The influence of IT sophistication on strengthening organizational structure, performance, and adaptability

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Abstract

In organizational theory research, the connection between the use of IT within organizations and its influence on organizational structure has been a long-standing area of interest. However, with technology evolving at a rapid pace, it is crucial to revisit and reassess these established relationships, particularly in terms of their impact on organizational performance. Moreover, this topic has been rarely explored in the Indian context. To address this gap, an empirical study was conducted among employees from various Indian organizations, using a comprehensive tool to measure IT sophistication, organizational performance, adaptability, and structural characteristics. The findings revealed that IT sophistication is positively correlated with both performance and adaptability. Among structural characteristics, centralization showed a negative correlation with IT sophistication, while participation showed a positive correlation. Additionally, the relationship between IT sophistication and organizational structure was stronger in high-performing businesses compared to low-performing ones. Differences also emerged between sectors: service sector firms became more informal as IT sophistication increased, and the correlation with performance was higher in service firms than in manufacturing firms.

Keywords: Adaptability, Information technology, Organizational behavior, Organizational performance, Organizational structure.

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1. Introduction

Innovations in microprocessor technology since the 1970s have led to the widespread adoption of computers across the economy in various forms. Advances in communication technologies such as fiber optics, satellites, and wireless communications have further introduced a range of devices like fax machines, smartphones, and tablets. The convergence of

computing and communication technologies has transformed computers into powerful, versatile tools, making them indispensable across many fields. As these technologies have become more pervasive, they have significantly influenced the ways individuals and businesses operate, making it crucial to study how information technology impacts organizational structures and broader economic growth.

In an increasingly globalized world, organizations are under constant pressure to become more competitive and deliver the latest products to customers in the most cost-efficient ways. The accelerated pace of innovation and shortened product life cycles require organizations to fundamentally rethink how they operate. A flexible management approach, combined with open communication networks among different organizational units, helps foster this efficiency. Leveraging information and communication technologies as integral tools and sharing their outcomes sets the foundation for building more productive organizations.

Today, business environments are evolving rapidly and unpredictably. It has been suggested that for organizations to remain effective and relevant, they must learn and adapt faster than the changes happening around them [1].

While there is a strong belief that IT innovation positively impacts firm performance, research findings on this relationship remain inconsistent. Moreover, as IT has become a standard strategic tool across industries, the competitive advantage it once offered in its early days may have diminished or plateaued over time.

2. Literature Review

2.1. Information Technology

Information Technology (IT) encompasses all the hardware and software that an organization needs to achieve its goals [2]. Alternatively, IT can be defined as the products, methods, developments, and standards used to generate and process data [3].

A firm's IT resources can be divided into two main categories: IT infrastructure and IT human resources. IT infrastructure includes hardware, communication technologies, software, shared technical platforms, and databases [4, 5]. Organizations typically allocate nearly 40% of their total capital expenditures toward infrastructural technologies [6]. IT human resources, on the other hand, involve salaries, training costs for IT staff, and the expenses associated with teaching IT skills to end users [4].

The primary goal of investing in IT is to enhance a firm's competitive advantage and overall performance [7, 8]. According to Bergeron et al. [9], it is essential to align the business strategy, organizational structure, IT strategy, and IT infrastructure. IT must "fit" with a firm's strategy, structure, and environment to be truly effective.

2.2. IT Sophistication

IT sophistication refers to the nature, complexity, and interconnectivity of IT usage and control within an organization [10]. It serves as a measure to evaluate how mature an organization's IT deployment is and how it influences business activities.

Experts view IT sophistication as a key organizational asset [11]. It is generally measured across three dimensions: the level of IT use, the extent of its integration, and the breadth of its application [12]. IT sophistication encompasses various technologies (both software and hardware), systems, telecommunications equipment, information databases, and shared services such as Electronic Data Interchange (EDI), email, document management systems, video conferencing, and remote collaboration tools.

2.3. Organization Structure

Organizational Structure (OS) refers to the internal framework of relationships within and between different units of an organization, clearly defined across levels [13].

Campbell et al. [14] provided a useful distinction between the "primary" characteristics of organizations such as size, hierarchy, and span of control and "structural" characteristics, which pertain to the rules and procedures guiding employee behavior.

2.4. Organizational Performance

Nitzl et al. [15] explored factors influencing sophisticated applications of accrual accounting in German public administration. They found that the contextual environment was the strongest driver of such sophistication.

Ahmad et al. [16] showed that greater employee involvement leads to lower turnover and higher productivity. Gandomi [17] used a resource-based perspective to find that firms processing big data achieve higher organizational performance when they use sophisticated tools.

Charles et al. [18] proposed a conceptual framework for building successful digital firms, emphasizing self-organization rather than traditional hierarchical structures. They suggested that "actor-oriented" principles enhance creativity and engagement among employees.

Cascio and Montealegre [19] reviewed how emerging information and communication technologies disrupt organizations, especially in human resource functions.

Barroso et al. [20] examined performance measurement system (PMS) sophistication, using a scale to differentiate between basic finance-driven systems and more advanced, strategy-linked ones.

Ratna and Kaur [21] found that job satisfaction has a greater impact on performance in the IT sector compared to other factors like health and safety or work-life balance. Similarly, Ratna [22] observed that higher job satisfaction could reduce employee attrition.

Cappelli [23] challenged the notion of a skills shortage in the U.S. labor market, suggesting instead that over-education is a persistent and growing issue.

Brynjolfsson and McAfee [24] explored how digital technologies are reshaping economies and lives, offering immense opportunities but also posing new challenges.

Daft [25] defined firm performance as an organization's ability to achieve its goals through efficient resource use, a view echoed by Riccardo [26] and Venkatraman and Ramanujam [27].

2.5. Organizational Adaptability

Birkinshaw and Gibson [28] defined organizational adaptability as the ability to swiftly seize new opportunities, respond to unpredictable markets, and avoid complacency. It reflects an organization's capacity to adjust its structures and processes in response to changing environments.

While adaptive IT can support greater adaptability, it is neither a necessary nor sufficient condition on its own. Das et al. [29] found that emotional intelligence significantly enhances efficiency in the service sector, which can be a key factor in adaptability.

2.6. IT Sophistication and Organizational Structure

Nadler in Gerstein [30] emphasized that IT is one of the most powerful forces shaping organizational planning and structure.

Past research has shown that IT promotes decentralization by enabling the easy sharing of information across all levels of an organization [31, 32]. On the flip side, increased IT use can also lead to higher formalization by requiring clear documentation of systems and decision processes [33].

However, IT has also enabled more flexible, remote working environments. As Jenner [34] pointed out, employees can now access the information they need anytime, anywhere, reducing the need for rigid office-based operations and potentially making organizations more informal.

Organizational structure has been described in terms of centralization, formalization, and complexity [35, 36]. Companies with more decentralized and diverse structures tend to exhibit greater structural complexity [37].

Raymond et al. [38] found a strong relationship between IT sophistication and organizational structure, which in turn positively influenced performance, although their research was largely focused on medium-sized manufacturing firms.

2.7. IT Sophistication and Organizational Performance

Previous studies on IT and organizational performance have mainly focused on the strategic use of IT and how IT integration impacts firm outcomes. In competitive environments, organizations need comprehensive IT systems to manage critical operational areas [39, 40].

Research by Boynton et al. [39], Ravichandran and Lertwongsatien [41], and Mahmood and Mann [7] suggested that IT development can reshape strategic issues such as cost structures and supply chain relationships, offering competitive advantages. However, some critics argue that since IT can be easily imitated, its strategic advantage may be temporary [42, 43].

While many studies found a positive link between IT investment and organizational performance, other research reported negligible or inconsistent relationships [44-46].

2.8. Research Gap

From the literature, it is clear that while many authors have established positive correlations between IT, organizational structure, and performance, there is also evidence of weak or contradictory relationships.

Furthermore, the role of the external environment a key focus of contingency theory has not been adequately quantified in these studies. Most of the existing research was conducted before the 2010s, and since then, rapid technological advancements such as big data analytics and artificial intelligence have dramatically reshaped the IT landscape. Today, IT capabilities are relatively uniform across industries, and the competitive advantage once derived from IT may have diminished.

Thus, there is a need for updated research that considers the current technological environment and its influence on the relationship between IT sophistication, organizational structure, and performance.

3. Research Model and Hypotheses

3.1. Objectives of the Study

This research aims to explore how IT influences organizational design and overall firm performance. It will also assess how the industry sector in which a firm operates affects the benefits gained from IT implementation. The specific objectives of the study are:

i. To examine the impact of IT on organizational design and firm performance.
ii. To evaluate how different industry sectors, influence the outcomes of IT implementation.

3.2. Hypotheses

Based on insights from the existing literature and aligned with the study's objectives, the following research model has been developed.
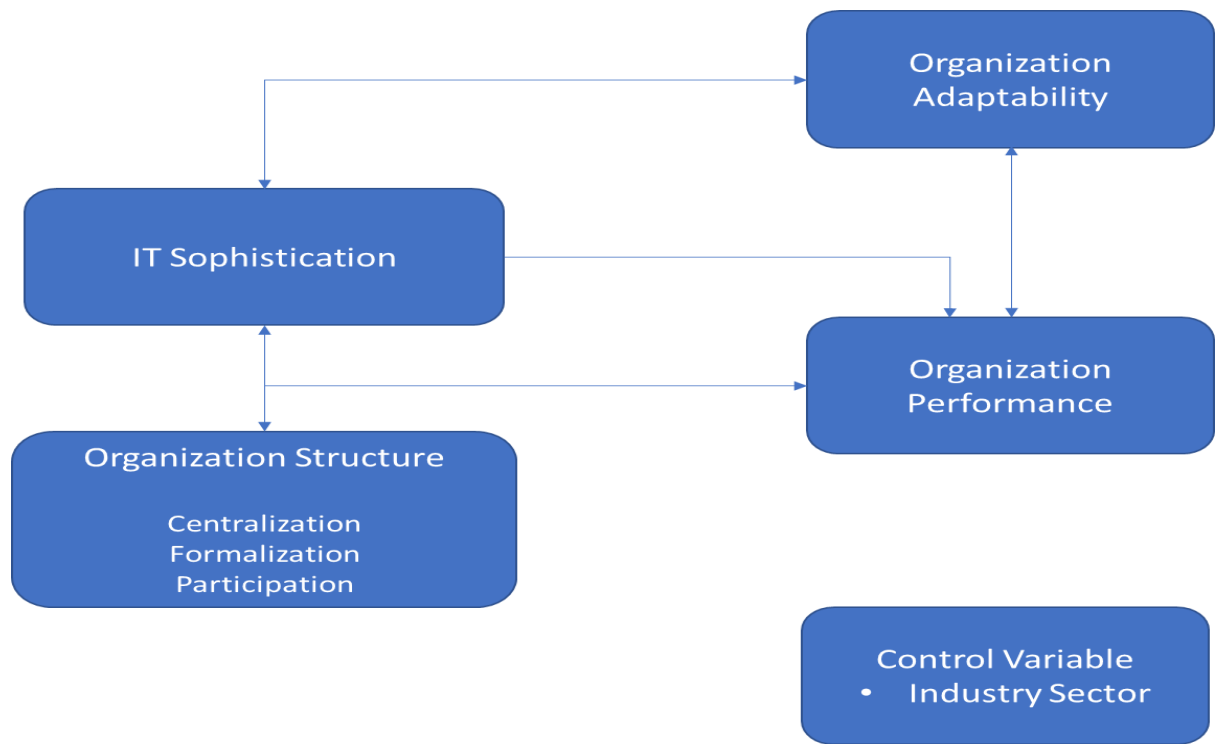
Figure 1.
Research model.

Based on the research model outlined above, the following hypotheses are proposed:

H_1: *There is a positive relationship between IT sophistication and organizational structure.*

H_2: *IT sophistication is positively associated with organizational performance.*

H_3: *IT sophistication is positively related to organizational adaptability.*

H_4: *The relationship between IT sophistication and organizational structure will be stronger in high-performing firms compared to low-performing firms.*

4. Methodology

4.1. Sample

The study was conducted among current and former employees from various organizations. For ease of access, most respondents were selected from the alumni network of the researcher's institute. The majority of participants held either an MBA or a postgraduate diploma. Respondents came from a wide range of organizations across different industry sectors located throughout the country. Data were collected using a self-administered questionnaire comprising 54 items, designed to measure four key variables: IT sophistication, organizational structure (specifically centralization, formalization, and participation), organizational performance, and organizational adaptability.

The questionnaire was developed by combining validated measurement scales corresponding to each variable in the study model. A total of 167 responses were gathered, out of which 163 valid responses were retained for the final analysis.

4.2. Measurement

The study variables, IT sophistication, organizational structure, organizational performance, and adaptability were assessed by adapting established, standardized scales from previous research.

Table 1.
Standard scales adopted.

Variable	Scale
IT Sophistication (IT)	Salleh [47]
Organization Adaptability (OA)	Mott [48]
Organization Structure (OS)	Hage and Aiken [49]
Organization Performance (OP)	Khandwalla [50]

All the scales were adapted to fit the current Indian context, and responses were recorded using a 5-point Likert scale.

5. Results

5.1. Reliability Test

The reliability of the items for each variable was tested using SPSS 22, and the results showed that Cronbach's Alpha exceeded the 0.7 threshold. This indicates that the instrument is reliable and suitable for repeated use.

5.2. Correlation Analysis

A correlation analysis was conducted using SPSS 22 to examine the relationships between all the variables.

Table 2.
Correlation Matrix.

Correlations									
	OP	**OSP**	**OSC**	**OSF**	**OA**	**IT**	**IT-EOU**	**IT-IOU**	**IT-INT**
OP	1								
OSP	0.175*	1							
OSC	-0.242**	-0.036	1						
OSF	-0.064	0.081	0.330**	1					
OA	0.243**	0.261**	-0.094	0.189*	1				
IT	0.352**	0.217**	-0.311**	-0.092	0.204**	1			
IT-EOU	0.385**	0.206**	-0.188*	-0.047	0.246**	0.899**	1		
IT-IOU	0.297**	0.183*	-0.365**	-0.132	0.152	0.938**	0.727**	1	
IT-INT	0.239**	0.204**	-0.207**	-0.008	0.152	0.778**	0.664**	0.611**	1

Note: *. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

From the table above, it is clear that IT Sophistication is strongly correlated with both Organizational Performance ($r = 0.352$, $p < 0.0001$) and Centralization ($r = -0.311$, $p < 0.0001$). The negative correlation between IT and Centralization suggests that as IT sophistication increases within an organization, it tends to become more decentralized. Additionally, IT shows a moderate positive correlation with Participation ($r = 0.217$, $p < 0.005$) and Adaptability ($r = 0.204$, $p < 0.009$).

The extent of IT use has a strong positive correlation with Organizational Performance ($r = 0.386$, $p < 0.0001$), while the intensity of IT use is strongly linked to Centralization ($r = 0.365$, $p < 0.0001$) within the organizational structure. However, there is no significant correlation between Formalization and any of the IT sophistication factors.

6. Discussion

6.1. Results of Hypothesis Testing and Inferences

This section discusses the outcomes of the hypothesis testing and the conclusions drawn from them.

6.1.1. Hypothesis 1

The correlation analysis shows that IT sophistication and organizational structure are significantly related. As IT sophistication increases, organizations tend to become more decentralized and participative. This aligns with the literature, which suggests that when information is more widely dispersed within an organization, employees at various levels can make decisions based on the available data. Supervisors can also allow their subordinates to make decisions because they have the tools and visibility to monitor progress and take corrective actions if needed. However, no significant correlation was found between IT sophistication and formalization in most firms, though some correlation was observed in service sector firms.

6.1.2. Hypothesis 2

There was a significant correlation between IT and organizational performance (OP) across the combined sample of 150 firms. This supports the findings in existing literature and justifies the increasing IT budgets in many organizations. It's also possible that the best-performing firms are the ones that can afford to invest in IT sophistication.

6.1.3. Hypothesis 3

In high-performing firms, a strong correlation was found with the structural characteristic of decentralization, whereas low-performing firms did not show a significant correlation. This indicates that for successful firms, aligning the right organizational structure with the right IT system is crucial. When this alignment occurs, organizational performance is likely to improve. On the other hand, failing to achieve this fit may result in lower performance.

6.1.4. Hypothesis 4

There is a positive relationship between organizational adaptability and IT sophistication. This is expected, as organizations that are quick to adapt to changes in their environment and competitors are more likely to adopt the latest technologies that can enhance their competitive edge. Conversely, IT systems help organizations stay adaptable by enabling them to capture trends from customers and competitors more quickly.

Table 3.
Summary of Hypothesis Testing.

Hypothesis	Result
H1	Accepted
H2	Accepted
H3	Accepted
H4	Accepted

6.2. Impact of Industry Sector

The impact of the industry sector on the relationship between IT and organizational structure was evident in the analysis. Both service and manufacturing sector firms showed a tendency to decentralize with increased IT sophistication. However, service sector firms also became more informal with the introduction of IT in their organizations. Additionally, service sector firms showed a stronger correlation between performance and IT compared to their manufacturing counterparts. This may be due to the fact that many service sector firms in the sample were from the IT service industry, which allowed them to better leverage their core competencies and knowledge to utilize IT for enhanced performance.

7. Limitations of the Study

One of the main limitations of this study is its data collection method. The questionnaire was administered to employees randomly chosen from different organizations, and responses may have been subjective or inaccurate. Future studies could focus on employees from specific functions within an organization, as they would be more knowledgeable about the particular areas covered in the questionnaire. For example, IT department employees could specifically answer questions related to IT sophistication.

Additionally, the factor analysis of the IT sophistication questionnaire did not clearly categorize the items into distinct dimensions. Future studies could improve the wording of the questions to better separate the items into more defined factors. The size of the organization, in terms of both revenue and workforce, can also influence the variables discussed. Future research might consider taking the size of the organization into account when analyzing these factors.

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Appendix

IT Sophistication items from Salleh [47] were modified and updated to suit the present-day Indian scenario. The items were grouped under 3 factors: IT integration, Scope of Use, and Intensity of Use. The definitions of these terms are already been introduced in the previous chapter. The following table contains the items used to measure the IT sophistication of an organization. The respondents are required to rate each item from a scale of 1-5 (1 – Very Low, 2 – Low, 3 – Average, 4 – High, 5 – Very High).