TECH TRANSFORMATIONS: UNLEASHING EFFICIENCY IN SMALL FIRMS THROUGH EMERGING TECHNOLOGY ADOPTION

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Introduction

Similar to the historical shift from local to national markets, a blossoming global commercial system is emerging in the twenty-first century. Business operations have seen significant changes due to intense rivalry, globalization, and technology improvements. This has resulted in a need for adaptability in a quickly changing economic environment. A paradigm change in the dynamics of the international business environment is reflected in this evolution (Pavic, 2007).Increased spending on computer processing and data preparation tools characterizes this new technological era, particularly in the manufacturing and service industries. To complement these improvements, a strong telecommunications infrastructure is also being built. Furthermore, the broad use of technology is not limited to the commercial sector; it has also permeated government institutions, academic institutions, and, more lately, private homes. This technological advancement highlights the revolutionary impact of implementing and utilizing information technology (IT). It is a primary motivator for many of the changes that have occurred in our economy and culture (Dierckx, 1999). Aside from opening up new company prospects, adopting innovative IT solutions can also have several advantages as information technology (IT) grows more widely used and marketed. Both huge corporations and small and medium-sized businesses (SMEs) are actively looking for ways to improve their competitive positions and increase efficiency in the current business landscape. Businesses hoping to prosper in today's technologically advanced business climate are realizing that IT integration is a strategic must(Premkumar, 2003). The requirement for SMEs to make money on their IT investments is becoming more widely recognized. IT tools are essential in helping SMEs because they offer the infrastructure required to deliver pertinent information at the appropriate moment. Additionally, by integrating interorganizational operations and supply chain partners, IT helps SMEs become more competitive. It is a useful tool that helps small and medium-sized businesses (SMEs)

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become more successful and efficient overall by providing access to important information (Bhagwat, 2007). Information technology (IT) literature indicates that, in the past, relatively few studies have explicitly examined how IT is adopted and used in small and medium-sized businesses (SMEs). Furthermore, studies reveal that small and medium-sized enterprises (SMEs) have traditionally exhibited a very low adoption rate of IT solutions, even in spite of the notable expansion of IT in this sector (Grandon, 2007). These findings emphasize the significance of comprehending the obstacles and difficulties that SMEs encounter when attempting to incorporate IT into their operations(MacGregor, 2005), Research shows that when it comes to cost savings and sales increases provided by IT, large firms have benefited more than SMEs. This difference highlights the differences in capabilities, resources, and potential obstacles that affect how much SMEs may use IT to gain a competitive edge over their bigger competitors. In order to handle the particular difficulties SMEs encounter in maximizing the advantages of IT adoption, it is imperative to comprehend these dynamics(Riquelme, 2002). It's crucial to take into account the distinctive qualities of SMEs while examining the causes of the variations in IT adoption in these companies. Due to restrictions on access to market data and limitations imposed by globalization, small and medium-sized firms (SMEs) sometimes face difficulties. These elements create barriers that might not be as noticeable in larger businesses, making it harder for SMEs to adopt and use IT solutions. Understanding these unique obstacles is essential to creating plans and support systems that will increase SMEs' adoption of IT(Madrid-Guijarro, 2009). It's also important to remember that SMEs rarely use management strategies like project management, financial analysis, and forecasting. The low adoption of these management methods could be due to a lack of understanding, a lack of resources, or the belief that certain practices are more appropriate for larger businesses. The ability of SMEs to make strategic decisions and operate more efficiently overall may be enhanced by filling this gap in management techniques(Blili, 1993). A few other traits that distinguish SMEs apart include their decision-making processes, informal and dynamic strategies, short-term planning orientation, and preference for generalists over experts in staffing. Notable characteristics of SMEs include a tendency toward a lack of development and a dependence on standard operating procedures. These traits emphasize the adaptability and flexibility that SMEs are known for, but they can also indicate problems with formalizing procedures and long-term strategic planning. Comprehending these attributes is crucial in order to customize assistance mechanisms that correspond with the distinct requirements and workings of SMEs (Dibrell, 2008)(Thong, 1996). One of the biggest challenges facing SMEs is resource poverty, which is the term used to characterize the restrictions in resources.

This limitation includes limited human, financial, and technological resources that could prevent the implementation of cutting-edge IT solutions and all-encompassing management techniques. In order to support SMEs in overcoming obstacles to IT adoption and promoting their sustainable growth, it is imperative to acknowledge and address these resource limits (Thong, 1997)(Welsh, 1981).Small and medium-sized firms (SMEs) and large corporations differ primarily in that SMEs have fewer resources at their disposal, a situation known as resource poverty. Comparing SMEs to their larger counterparts reveals relative deficiencies at several levels, including organizational, managerial, technological, individual, and environmental. These obstacles have a substantial impact on SMEs' adoption and use of IT, highlighting the necessity of focused strategies and support systems to overcome resource constraints and boost their ability to compete in the digital economy (Al-Qirim, 2007)(MacGregor, 2006).

Using a structured questionnaire and a descriptive research approach, 384 responses from MSME industries were gathered for the study in order to gauge the effectiveness of technology adoption.

Results & Discussion

We are providing below the results of the study on the relationship between technology and efficiency:

Table No 1 : Relationship between technology adoption and overall efficiency

ANOVA						
Overall Efficiency		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Technology adoption has significantly improved our company's operational efficiency.	Between Groups	56.843	1	56.843	26.524	.000
	Within Groups	818.655	382	2.143		
	Total	875.497	383			
Our company's revenue has increased as a direct result of technology adoption.	Between Groups	53.377	1	53.377	26.155	.000
	Within Groups	779.582	382	2.041		
	Total	832.958	383			
Technology adoption has enhanced our company's ability to compete in the market.	Between Groups	.245	1	.245	.153	.695
	Within Groups	609.752	382	1.596		
	Total	609.997	383			
Customer satisfaction has improved since we adopted technology solutions.	Between Groups	.168	1	.168	.092	.762
	Within Groups	694.830	382	1.819		
	Total	694.997	383			

Our company faced resistance from employees during the technology adoption process.	Between Groups	17.128	1	17.128	11.010	.001
	Within Groups	594.278	382	1.556		
	Total	611.406	383			
Technology adoption has increased our company's cybersecurity concerns.	Between Groups	13.053	1	13.053	8.243	.004
	Within Groups	604.905	382	1.584		
	Total	617.958	383			
Technology adoption has made it easier for our SME to adapt to market changes or disruptions.	Between Groups	2.301	1	2.301	1.577	.210
	Within Groups	557.550	382	1.460		
	Total	559.852	383			
Our company has a well-defined strategy for technology adoption and integration.	Between Groups	.535	1	.535	.329	.567
	Within Groups	620.424	382	1.624		
	Total	620.958	383			
We have experienced a return on investment (ROI) from our technology adoption efforts.	Between Groups	.201	1	.201	.133	.715
	Within Groups	575.799	382	1.507		
	Total	576.000	383			
Government incentives or programs have played a role in our decision to adopt technology.	Between Groups	15.313	1	15.313	11.798	.001
	Within Groups	495.810	382	1.298		
	Total	511.122	383			

Each statement from Table No 1 denotes a different facet of the impact that technology adoption has had on various aspects of the business. There are statistically significant differences between groups (i.e., those who agree and disagree with the claims) when the significance levels (Sig.) in the "F" column are less than 0.05. According to unusually high F-values (26.524 and 26.155, respectively) and extremely low p-values (all 0.001), technology adoption specifically greatly increased operational efficiency and increased corporate income. Additionally, the adoption of technology was significantly impacted by employee opposition and government incentives (p-values 0.001). However, the company's capacity to compete in the market, customer satisfaction, adaptability to market changes, well defined technology adoption strategy, or return on investment were not substantially impacted by technology adoption (all p-values > 0.05). Overall, these findings imply that while technology adoption clearly benefited productivity and income, its impact on other elements varied, with key influences including employee resistance and government incentives.

VARIABLES IN THE STRUCTURAL EQUATION MODEL ANALYSIS

The variables used in the structural equation model are

Variable Summary (Group number 1)

our model contains the following variables (Group number 1)

I. Observed, endogenous variables

MI_IND - Manufacturing Industry

EFF_IND - Overall Efficiency

II. Observed, exogenous variables

RU_IND - Resource Utilization

IM_IND - Inventory Management

III. Unobserved, exogenous variables

e1 - Error term for Manufacturing Industry

e2 - Error term for Overall Efficiency

Variable counts (Group number 1)

Number of variables in your model: 6

Number of observed variables: 4

Number of unobserved variables: 2

Number of exogenous variables: 4

Number of endogenous variables: 2

Utilizing Standardized Coefficients in a Structural Equation Model (SEM) to analyze overall efficiency.

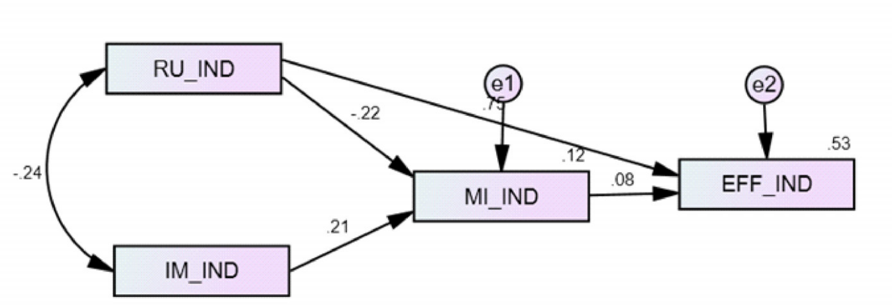

Figure 1.Structural equation model (SEM) based on standardised coefficient on overall efficiency

Table No 2 :

Variables			Unstandardised Coefficient (B)	S.E	Standardised Co-efficient (Beta)	t value	P Value
Manufacturing Industry	<---	Resource Utilization	-.314	.070	-.223	-4.507	<0.001**
Manufacturing Industry	<---	Inventory Management	.341	.081	.210	4.234	<0.001**
Efficiency	<---	Manufacturing Industry	.110	.049	.083	2.276	<0.001**
Efficiency	<---	Resource Utilization	1.397	.068	.746	20.475	<0.001**

Note: ** denotes significant at 1% level

Relationships within the SEM model are explained in Table No. 2. These linkages can be understood in more detail thanks to the unstandardized coefficients. First off, the Manufacturing Industry's unstandardized coefficient of effective Resource Utilization is -0.314. This is the Manufacturing Industry's partial response to Resource Utilization, holding other path factors constant. Given the negative sign, the Manufacturing Industry would see a commensurate loss of -0.314 for every unit fall in Resource Utilization. At the 1% level, this coefficient is statistically significant. Next, we have 0.341 as the unstandardized coefficient for efficient inventory management in the manufacturing sector. Keeping other path variables constant, this illustrates the partial impact of inventory management on the manufacturing sector. The positive sign means that there is a 0.341 gain in the Manufacturing Industry for every unit increase in Inventory Management. At the 1% level, this coefficient is likewise substantial. Similarly, after adjusting for other variables, the unstandardized coefficient of the manufacturing industry on total efficiency is 0.987, suggesting the manufacturing industry's partial impact on efficiency. The coefficient is significant at the 1% level, and the positive sign suggests that an increase of one unit in the Manufacturing Industry equates to a 0.987 gain in Efficiency. Furthermore, the effective Resource Utilization on Efficiency has an unstandardized coefficient of 1.397. This illustrates the partial relationship between Resource Utilization and Efficiency; a positive sign means that an increase in Resource Utilization of one unit corresponds to an increase in Efficiency of 1.397. At the 1% level, this coefficient is likewise substantial. The most significant path in the SEM model, according to the standardized coefficients, is Resource Utilization on Efficiency (0.746), which is followed by Inventory Management on Manufacturing Industry (0.210), Resource Utilization on Manufacturing Industry (-0.223), and so on.

Lastly, null and alternative hypotheses are developed for testing in order to evaluate model fit.

HYPOTHESIS

Null Hypothesis: The hypothesized model exhibits a satisfactory fit.

Alternative Hypothesis: The hypothesized model lacks a satisfactory fit.

Table No 3 :

Model fit summary of Structural Equation Model Indices	Value
Chi-square value	2.061
DF	1
P value	0.151
Chi-square value/DF	2.061
GFI	0.997
AGFI	0.973
NFI	0.994
CFI	0.997
RMR	0.300
RMSEA	0.053

With a computed P value of 0.151, which is above the 0.05 cutoff, Table No. 3 shows a structurally sound fit for the suggested model. The model's robustness is further supported by important goodness-of-fit indices, which indicate a strong fit when they surpass 0.9 for both the Goodness of Fit Index (GFI) and the Adjusted Goodness of Fit Index (AGFI). The idea of a great fit is supported by both the Comparative Fit Index (CFI) and the Normed Fit Index (NFI), both of which have values close to 1. Furthermore, a precise fit is confirmed by the Root Mean Square Residuals (RMR) and Root Mean Square Error of Approximation (RMSEA) values, which, at 0.053, are below the 0.08 requirement. All of them show how well the model explains the observed data and how consistently it captures the relationships between variables.

Conclusion

With an emphasis on its implications across multiple operational dimensions, this study sought to assess small enterprises' overall operational efficiency in implementing emerging technology. Using a structured questionnaire and a descriptive research approach, 384 responses from MSME industries were gathered for the study in order to gauge the effectiveness of technology adoption. A Structural Equation Model (SEM) was employed in the analysis to examine the connection between overall efficiency and technology uptake. The results of the SEM showed that, in contrast to the benefits of inventory management, resource utilization had a considerable detrimental effect on the manufacturing sector. Overall efficiency was thus positively impacted by the industrial sector. Notably, the strategy with the greatest influence on total efficiency was the one that involved resource use. Notably, the strategy with the greatest influence on total efficiency was the one that involved resource use. The model fit study, which included the Chi-square value, GFI, AGFI, NFI, CFI, RMR, and RMSEA, confirmed that the proposed model was appropriate. All things considered, this study offers insightful information about the complex dynamics of technology adoption in small enterprises, highlighting the diverse effects and the significance of identifying particular influential aspects to improve overall operational efficiency in this setting.

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