-based] network … allows us to create gateways with some of the outdated legacy protocols still in wide use in the industry." • "Until Sabre catches up with National, the latter will have to maintain flexible connectivity so that Sabre's problems don't frustrate National's customers."
• Infrastructure Architecture Planning	• Location	• Need to accommodate different users in a variety of settings (locations)	Wireless solution using a radio LAN	• "Choosing the flexibility of a wireless solution means the company can put the kiosks anywhere within the stores."

Future Research

Future research will examine the tradeoffs and consequences of pursuing various strategies for managing the different types of IS flexibility?

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