
| RESEARCH ARTICLE

Digital Transformation in Traditional Industries: A Case Study Approach

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| ABSTRACT

The traditional business market undergoes fast structural changes due to digital innovations, which create new operational schemes alongside efficiency improvements and customer-focused delivery systems. The analysis of this procedure utilizes case study methodology, which demonstrates the digital technology integration process across manufacturing, retail, automotive, Information and Communication, Education, Human Health, and Supply industry legacy systems. A review of the relevant literature supports analyses from multiple cases in identifying the main drivers and barriers, as well as their strategic implications. The analysis shows that digital technologies promote innovation acceleration and process enhancement, but companies still go through change resistance and integration issues. The research results provide fundamental knowledge for both industrial leaders and government officials who need to build effective implementation plans for technological methods combined with solutions for organizational obstacles and cultural adaptation. Research efforts should work toward analyzing permanent transformation effects and developing better digital maturity evaluation techniques for traditional markets.

| KEYWORDS

Digital Transformation, Industries, Manufacturing, Retail, Automotive.

| ARTICLE INFORMATION

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1. Introduction

The volatile and ever-evolving market necessitates that organizations perpetually innovate their products and/or services, as well as their corporate operations. Simultaneously, market conditions undergo rapid fluctuations, heightened rivalry necessitates the decrease of operating expenses, and businesses are anticipated to respond accordingly to attain maximum efficiency. The market currently necessitates digital transformation as an essential phase for companies to complete to achieve or maintain competitiveness [1-3]. Companies in all sectors now see digital transformation as their essential strategic business priority after the word lost its buzzword status during the last decade. The transformation of traditional industries from their established practices using legacy infrastructures to the rapidly evolving technological landscape takes place because of pressure from Fitzgerald [4]. Digital technologies like cloud computing and the Internet of Things (IoT), as well as data analytics, have spread across sectors like manufacturing, automotive, and retail. Modern industries need to transform into digital models because globalization and technological unification produce obsolescence as an inevitable outcome. All enterprise resources—human, technological, physical, organizational, and financial—must be involved in the challenging process of digital transformation [5, 6]. With a particular emphasis on people and business processes, it signifies digitization and its deployment across the entire enterprise [7-9].

Digital Transformation is the digital technology-driven transformation of an organization, and it has a direct impact on the corporation's core change or business model [10, 11]. As a result, companies provide opportunities for new business ventures, innovations in the development of goods and/or services, and chances to learn new things. Despite the growing popularity of digital transformation among businesses, a new study indicates that people are undergoing far more transition than they anticipated [12]. An appropriate digital strategy that is adapted to the company structure is undoubtedly one of the key components of a successful DT [13-17]. Dynamic strategy (susceptible to ongoing change), utilization of all available resources (human and technology), and quantitative measurement of DT performance (establishing quantifiable and achievable goals) are

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all examples of transformation efficiency, according to the aforementioned [7, 18]. It does not apply to all industries at the same time because not all businesses are equally focused on digital transformation. While DT is a relatively new word for some businesses, it has already caught up to others. All of them, meanwhile, are willing to embrace new technologies and approaches to conducting business [19]. An overview of case studies per industry—that is, how businesses handle the process of digital transformation—is provided in this study [20].

Early in the twenty-first century, digital platforms are innovative forces behind the creation of new industries, consumer experiences, and changes in economic systems. These include digital logistics systems, financial solutions, and e-commerce. They have drastically altered the company landscape and offered limitless chances to increase consumer value creation, open up new markets, and bring about high efficiency [21]. In order to survive in the modern digital environment, old-economy business sectors—such as manufacturing, sales, and agriculture that have been conducting production and service operations based on pre-information age structures are now under a lot of pressure to embrace digital drives [22]. Modern organizations face several difficulties, including the quick advancement of technology, shifts in society or the population, and emerging political forces and instability [23]. Digital transformation, however, appears to be one of these changes that merits further investigation. Numerous scholars believe that it is essential for these businesses that aim for long-term financial success and a competitive edge [24]. Digital transformation (DT) can be defined as a process that uses a combination of information, processing, communication, and connection technologies to improve an entity by causing significant changes to its properties [25]. These days, DT provides a fascinating field of study focused on its economic, social, and technical effects [26-28].

The study looks at the reasons behind traditional businesses' motivation to embrace digital transformation as well as the difficulties they encounter. It examines the strategic frameworks that direct the adoption of digital technology in various industries, with an emphasis on their practical implementation. The report emphasizes useful lessons and insights that other organizations can employ in their digital transformation journeys through case studies from the automotive, retail, and manufacturing industries. This paper conducts real-world case research through which it examines digital transformation strategies both in their successful implementations and their encountered challenges. This research enhances academic literature according to Bharadwaj et al. (2013) while delivering meaningful guidance to executive decision-makers of classic sectors [12, 29].

2. Literature Review:

Digital transformation integrates digital technology into every business sector, which leads organizations to execute fundamental operational and value delivery modifications for their customers. Digital transformation differs from IT adoption because it builds on a complete process to transform both business strategy and operational frameworks while using digital methods for customer relationship management [24]. According to Chen & Mocker (2019) and scholars' research, digital transformation needs flexible organizations that think innovatively and project technology to business objectives. [30] As previously said, DT is predicated on the utilization of emerging digital technologies (such as social media, mobile, analytics, or embedded devices) to facilitate significant business enhancements like improving customer satisfaction, optimizing operations, or developing new business models [31]. Digital technologies typically focus on increasing efficiency, but they also provide improved communication and automation. Customers' behavior or expectations alter as a result of their use; they become active participants in a conversation between a business and its stakeholders since they have access to communication and information. Additionally, the technologies make it easier to modify current goods and services to produce new kinds of offerings and business models [32].

The article outlines several frameworks for managing digital transformation. The Digital Maturity Model illustrates how organizations progress from basic digitization to more advanced digital optimization. Strategic Alignment Models emphasize the importance of aligning business strategies with IT capabilities. Research by Hess et al. (2016) and Kane et al. (2015) highlights that successful digital transformation depends not only on investing in technology but also on fostering a supportive organizational culture, strong leadership, and efficient business processes [33]. There are findings from earlier studies carried out in certain fields or businesses, such as the hospitality sector (Leung et al., 2015), the medical field (Sebastian et al., 2017), and the fashion industry (Bertola and Teunissen, 2018) [34-36]. The industry examined in this paper was specifically chosen because it has an intriguing feature: it has seen substantial changes recently. It went from being very traditional, with state-owned or state-supported businesses based on the exploitation and use of natural resources, to becoming more creative and market-oriented companies that aim to draw in younger clients as well as Polish and international tourists. Studying the extent, trends, and courses of DT in this specific environment is crucial for this reason [37].

Existing economic sectors face extreme transformations in their operations. The manufacturing industry benefits from IoT and automation technology to improve manufacturing efficiency along with production flexibility according to Li and Wang (2015) [38]. The retail business sector uses big data analytics and digital marketing to analyze consumer conduct better while providing individualized service offerings [35]. The automotive sector is implementing smart technologies to develop connected and autonomous vehicles as described by K. Warner and M. Wäger (2018) [39]. Digital transformations act as indicators for a broader industry trend that shows digital innovations both destroy established businesses while simultaneously re-inventing them. One major change in the business economy is the use of digital platforms in traditional industries as part of organizational

reform and operational structure. Digital platforms are defined as Web-based structures that, with the aid of data technology, offer frameworks for interaction between users, producers, and consumers [40, 41]. Many of these platforms serve as facilitators, providing organizations with solutions to improve customer satisfaction, efficiency, and market reach.

Even though digital platforms permeate every aspect of the economy, it's critical to comprehend when and how they affect different businesses, their business methods, rivals, and consumers. The study's framework and knowledge of the development of technology and industry are provided by this conceptual debate. Because of their high maintenance costs, security flaws, integration issues, and technical and regulatory obstacles, legacy systems provide serious obstacles to digital transformation. Organizations find it more difficult to innovate and react swiftly to changes in the market when these antiquated technologies restrict scalability and frequently produce data silos. Furthermore, organizational resistance can impede transformation initiatives because it stems from cultural hesitation and a fear of change. Concerns about data privacy and cybersecurity make the process much more difficult. Businesses are encouraged to get over these challenges and update their systems since digital transformation offers significant advantages like better operational performance, more customer satisfaction, and new income prospects [27, 42].

3. Methodology:

This paper's research was motivated by a review of the literature based on scholarly publications found in the Web of Science (WOS) database. Papers were chosen based on a search for the term "Digital Transformation" in the titles. Books and other materials not found in scientific journals or conference proceedings papers were not included in the investigation. Additionally, because articles published before the year 2000 mostly dealt with the shift from analog to digital media, the publishing period was shortened from 2000 to 2019. A selection of 214 academic publications was produced from an analysis conducted in December 2018. 88 papers were selected through content analysis of these articles using a case study approach as an example of a real-world digital transformation process.

Case Study Approach: The case study methodology served as a great method to deliver a detailed understanding of digital transformation among traditional industries. The selected methodology allows researchers to study multiple transformation experiences in different sectors by delivering insightful qualitative findings, which will benefit quantitative research in upcoming studies.

Data Collection: The research relied on data collected from academic journals in addition to industry white papers expert interviews and company report secondary data. Three representative cases were selected:

- The firm that manufactures products while utilizing smart manufacturing technological solutions.
- The company operates as a retail organization that fully supports e-commerce operations and digital customer relationships.
- The company operates in the automotive sector by developing connected vehicle systems.

Data Analysis: The research analysis utilized thematic methods to extract common elements and difficulties from the studied cases (Miles & Huberman, 1994)[43]. The paper makes use of secondary academic references and authorized industry information to create its citations within the text.

3.1 Case Study Analysis:

An overview of case studies from six different industries is provided below, which is based on a thorough literature analysis of publications from a chosen sample manufacturing, retail, automotive, Information and Communication, Education, Human Health, and Supply Industry.

Digital Transformation in the Manufacturing Sector: Industrial production facilities usually symbolize traditional industrial manufacturing. The manufacturing firm changed digitally by providing funds to IoT sensors, and predictive maintenance technologies, along automated production lines. The company achieved operation streamlining with the help of real-time analytics enabled through its digital dashboard implementation [44]. The digital transformation produced three essential effects such as enhanced production speed outlook decreased operational interruptions and supply network optimization. Despite their integration the digital solutions required solving data interoperability problems and breaking through barriers from legacy system constraints, which frequently happen when implementing digital solutions in established manufacturing processes[45]. The following manufacturing case study described DT in the context of Husqvarna Group AB, a top producer of chainsaws and gardening tools. Given that Husqvarna is currently undergoing DT and that it appears to be necessary for them to remain competitive in the global market, a case was created on the business potential of DT and its impact on enterprises' architectural management [46].

Research was conducted in the automobile sector case study to determine whether production robots' digital transformation could be utilized to maximize their speed and reduce power consumption. According to, "Today, every robot in a body-in-white manufacturing run has a 100% motion speed." In actuality, however, the robots converse and collaborate in groups. This implies that while they must wait for one another, not all robots must operate at full speed. Robots that are not cycle time crucial can be

slowed down during these waiting periods. Reduced energy consumption is the outcome of slower motion. The fourth industrial revolution is brought about by the digital networking of machines via the Internet. As noted, these "smart machines" are already changing a number of industries, including transportation, healthcare, and agriculture in addition to production. In order to depict and analyze the technological knowledge trends that result in discoveries that drive industrial digitization with a significant impact on the value chain, their study conducted research[47]. They have seen firsthand how industry 4.0 technology advancements lead to new inventions in the machine tool industry through the analysis of patents[48].

Digital Transformation in the Retail Sector: The second case is of a top retail company that transitioned from traditional brick-and-mortar to omnichannel retailing. The firm used customer engagement policies by implementing advanced e-commerce systems and big data analytics to individualize customer experiences[49]. This transformation led the company to keep more customers while cutting down operational expenses. Nevertheless, digital integration also needed vital investments in cybersecurity and data governance. Targeted digital literacy programs for employees accomplished the mitigation of resistance against digital transformation while proving the necessity of organizational learning for transformation success. Another study examined the use of simulation games to instruct students or manufacturing staff in the digital transformation of the online retail and automobile industries [50]. Although both case studies are discussed in the context of education, their objective is to enhance the manufacturing and sales sectors.

Digital Transformation in the Automotive Sector: The automotive industry is experiencing an active transformation period due to its implementation of digital technologies for the creation of connected and autonomous vehicles. A complete digital platform integrated by the automotive firm analyzed live vehicle data to boost predictive maintenance and strengthen its customer infrastructure. Advanced digital solution implementation received significant acceleration due to the critically important partnership with technology experts. Through this strategic alliance, the firm obtained technical expertise together with the necessary infrastructure, which allowed customization of its digital strategy for particular industry demands. The advancements during this period still needed additional data privacy and cybersecurity standards because these issues remained significant.

Industry of Information and Communication: The most prevalent type of case study papers are those from the IT sector, however, it can be difficult to distinguish between case studies created by IT professionals in other industries and those that are DT in the IT sector. First, we chose to highlight papers from the IT sector in this collection, such as the case study of Fujitsu, in which the company presents its vision for future companies undergoing digital transformation through cloud services and an interconnected business model known as Composite Business. In this, the writers described the DT strategy using the SaaS multi-cloud platform and provided similar cloud-based solutions based on interviews with ten firms. CIOs and other senior executives struggle to manage the benefits and hazards of digital transformation, as Hess et al[10]. explain. The essay explains how three German media firms have effectively embraced the digital transition in order to assist managers in finding a more methodical solution to this problem. Managers can use the list of 11 strategic questions and potential responses—which are based on their experiences—as a reference for developing their digital transformation plan. The digital transformation of media is the subject of several papers. The first discusses the evolution of Arab news and contrasts 54 newspapers in both hard copy (paper) and soft copy (web page) formats. With an emphasis on digital leadership and the traits of those in charge of such a project (digital transformation manager).

The second paper presents research on the obstacles that must be overcome to digitally change the media group Haufe Digital. Sanchez outlines the necessary framework for evaluating organizational readiness for DT while going into further detail about how the chief digital officer must encourage digital transformation in his firm. The final article in this brief overview of the IT sector highlights the difficulties posed by digital transformation in businesses in relation to integration, architecture, and infrastructures both during and after the transition. In the essay, the authors gave examples of Tesla, Audi, Apple, and Google, thereby highlighting issues brought on by the rise in external integrations, their fixes through the usage of external infrastructure, and the fallout from architectural changes.

Education Industry: The growing use of digital technology in instructional procedures has led to a change in teaching methodologies. An American non-profit company called Ithaka S+R (Strategies and Research) assists publishing firms, libraries, and institutions of higher learning in effectively adjusting to the new, digital needs of the market. As a result, Ithaka hosts conferences on the subject of digital library transformation, which leads to the sharing of digitalization techniques and experiences. Additionally, through online learning, Ithaka investigates the application of digital technology in education. In America, it is seen as a strategy to draw in students while simultaneously bringing down the expenses of universities. MOOCs (Massive Open Online Courses) like Coursera, Udacity, and edX are becoming more and more popular because online learning makes education more accessible at any time and from any location. They are active learning boosters as well as offering participants individualized access and prompt task feedback. In order to communicate findings to universities and implement them in higher education institutions, Ithaka investigates the topic of online learning.

Human Health and Social Work Activities Industry: Both the growth of telemedicine and the burden of healthcare personnel are being exacerbated by the growing number of patients in the industry. According to a survey conducted by Clinic A and Clinic B, Swedish hospitals have begun holding video conferences with their overburdened patients as a way to reduce costs and offer services to patients from distant locations. A number of meetings intended to alter patients' lifestyles were included in the video visits. For video visits, both clinics have selected current patients or family members. The following benefits and drawbacks have

been mentioned during the video visit: technological (flexibility in terms of time and distance, connection problems, and waiting) and environmental (inadequate patient or physician environment).

We can conclude that the advent of video visits has influenced the development of new technologically based job tasks, new methods of working, and a new division of labor. Using first Forbes data, from which they identified 100 leading companies based on keywords related to the digitalization of health care, and second CBInsights data, from which they identified the 100 most successful start-ups, the authors present a systematic analysis of global companies in the health sector. A commission including ten experts from the fields of health, pharmacy, and economics was established to conduct the analysis and evaluation of the companies. The following criteria served as the basis for the analysis: profit, identification of important processes and resources, and the value of the buyer's offer (patient engagement, prevention, treatment, etc.). It has been discovered through observing various stakeholders in the health sector, including life science, technology, and start-up businesses, that these businesses are making significant investments in meeting patient needs, investigating new market niches, changing business models, and funding transformational initiatives. Longer-term businesses, however, depend on innovations that bolster their current business models.

Electricity, Gas, Steam, and Air Conditioning Supply Industry: Natural gas collection is a labor-intensive process that involves many different tasks, including pipeline maintenance and operations, gas processing facilities, dehydration and treatment facilities, condensate storage, and sales, etc. Many businesses still use spreadsheets and paper to manage their core operations, but they do not use firm eSimulation. A company called eSimulation Inc. was founded in late 2013 with the goal of assisting the operator in increasing their productivity by switching from spreadsheets and paper management to specialized digital applications. The condensate inventory management system (CIMS) is based on software designed to enhance the condensate's working flow with the goal of identifying and measuring the advantages of a rigorous, cloud-based material-balance application. Using a cloud-based web interface and SQL database, the CIMS was developed and deployed quickly, enabling a simplified workflow (reducing superfluous data for working groups, making losses apparent and documented, explaining variances, making CIMS easy to verify and regulate, etc.). Information technology (IT) is a key strategic component, a source of competitive advantage, and a crucial link in the shift to a digital economy in today's corporate environment. Its responsibilities extend beyond simply carrying out corporate procedures; they also include redesigning them. One of the biggest oil and gas firms in Russia has acknowledged the significance of IT as previously said. According to this perspective, digital transformation presents new business opportunities for entering new markets and developing new business models. The IT department is in charge of analyzing the issue and defining changes in practice, procedures, and IT systems, and the organization has sufficient resources to carry out the transformation.

4. Result and Discussion:

The series of analyzed cases confirms that digital reinvention requires more than technology adoption because it represents an all-encompassing business transformation process. The implementation of digital initiatives depends heavily on leadership direction, strategic planning, and a favorable staff-oriented organizational structure. Unique market problems existed within each sector but efficiency improvements and focus on customers and market speed emerged as universal needs.

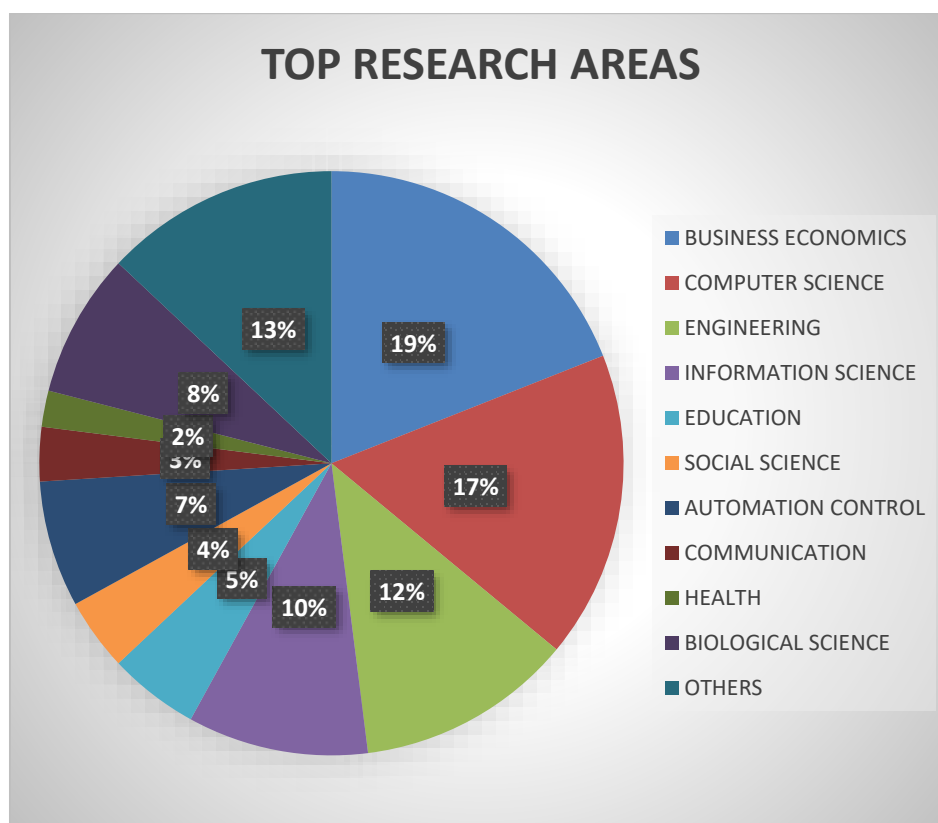


Figure 1. Top Research Areas

The major research fields by WOS where these case study papers on digital transformation were published are graphically represented in Figure 1.

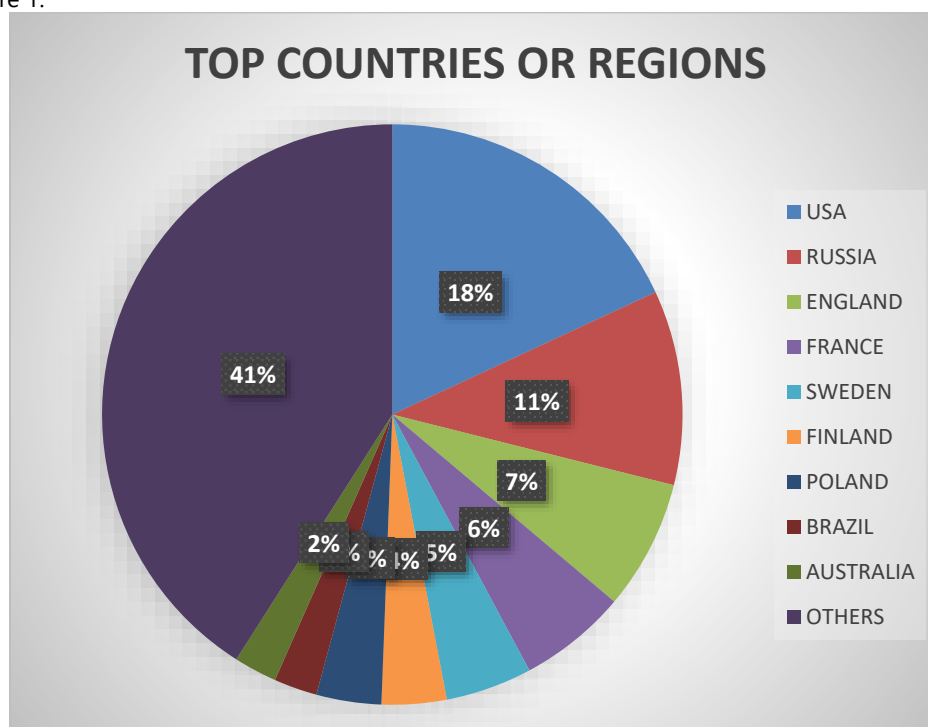


Figure 2. Top Countries or Regions

Top nations on the same sample of DT articles are displayed in Figure 2 according to the country of origin of the case studies and authors of the papers.

The research's importance is thus validated by the study, which highlights the potential for a new era for established sectors in relation to digital platforms and the crucial elements that could impede this progress. Propositions outline these findings and their consequences for current understanding in the areas of business, policy, and the economy in light of this discussion. Regarding performance, market connections, and clients, technology has been a confirming aspect. The power of new technologies to increase productivity is demonstrated by the strong positive correlation between the number of platforms managed and productivity metrics. For instance, many businesses that implemented point-of-sale devices and e-commerce systems reported positive results, including faster transactions and other inventory-related problems. These results are also in line with Kaplan's (2005) research, which emphasized the beneficial effects of digital technology on the efficiency of organizations. However, the current study also demonstrates that these benefits are not available to all organizations, with urban businesses benefiting more from them because of superior facilities and comparatively greater levels of technological literacy. This reinforces the need for further efforts to bridge the urban/rural divide and is in line with the infrastructure challenges highlighted by Okonkwo (2008).

Particular attention has been drawn to the extent of integration that has enabled companies to increase their market reach and degree of client interaction. Businesses that integrated e-commerce technologies into their operations were able to access larger consumer populations, expanding their markets outside their geographic operational domain. This lends credence to the Diffusion of Innovative ideas, which maintains that the rate at which businesses adopt a particular technology is influenced by relative advantage. Platforms are a competitive advantage in the retail and manufacturing industries because they provide access to the desired customer. However, the agriculture industry lags far behind, reflecting the persistent problems with integrating technology in settings with limited resources. Barriers like slow internet access and low computer literacy are also present in newly rising economies across the globe and call for specially designed, cutting-edge solutions[51].

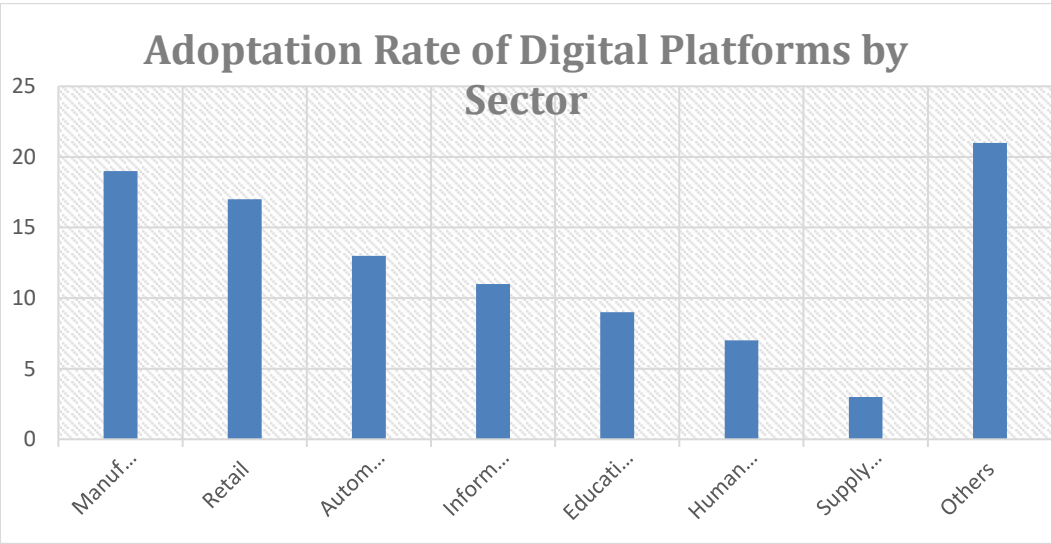


Figure 3. Adoption Rate of Digital Platforms by Sector

Figure 3 represents the adaptation rate of digital platforms by sector.

The study also reveals a dynamic relationship between the effectiveness of digital platform adoption and organizational preparedness. It becomes evident that companies with higher info-management capabilities—as indicated by financial capital and digital literacy—perform better when integrating technology. Given that only rare, valuable, unique, and organization-specific resources can result in competitive advantage, this finding lends credence to Barney's (1991) RBV hypothesis. However, outside factors like erratic connectivity and power might occasionally outweigh organizational readiness, particularly in rural areas. This reminds us that although firm-level strategies may be the best, they are not enough to propel digital transformation, therefore systems still play a crucial role. The strict predisposition toward traditional practices on the part of both the buyer and the seller made cultural elements as a category relevant as a restraint. In the agricultural sector of the nation, where there are elderly farmers who are resistant to new technologies, this resistance is particularly noteworthy. The aforementioned findings are consistent with Doe's (2008) examination of the challenges that culture presents for emerging technologies. Raising knowledge of the benefits of digital environments alone won't be enough to overcome this opposition; deliberate, tangible efforts to demonstrate the possibilities are also required. One effective strategy to encourage implementations is to employ tools that show communities examples of successful local implementations[52].

The conversation concludes by highlighting the double character of digital transformation in manufacturing, retail, automotive, Information and Communication, Education, Human Health, and Supply industry industries: on the one hand, digital platforms can boost corporate efficiency and competitiveness, but they are constrained by certain obstacles. The findings of this study advance knowledge of the opportunities and challenges of digitization, which is crucial for academics, practitioners, and decision-makers. Based on these findings, the following section will offer particular, useful recommendations for promoting efficient DT in traditional sectors.

5. Conclusion:

Through the evaluation of case studies, this study has examined the process of digital transformation in conventional industries. Analysis of the retail, manufacturing, and automotive industries shows a strong push for data-driven decision-making, increased customer involvement, and greater operational efficiency more thorough examination reveals that while the DT process is used in many different industries, not all of them embrace the change at the same rate or to the same degree. Companies can gain from digital transformation, but there are drawbacks as well, chief among them being security and personnel risks as well as legacy system problems. Businesses are using digital technologies for a variety of reasons, including cost reduction, product innovation, business process integration, and the development of new business models. To improve their market position and remain competitive in the global market, businesses should, nevertheless, approach the DT process strategically. DT is viewed as a novel strategy in all examined case studies, acknowledged as a tool to advance the company and address the issues of the future.

5.1 Limitations and Future Research:

The case study method delivered meaningful knowledge but also had constraints in its use. The case studies chosen might not exemplify how digital transformation phenomena occur across all traditional industries. Future research needs to take into consideration bigger samples in diverse geographical regions and use longitudinal studies to evaluate the long-term effects of digital transformation strategies. Digital transformation creates an essential change in traditional business operations and industries. Digital economies can benefit from companies that adopt emerging technologies through organizational change to establish competitive positions. This work contributes new academic findings about digital transformation, which deliver useful advice to practitioners operating in this demanding field.

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