

Factors Influencing the Adoption of Technology and Its Impact on Small Business Enterprises: A Case Study

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Abstract

The high rate of proliferation of digital technologies has presented new opportunities and challenges to the operations of small and medium enterprises (SMEs) especially in emerging economies like India. This research paper examines adoption determinants of technology and how it affects the operational performance of SMEs in the Dharwad district. The model is based on the Technology-Organization-Environment (TOE) framework, the Resource-Based View (RBV), and the Dynamic Capabilities Theory that incorporates organizational readiness, IT resources and infrastructure, and the capability investments as the main predictors of technological adoption. Moreover, the effect of adoption on the operational performance is looked into in order to evaluate the efficiency and competitive performance. SME owners, managers and functional heads were given a structured questionnaire that employed validated five-point Likert scale items that produced 150 usable responses. Content validity was ensured by using already established scales which were used to measure the constructs. Cronbach alpha, composite reliability and average variance extracted (AVE) were used to verify reliability and validity, and HTMT ratios and Fornell-Larcker criteria were used to verify discriminant validity. The measurement and structural models were tested using Structural Equation Modeling (SEM) using SmartPLS.

The findings indicate that the organizational readiness, IT resources and infrastructure as well as capability investments are crucial factors that affect technological adoption in SMEs. Strategically ready firms with good IT systems and dedication to employee capability building have higher chances of successful adoption of new technologies. Technological adoption, in turn, has a significant impact on the performance of operations since it leads to increased efficiency, cost-effectiveness, and service delivery. These results point out that digital transformation is not merely a question of the technological acquisition, but also a question of organizational strategy and resource alignment. In general, the paper identifies the synergy between preparedness, infrastructure, and investments in performance enhancement by adoption of technology.

The research is also very theoretical and practical and is likely to expand the TOE and RBV perspectives to the SME context in India showing how organizational and resource-based variables work together to predetermine the outcomes of adoption. In practice, it implies that investments in IT infrastructure, employee digital capabilities, and conducive organizational cultures should be considered by the leaders

of SMEs as the means of benefiting the full potential of digital transformation. Although the design does not allow us to come up with any causal inference, the results present a solid background to further longitudinal studies on technology adoption patterns within SMEs.

Keywords: small& medium enterprises(SMEs),Technology-Organisation environment(TOE), Resource based view(RBV),Average variance extracted(AVE),Fornell Larcker Criteria, Structural Equation modelling (SEM),Smart PLS(Partial least Squares).

1. Introduction

The technological development has become a key force in global small business entrepreneurship changing the manner in which entrepreneurs access markets, how they operate and innovate their business models. The adoption of online solutions like cloud computing, online stores, and mobile applications, and online payments democratized the level of opportunities that small companies have because of their capabilities to compete with bigger firms (Gupta and Bose, 2019). Specifically, technology has helped entrepreneurs lowering expenses and enhancing efficiency besides increasing their reach beyond the physical boundaries. In addition, the latest technologies, artificial intelligence, blockchain, and the Internet of Things (IoT), are transforming the work of small businesses, providing greater productivity, customer intelligence, and new value propositions (Acs et al., 2017).

Small business entrepreneurship is very crucial in job creation, poverty alleviation and inclusive development especially in the developing economies. The technological solutions have enabled small businesses to rise above the challenges of low access to capital, competition in the market, insufficient infrastructure (Bharadwaj, El Sawy, Pavlou, and Venkatraman, 2013). With the help of digital ecosystems, businesspeople can not only survive in competitive markets but also be creative in delivering products and services. The growing yielding of technology and entrepreneurship is therefore transforming the environment of small business development, with possibilities and challenges to the emerging economies.

The small businesses are almost 30 percent of the GDP and provide employment to more than 110 million people in India, and it shows how important the small businesses are to the growth of the economy and social development (MSME Report, 2023). The technological integration of small businesses has increased with the efforts of the government i.e. Digital India, Startup India and the encouragement of Unified Payments Interface (UPI). Nevertheless, other issues, including digital illiteracy, infrastructure snarls, and fear of cybersecurity threat, do not allow efficient use of technology (NASSCOM, 2022). This study is necessitated by the urgent need to appreciate how technological changes can be successfully tapped by Indian entrepreneurs to enhance competitiveness, resilience as well as long-term sustainability. This area is of critical importance to explore because India is moving to an era of digitally empowered economy in which small businesses will assume a central role in the inclusion and sustainable growth.

Need for the study

This study aims to highlight the factors influencing the adoption of new technologies in small Business Enterprises in Dharwad District. Understanding such factors may help in promoting new entrepreneurial projects and the emergence of more start-ups and also to evaluate impact on profitability or Performance of small businesses.

Objectives of the study

1. To know the factors which are directly influencing the technology adoption in small Business Enterprises.
2. To Evaluate the performance of small business enterprises through adoption of technology.

Scope of the study

The study was restricted to SBE's within Dharwad District. The area is selected due to more small industries located in Dharwad District. Data was collected from the respondents i.e owners and employees in decision making positions of SBE's through the use of questionnaire.

2. Literature Review

Thong (1999) In a study on determinants of information systems (IS) adoption in small business, the study reported the results of a survey and structural modelling which identified the significance of managerial and organizational factors in decision-making related to technology. The paper identified that adoption was greatly affected by the CEO traits, the knowhow of IS, firm size and external support, which highlight the importance of owner/manager traits and resource limitation as the core factor in the small firms setting. The small firms are also more susceptible to leadership orientation and less external guidance unlike large enterprises where adoption is usually organized and resource rich. The results indicate that effective IS adoption in small companies cannot be based solely on technical abilities but should also include managerial vision, resource allocation, and support networks. Thong concluded that future studies ought to investigate post-adoption use and long-term performance effects especially by conducting longitudinal studies, which would track the development of micro enterprises in their digital adoption process, and this would provide a deeper understanding of long-term competitiveness and innovation.

(Tornatzky and Fleischer, 1990). The Technology-Organization-Environment (TOE) framework is the name of the model of technology adoption in companies provided by Tornatzky and Fleischer (1990) to explain the adoption of innovations in various industries. Their synthesis of concepts with multi-industry examples proved the idea that technological fit (e.g., relative advantage, complexity), organizational preparedness (e.g., resources, managerial support), and environmental pressures (e.g., competition, regulation, vendor support) have a joint impact on the adoption decisions. The framework underlines that adoption within a small and medium-sized enterprise (SME) is multi-factorial in nature, with external ecosystems, including policies and vendor networks, as strong as internal preparedness. This view transcends the technological explanation where focus is placed on the balance between the internal capabilities and the external drivers. According to the authors, it would be useful to redistribute the TOE model on modern digital environments, including cloud computing, AI, and data analytics, as institutional conditions and resource constraints would manifest themselves differently in emerging-economy SME settings

Grandon & Pearson (2004) The cross-sectional survey of SMEs in the U.S. ascertaining the factors that affect e-commerce adoption indicated that organizational readiness, perceived strategic value and external pressures are predictive factors of adoption. Regression analyses have indicated that strategic vision of leaders and organizational ability to accommodate the new systems is more imperative than the availability of advanced technology features. This observation serves as good evidence that preparation and consistency with strategic objectives are more important in influencing adoption decisions than technical factors. The paper concludes that leadership priorities and preparedness are the driving forces

that facilitate the successful uptake of SME e-commerce, with external pressures being reinforcing forces. To determine how e-commerce has long-term value in competitive markets, it is necessary in future studies to explore the digital sales increase, integration of omni-channel as well as the performance of the company over the long-term following the adoption of e-commerce.

Bharadwaj (2000) The comparisons of archival performance between the firms with an IT leader and peers of a comparable size indicate that IT capability is a crucial firm-level resource, which is correlated with the high-performance results. Companies that have high IT strength are always ahead of the pack in terms of profitability, cost effectiveness and competitiveness, which is a confirmation it is an asset that is a strategic tool that helps grow in the long run. The results indicated that the long-term benefits of constructing IT capacity are long-term in nature as it enhances operational efficiency, decision-making and flexibility, which is particularly useful when a growth-oriented SME wishes to be scalable. In the case of smaller firms, the building of IT capabilities cannot only be addressed in terms of technology investments, but also with regard to the accompanying skills, processes and learning pathways in an organization. Further studies might include micro-evidence on the development of IT capability in small enterprises in small steps, the complementary relationship between human ability and digital technology, and how the effect of resource limitation is used to influence the adoption and performance consequences.

Molla & Licker (2005) The e-commerce adoption model in the firms of developing countries who are also SMEs has emphasized the role of organizational e-readiness and environmental e-readiness in relation to the perceived benefits of online business platforms. The survey validation, factor analysis and structural equation modeling (SEM) yield consistent results where SMEs capability to embrace e-commerce, is not only based on the technological availability but the organizational readiness and the institutional environment at large. The constraints that are in the middle ground, namely, a lack of digital literacy, poor IT infrastructure, and poor support services, become apparent as the main barriers to adoption in situations where resources are limited. Further, institutional impediments such as regulatory uncertainty and infrastructural shortfall also make uptake difficult. By adding more dimensions to the model like consumer trust, cybersecurity readiness and the role of government-led e-infrastructure, it would be possible to have a more complete picture of how adoption works. This is of particular importance in emerging economies, where the creation of strong trust systems and digital ecosystems is important to enable the empowerment of SMEs to penetrate digital markets successfully.

Zhu, Kraemer, & Xu (2006) The phases of e-business assimilation that include the process of initiation to routinization represent a gradual process whereby a firm initially tests the digital technologies and ultimately incorporates it into its normal operations. Multi-stage modeling of large-scale survey data has indicated that technology readiness and competitive pressures are common antecedents of initiation, i.e. push factors that cause firms to start experimenting with e-business solutions. Nevertheless, to achieve the real assimilation, i.e. the digital processes are routinized and value-generating, the presence of complementary assets, e.g. skilled employees, supportive organizational structures and aligned business processes is essential. In the case of SMEs, it means that adoption is just the initial stage, and, in order to enjoy the benefits, they should develop capabilities, acquire digital skills, and implement technology into the routine. Further studies recommend that monitoring the digital maturity trajectories of SMEs and measuring the productivity benefits may yield more in-depth information about the ways in which companies may shift between initial acquisition and continuous digital transformation.

Low, Chen, & Wu (2011) An analysis of Taiwanese SMEs in the framework of the TOE-based structural equation modelling (SEM) revealed that there are certain determinants of cloud-computing adoption involving the relative advantage, the top management support, the competitive pressure, and the vendor support. The results emphasize that the entry barriers are reduced despite the higher cost of infrastructure and enhanced scalability provided by cloud technologies, the commitment of the leadership to the digital transformation and the credibility and reliability of the vendors remains a prominent determinant in the successful adoption. Competitive forces drive SMEs to move to cloud to be agile and innovative, and the vendor support makes the integration and maintenance of cloud activities smooth. Nevertheless, the research indicates that after the adoption, SMEs need to concentrate on the post-adoption value creation, sound data management and formation of multi-cloud strategies to reduce risks, cost optimization and long-term sustainability in the more digitized markets.

Ghobakhloo, Arias-Aranda, & Benitez-Amado (2011) A survey done empirically using structural modelling of SMEs indicated that organizational preparedness and access to IT resources are significant predictors of e-business application adoption, which is directly correlated with significant operational benefits that include efficiency and process streamlining. The analysis also indicated that the relationship between the adoption and performance is mediated by investments in capabilities including workforce digital skills and IT infrastructure, which showed that technology is not enough to ensure success without additional resources. Besides, the results of adopting e-business go beyond efficiency, development of innovation potential, boosting the output of products and services, and helping SMEs to become part of larger markets. The concluding evidence points to the idea that the correlation between the adoption of e-business and the metrics of innovation and growth in the export industry offers a more comprehensive perspective on the role of digital tools in the competitiveness of the SMEs and their ability to survive in the global value chain.

Selection of the field:

**Table No.1 Number of Small Business Enterprises in Karnataka
(District Wise)**

Sl.NO	Name of the District	No. Of small Enterprises
1	Bagalkot	374
2	Ballari	915
3	Belagavi	1185
4	Bengalore Rural	1468
5	Bengalore Urban	13408
6	Bidar	329
7	Chamarajanagar	185
8	Chikballapur	325
9	Chikkamangaluru	345
10	Chitradurga	381
11	Dakshina Kannada	1178
12	Davangere	592
13	Dharwad	1042
14	Gadag	267

15	Hassan	634
16	Haveri	410
17	Kalburagi	654
18	Kodagu	212
19	Kolar	490
20	Koppal	486
21	Mandya	428
22	Mysuru	1315
23	Raichur	771
24	Ramanagar	348
25	Shivamogga	636
26	Tumakura	827
27	Udupi	675
28	Uttar Kannada	351
29	Vijayanagar	120
30	Vijayapur	560
31	Yadgir	228
	Total	31139

(Source:DIC, Dharwad-2023-24)

**Table No:2 Distribution of Small-Scale Industries in Dharwad
(Taluk wise)**

SINO	Taluk Name	Small Scale Industries
1	Dharwad	309
2	Hubballi	574
3	Kalgatagi	38
4	Kundagol	67
5	Navalagunda	54
	Total	1042

(Source:DIC, Dharwad-2023-24)

2.1 Theoretical Foundation and Hypotheses Development

2.1.1 Organizational Readiness

The level of preparation of firms to new technologies is known as Organizational Readiness, which involves leadership support, financial ability, as well as strategic alignment. TOE framework (Tornatzky and Fleischer, 1990) and RBV (Barney, 1991) are the models that indicate that readiness determines the extent to which firms can integrate digital systems effectively. Organizations that are highly prepared have an easier time adopting and have increased chances of successful technology assimilation to enhance their competitiveness.

2.1.2 IT Resources & Infrastructure

The Resource-Based View (RBV) holds that IT infrastructure such as hardware, software, and technical expertise is a basic ability facilitating technology adoption (Zhang et al., 2009). The companies that

possess sophisticated IT assets can adjust faster, minimize the integration limitations, and use digital innovations to enhance their efficiency. Bad infrastructure only allows but facilitates scaling and system resilience.

2.1.3 Capability Investments

Technology-enabled performance depends on investments in IT skills, employee training as well as process redesign. Dynamic Capabilities Theory (Teece, 2007) points out that the ability to develop dynamic capabilities reinforces innovation adoption and operational agility. Those SMEs that invest in the creation of digital competencies have a higher chance of getting value out of the technological change and attaining sustainable gains.

2.1.4 Technological Adoption

Technology Adoption theories include TAM (Davis, 1989) and UTAUT (Venkatesh et al., 2003), which assert that the level of adoption would be determined by perceived usefulness, ease of use and organizational enablers. In the case of SMEs, attitudinal factors on the part of the owner/managers, resource limitation and external forces tend to influence adoption. Adoption does not only end at an initial uptake but goes further to routinization and embedding in the business processes.

2.1.5 Operational Performance

The outcome variable is Operational Performance which speaks of efficiency, productivity, and customer satisfaction. According to the IT Capability-Performance Link (Bharadwaj, 2000), IT-enabled resources, and adoption practices enhance the cost efficiency, service quality and innovation. In the case of SMEs, the operational performance of technology implementation is dependent on readiness, infrastructure and capacity building, thus it serves as the dependent construct as well as a scale to determine the value of technologies, realized.

2.2 Hypotheses Development

H1: Organizational Readiness has a positive and significant effect on Technological Adoption.

The readiness of the organization, based on the TOE Framework (Tornatzky and Fleischer, 1990) through leadership support, resources and strategy, provides a good environment in which technology could be adopted. Organisations that have a structurally and culturally ready adapt innovations quicker.

H2: Adequate IT infrastructure and expertise positively influence Technology Adoption

According to the Resource-Based View (Barney, 1991; Bharadwaj, 2000) the IT assets which include infrastructure, expertise, and systems are considered to be the strategic resources. Well-organized IT competence improves the capability of firms to combine and expand new technologies.

H3: Capability Investment has a positive influence on Technology Adoption

In line with the Dynamic Capabilities Theory (Teece, 2007), absorptive capacity is created through investments in skills, training and process innovation. These strengths can help organizations to successfully apply and use technology in competitive landscapes.

H4: Higher levels of technological adoption significantly improve operational performance

Based on the Technology Acceptance and Performance Theories (Davis, 1989; Bharadwaj, 2000), efficiency, cost-effectiveness and quality of services are increased due to successful adoption. Therefore, the technology adoption is directly related to the better outcomes in terms of operational performance.

3. Research Methodology

The current research is a quantitative and explanatory research with the intended aim to test the hypothe-

sis with the help of empirical research. The survey design used is descriptive cross-sectional in which SME respondents in Dharwad district will be surveyed in one wave. The plan is mostly based on the primary data collection using questionnaires; however, the secondary data sources (including industry reports and government documents) will be utilized to give an extra context and confirmation. The design can be used to test causal relationship between constructs like organizational readiness, IT resources, capability investments, technological adoption and operational performance.

The study population is owners, partners and functional managers of registered SMEs (manufacturing and service industries) in the Dharwad district, Karnataka. The sampling frame will comprise of SME registered in the District MSME/Industry Centre listing, local trade and industrial associations and firms registered under Udyam. With the practical difficulties of accessing decision-makers in all the SMEs, purposive mixed with convenient sampling will be applied to allow accessibility and relevance of respondents. The Structural Equation Modeling (SEM) was used to test the relationship between the latent variables in the study. With SmartPLS, measurement model (reliability and construct validity) and structural model (theoretical causal relations) were evaluated.

4. Data Analysis and Interpretation

In the current study, the data analysis is carried out on the descriptive and inferential statistics to present a comprehensive picture of the profile of respondents and the pre-tested relations. At first, the demographic information including gender, age and education was examined to provide the sample characteristics. Secondly, reliability, and validity tests (Cronbach alpha, composite reliability, AVE, and Fornell-Larcker) were done to ensure soundness of measurement constructs. The SmartPLS Structural Equation Modeling (SEM) was used to test the hypothesized causal relationships between the variables. The demographic profile of the respondents (N = 150) is offered in Table 1. The sample was 60 percent males and 40 percent females, which means that the sample was balanced with a male majority. Regarding age, the greater part of respondents fell into younger (2039 years, 40) and middle (3039 years, 36.7) age groups with 23.3% of the respondents being above 40 years of age. The respondents were well-educated in general, 46.7% were graduates and 53.3% were postgraduates. In general, the demographic sample may be considered rather young and well-educated respondents, which will be appropriate to measure the views on technological adoption and organizational practices.

Table 1: Demographic Profile of Respondent

Demographic Variable	Category	Frequency	Percent	Cumulative Percent
Gender	Male	90	60	60
	Female	60	40	100
Age	20–29	60	40	40
	30–39	55	36.7	76.7
	40 and above	35	23.3	100
Education	Graduate	70	46.7	46.7
	Postgraduate	80	53.3	100

There was high convergent validity and reliability of the measurement model. The alpha values of all the constructs were greater than the 0.70 level, which ensured internal consistency (Hair et al., 2019).

Construct stability was also confirmed by the values of composite reliability (0.7910.897). The AVE was between 0.610 and 0.763, which is greater than the recommended 0.50, which means that there is adequate convergent validity.

Table 2: Reliability and Convergent Validity

	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)
Capability Investments	0.897	0.897	0.763
IT Resources & Infrastructure	0.819	0.823	0.649
Operational Performance	0.874	0.877	0.725
Organizational Readiness	0.787	0.791	0.61

The FornellLarcker criterion was used to determine discriminant validity. The square root of AVE of each construct (ranged between 0.781 and 0.874) exceeded its correlations with the other constructs, which proves the adequate discriminant validity (Fornell and Larcker, 1981). As illustrative, Capability Investments (0.874) were higher than the correlation with IT Resources and Infrastructure (0.377) and Operational Performance (0.365). These findings are evidence that every construct is empirically different in the model.

Table 3: Discriminant Validity of Fornell Larcker Criteria

	Capability Investments	IT Resources & Infrastructure	Operational Performance	Organizational Readiness
Capability Investments	0.874			
IT Resources & Infrastructure	0.377	0.806		
Operational Performance	0.365	0.505	0.852	
Organizational Readiness	0.226	0.192	0.198	0.781

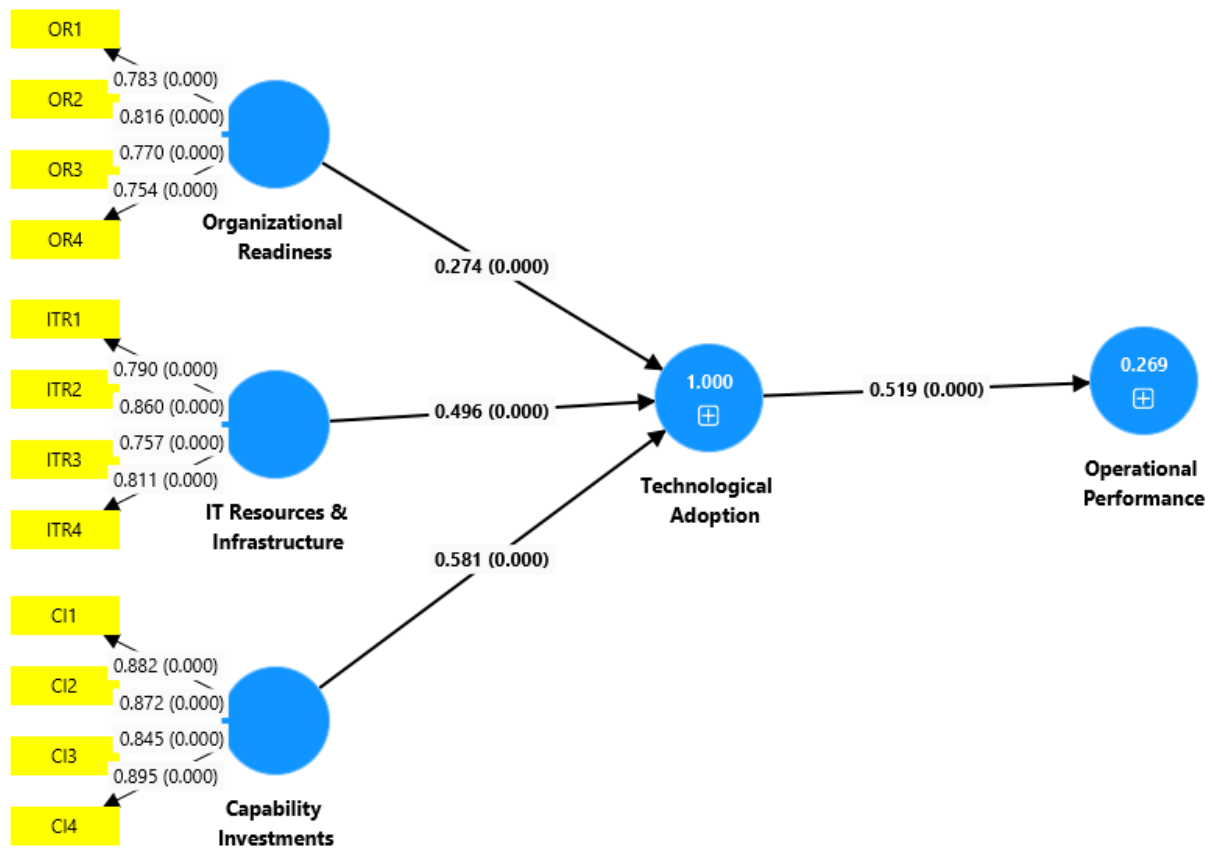


Figure 1: Structural Model of Technological Adoption

Table 4: Structural Estimate of Technological Adoption

	Beta	Standard deviation (STDEV)	T statistics	P values
Capability Investments -> Technological Adoption	0.581	0.044	13.126	0.000
IT Resources &Infrastructure -> Technological Adoption	0.496	0.044	11.319	0.000
Organizational Readiness -> Technological Adoption	0.274	0.067	4.066	0.000
Technological Adoption -> Operational Performance	0.519	0.061	8.451	0.000

The structural model findings proved that Capability Investments had a significant effect on Technological Adoption ($\beta=0.581$, $t = 13.126$, $p = .001$) which confirmed H1. Technological Adoption was also strongly positively influenced by IT Resources and Infrastructure ($\beta=0.496$, $t = 11.319$, $p < .001$) thus proving the H2. Similarly, H3 was confirmed with Organizational Readiness influencing Technological Adoption ($\beta=0.274$, $t=4.066$, $p=.001$). Lastly, Technological Adoption made a great

impact on Operational Performance ($\beta=0.519, 8.451, p < .001$), which proved that H4 is true. All the hypotheses were proved, and p-values were significantly lower than the .05 mark.

Those results suggest that Capability Investment (training, process redesign and experimentation) is the most significant driver of technology adoption meaning that those SMEs that invest more in capacity-building are more effective in digital transformation. Supporting infrastructure and skills are also important enabling factors, which guarantee reliability and integration of the new systems. Although the influence of Organizational Readiness is rather smaller, yet considerable, this factor emphasizes the role of leadership support and culture of change. Above all, Technological Adoption directly positively impacts the operating performance, i.e., the SMEs that strategically adopt technology can achieve efficiency, cost reduction, speedy delivery, and customer satisfaction. Comprehensively, the findings indicate that organization preparedness, IT capacity and capacity investments are essential elements that SME should use technology to facilitate sustainable performance.

5. Conclusion

The research concludes that the major enablers of technological adoption among the SMEs are the organizational preparedness, IT resources, and the ability investments. Companies that have a dynamic leadership, well-established infrastructure, and ongoing investments in skills and processes have more chances of successfully integrating digital technologies in their operations. Among them, capability investments proved to have the most impressive impact, implying that the construction of human capital and complementary assets is essential to this issue to overcome obstacles to adoption. In addition, the adoption of the technologies was also observed to dramatically improve operational performance, which proves that digital transformation results in the real-life increase in efficiency, cost-reduction and customer-satisfaction.

Meanwhile, the results also point at the fact that adoption can be referred not only to the presence of technology but to the interrelation of organizational, infrastructural, and capability-related factors. This highlights the necessity of taking a holistic approach by the SMEs which integrates internal preparedness with external resources. To policymakers and industry players, the research reaffirms the need to offer favourable ecosystems like training programs, financial support, and vendor relationship, which assist SMEs to utilize technology to achieve sustainable competitiveness. The alignment of readiness, capability building, and adoption practices allows the SMEs to attain a better performance and resiliency in dynamic markets.

6. Limitations and Future Research Directions

The sample size of the study is restricted to SMEs in Dharwad district, and it is therefore less generalizable to other regions or industries, as well as the cross-sectional and self-reported data used in the research, which can be biased, and it is not possible to draw a causal conclusion. It is also based on selected constructs and ignores the rest of the situational aspects such as government policies or the vendor ecosystems. The next step of research might be to conduct future studies that take longitudinal designs to capture change over time, cross-regional or cross-sector comparisons to ensure expanded validity and to use qualitative research to learn more about SME decision-making. More variables like policy support, competitive pressures and post adoption outcomes like innovation and market growth would give a more detailed insight into technology adoption and performance in SMEs.