



# Digital transformation and workforce automation in India's SSI sector: a comparative study of SSIs in Delhi and Uttar Pradesh

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## Abstract

In India, Small-Scale Industries (SSIs) are a very necessary part of India's economy which create a lot of job opportunities while helping the industrial growth in different region, it also supports rural development and increase innovative activity. As the Fourth Industrial Revolution came out, automation and digitalization came into pictures influencing production processes, business operations, and workforce dynamics within SSIs. However, adoption of technology differs as we shift from one location to another, the facilities available in different regions and the employee skills. This research examines the Digital Transformation and Workforce Automation in India's SSI Sector through a comparative study of enterprises located in Delhi which are representing metropolitan environments, and Uttar Pradesh which are representing tier-2 socio-economic region.

The study aims to identify the differences in the digital adoption between these two cities, digital literacy and exposure to automation in the employees working there, infrastructure availability, tools they use during their daily operations, workplace efficiency, and attitudes toward technological transformation. A structured questionnaire has been made and circulated after the pilot testing in order to collect primary data from employees working in SSIs across Delhi and Uttar Pradesh regions. The research aims to identify how regional differences in metropolitan cities and a tier-2 economy influence technology adoption in SSIs, the various barriers faced by the workers in adapting to digitalization and automation, and the extent to which automation influences productivity level, skill requirements, and work quality.

The result shows that the gaps between the SSIs of Delhi and Uttar Pradesh can be explained due to the fact that the SSIs located in Delhi have better infrastructure, technology and knowledge of the employees while the SSIs located in Uttar Pradesh might suffer from the lack of awareness, affordability, internet connectivity and training. The study gives us insight into how employment practices have evolved with the introduction of digital transformation. And by understanding these changes, the study highlights the positive effect on SSIs to become more structured and future-ready. It also highlights its usefulness for entrepreneurs and industry stakeholders in adopting technology more effectively and promoting inclusive growth.

**Keywords:** SSI, Digitalization, Automation

## 1. Introduction

A small-scale industry is one that operates with limited capital, has few employees, small or few capital-intensive machinery, and fulfills the requirements of the local people.

According to Krishnaiah (2018), Small-scale industry (SSI) means entrepreneurs who are engaged in the manufacturing and production on a limited scale, usually associated with the agro-based rural industries that require less capital investment or infrastructure facilities [5].

In the words of P. A. Neck, "Small enterprises are those in which the management lies in the hands of one or two people who usually make the major decisions" [10].

As per the Micro, Small and Medium Enterprises Act of 2006, any industry that qualifies for the following criteria is considered a Small-Scale Industries (SSIs):

- The investment for business purposes (plant, machinery, and equipment) should not exceed rupees 10 crore; and
- The annual turnover of the industry should be in the range of rupees 50 crore.

Small-scale industries operate are all over the economy in different sectors and can be broadly classified based on the nature of their activities. Like Manufacturing small-scale industries which are engaged in producing finished or semi-finished goods, such as food processing units, textile production, and small-scale electronics manufacturing. Then there is Ancillary industries that help out the bigger factories by giving them parts and spares for machines. Service-oriented small-scale industries they focus on more about helping with things instead of making products including repair, maintenance, consultancy, and technical support services. Retail small-scale industries involves selling straight to people, small shops or boutiques and now online too. Additionally, agro-based small-scale industries which focuses on processing agricultural raw materials such as dairy products, grains, and fruits, thereby adding value to farm produce and supporting the rural economy. (Adapted from Kotak Mahindra Bank)

In the Indian economy, Small Scale Industries (SSIs) play an important role in the overall development of the country by contributing over 30% of the GDP and constituting nearly 95%

of the total industrial units in the country. This industry has now become the backbone of the country, which employs more than 175 lakh people, providing our day-to-day requirements. These SSI sectors add value to the economy in many dimensions, such as generating employment in rural and semi-urban areas, promoting regional development of the communities, and also encouraging more people towards entrepreneurship.

As the world is now experiencing the Fourth Industrial Revolution, with technologies like automation, artificial intelligence, and digitalization transforming all sectors, including SSIs. Automation simply means the use of technology, including software, machinery, or robotics, to perform a task with minimal human effort. According to Goldberg (2011), automation concerns involve designing a simple system to perform a job perfectly in a controlled environment, thereby making the process faster and cheaper [3]. It has various benefits, such as better quality of work, faster work cycles and efficient production, which also reduces the wastage associated with manual work. In the case of SSIs, even simple automation (such as semi-automatic weaving or packaging or quality monitoring equipment) can significantly improve productivity and reduce wastage. Likewise, digitalization is the term used to describe integrating digital technologies in all aspects of business. This includes automation, virtual platforms, online stores, online accounting software, mobile banking and so on. As per Lang (2021), Digitalization is a technological megatrend that is reshaping all industries and society. It is a powerful force for both innovation (new value) and disruption (old ways of doing business), impacting all private enterprises as well as public institutions [8]. For SSIs, digitalization has created new and transformative opportunities that can be achieved through digital marketing to reach a broader audience; platforms like Amazon and GeM facilitate direct sales between rural producers and end consumers; mobile banking and digital payment systems that promote financial inclusion and ensure transparent transactions; and Using cloud apps, small industries can handle inventory and supply chain tasks more easily, which helps them become more efficient and expand.

This research paper will mainly explore the interactions of the SSI sector with automation and digitalization, and how these technologies are affecting that, what their positives and negatives are, and provide valuable insights into the strategies of entrepreneurship. Metropolitan cities like Delhi usually have better infrastructure and skilled workforce as compared to tier-2 city like Uttar Pradesh. Therefore, this study is going to focus on a comparative analysis of SSIs in Delhi and Uttar Pradesh and examine their regional differences in digital adoption, workforce readiness, and the impact of automation on employee performance working their and their work efficiency.

## 2. Literature of review

### 2.1 Literature review

a) Kulkarni (2020), in her paper "The Need for Digitalization of SMEs in India," focuses on the importance and need of SMEs, helpful digital technologies they can adapt to

Enhance efficiency, lower expenses, broaden market presence, and strengthen global competitiveness along with highlighting the role of government initiatives like Digital India, Make in India, and Startup India in driving technological advancement in SMEs. The study uses a qualitative research approach by collecting secondary data from government reports, newspaper articles, published research papers, World Bank data, and institutional surveys such as those by KPMG, McKinsey, and IAMAI. Following this, the findings highlight that SMEs contribute significantly to India's GDP and exports, but only a small share of the country has access to digital equipment because of insufficient knowledge, capital, and awareness. The paper end with the conclusion that digitalization is vital for SME growth and suggests the need of Skill development, funding, and state-driven initiatives like Digital India and Make in India aim to enhance SME efficiency and global competitiveness [6].

- b) Viswanathan and Telukdarie (2021), in "A systems dynamics approach to SME digitalization," examine how using smart systems (System Dynamics) can assist in making SMEs achieve more success, especially in South Africa. Their main idea is that being "digital" can hugely impact a business's long-term survival. In their methodology, they used a computer model to look at how different factors(enablers and barriers) affect a business over time and found that whenever a business uses more digital services, its performance gets much better, and it also highlights that skilled workers are a major factor too [16].
- c) Bogavac et al (2021), in their work "Digitalization of SMEs in Developing and Developed Countries," examines how digitalization impacts SMEs in both developed and developing countries, especially after the COVID-19 pandemic happened. The study uses secondary data from international reports, academic studies, and global databases for reviewing trends in SME digital adoption, the barriers they encounter, and how technology influences their performance and overall growth. The findings that degree of digitalization varies as there is a better adoption rate and infrastructure support in developed countries, while developing countries have limited finance, connectivity and digital skills. COVID-19 accelerated the digital transformation across the board, but it is still lagging among small firms [2].
- d) Yadav et al. (2022), in their research "Digital Policy in Small, (Micro) and Unorganized Industries," examine how Indian SMEs mainly in the handicraft sector, overcame the economic challenges of the pandemic. The study reviewed government assistance models and shifted toward ITC and highlighted that small-scale artisans were most vulnerable when supply chain collapses and local demand drops. The study argues that unorganized industries' survival is greatly dependent on a robust digital policy and suggest that integrating the Internet of Things (IoT) and E-commerce platforms with the government backed digital literacy programs can help these businesses from the future

- shocks. The study concludes that while traditional craftsmanship is the core of the Indian economy, its future growth greatly depends on the digital technologies that links rural artisans directly to global markets with the backing of institutional support <sup>[17]</sup>.
- e) Vandita and Srivastava (2023) in their work “Role of Digitalization in the Growth of MSMEs in India: Opportunities and Challenges,” examine the effect of digitalization on MSME sector development across India. The paper follows a descriptive research design and makes use of the data collected from official records, government materials, and studies conducted by CRISIL, ASSOCHAM, and other researchers. Their findings show that after COVID-19, digitalization has improved a lot, but many people still face issues like low awareness, poor infrastructure, and financial constraints. To sum up, the study concludes that digitalization is crucial for MSME growth, and the study calls for better training, infrastructure, and government support to help small businesses fully adopt technology <sup>[15]</sup>.
- f) Lachvajderova et al. (2023), in their conference paper “Significance of Digitalization on the Effectiveness of SMEs,” assesses the impact of technology adoption on performance of small businesses in 27 EU countries. It uses data from Digital Economy and Society Index (DESI) and suggested that the pandemic was a digital booster which compelled many traditional firms to upgrade to new infrastructure. The study points out that it is not just the efficiency that is driven through digitalization but it is a prerequisite for doing business in Europe. But there are some member states which have trouble with initial cost and lack of training who should work on incorporating digital technologies into the infrastructure of SMEs. The research shows that while the transition has started towards the digital decade, effectiveness of the process relies on the corporation's vision of integrating the technology to the long-term goals of the business <sup>[7]</sup>.
- g) Sahoo et al (2023), in their work “A Review of Digital Transformation and Industry 4.0 in Supply Chain Management for Small and Medium-sized Enterprises,” discuss the impact of Industry 4.0 technologies such as IoT, AI and big data on supply chain management in SMEs and emphasis on how these technologies enhance supply chain tracking, efficient operation and resilience. The paper is based on a systematic literature review of 50 journal articles and case studies and the study reveals the advantages of adopting such technologies, such as inventory optimization, improved decision making and improved agility, but also the challenges, such as lack of technical expertise and cybersecurity threats. The authors conclude that there is a need for strategic digital adoption, collaboration and effective cybersecurity for SMEs to gain a competitive advantage and supply chain resiliency <sup>[12]</sup>.
- h) Angle (2024), in his work “AI in SMEs: Accelerating Digitalization for Resilient and Scalable Growth” explores how AI can manage resource shortages and limited technical skills and help SMEs achieve digital transformation. The paper employs a literature review methodology and focuses on how automation powered by AI leads to a meaningful improvement in operational efficiency and how analytics powered by AI leads to considerable revenue growth. The paper concludes that AI adoption is important for building SMEs' resilience and working towards both long-term and scalable growth in a rapidly evolving tech-driven market, and also highlights that there are many opportunities, but SMEs need to address challenges while adapting to make the most of AI-driven digital transformation <sup>[1]</sup>.
- i) Siregar et al. in their work “Digitalization of MSMEs: Encouraging Entrepreneurial Excellence and Competence in the Modern Era” explore the impact of digitalization on the performance of women entrepreneurs in Indonesia who run the small and medium-sized firms (SMEs) with the core argument that the business's performance is not solely dependent on the skills of the women entrepreneurs but their understanding of how to use digital tools to improve their efficiency. In their methodology, they conducted research on 140 Indonesian women entrepreneurs and found that to become a more digital business, the entrepreneur must have competently prepared and proficient skills. The study ends with the findings that digitalization acts as a bridge and is equally needed along with infrastructure, as skills by themselves may not be enough to ensure complete integration of digital tools <sup>[13]</sup>.
- j) Priya (2024), in his work “Leveraging Digital Technologies For Resilient And Sustainable Growth In MSMEs,” discusses how digital technologies are driving Indian MSMEs towards resilience, growth and competitiveness. The paper conducts literature review and data analysis to review current adoption rates and government initiatives, to investigate the opportunities and challenges, including resource constraints, lack of digital skills and high cost of adoption. The results reveal the beneficial impact of digital technologies on productivity, market reach, and efficiency, as well as the gradual adoption of digital technologies in the sector. The conclusion of the paper points out that to sustain growth and remain competitive globally, MSMEs need to continue to receive government support, build capacity and have better digital infrastructure <sup>[4]</sup>.
- k) Prasetyani et al. (2024), in their review “Does technology adoption matter for SMEs? A literature review” examined 394 papers published between 2009 and 2023, to understand how firms deal with digital changes. The research shows companies become more efficient and connect with more customers thanks to tech, but they were often stunted by limited resources, limited internet and digital training. The study recommends using models such TOE and TAM which have the barrier barrier of employee resistance. The study concludes SMEs require affordable digital technology and policies which boost infrastructure and bridge the technology gap <sup>[11]</sup>.
- l) Nekuyi and Nakhaei (2025), in their study “The Impact of Digitalization on the Internationalization of SMEs: A

Narrative Review,” examine how digital technologies can help SMEs face challenges while expanding into international markets. As is known, Digitalization enhances SMEs' adaptability, innovation, organizational resilience, and efficiency, facilitating global growth. The study finds that digital tools support the creation of new business models, improve operations, reach more markets, and build better customer relationships worldwide. Still, these benefits are achieved only when technology is used strategically, supported by trained employees. Other than benefits, digitalization's effect on competitive advantage is indirect and further requires integration with other capable organizations. Overall, digital transformation is vital for SMEs to achieve sustained international growth and competitiveness [9].

- m) Sudirman et al. (2025), in their article “Enhancing Digital Technology Adoption in SMEs Through Sustainable Resilience Strategy: Examining the Role of Entrepreneurial Orientation and Competencies”, study the motivation of small companies to adopt more new technology. This paper is based on 381 Indonesian SMEs, and they found that while a proactive, risk-taking attitude and business acumen is essential, it's not everything. The main element of change is the "sustainable resilience strategy" as it acts as a buffer that enables the company to cope with disturbances while moving forward to the digital path. The study concludes that SMEs need to establish a sound internal system to translate entrepreneurial vision into a digital reality so that businesses can survive and thrive in the digital era [15].

## 2.2 Research gap

Though many studies have reviewed digitalization and automation in India's small-scale industries (SSIs), most of them have been limited to certain states or districts, reducing their regional coverage and ability to compare across contexts. While all these studies mainly focused on how SSIs are adopting digital technologies, they primarily show the regional conditions and fail to provide a comparative perspective across diverse geographic and socio-economic contexts, largely emphasized secondary data or specific social groups; as a result, there is a limited understanding of how digital transformation affects varied demographic and economic segments. There is limited evidence in respect to how digital technologies and automation are adopted and experienced in different regions while performing their daily operations.

To address this gap, the present study titled “Digitalization and Automation of India's SSI Sector: An Analysis of the SSI Sector Incorporated in Delhi and U.P.” conducts a comparative analysis of two small-scale enterprises, one in Delhi and one in Uttar Pradesh. It explores the digital proficiency of employees, the specific digital and automated tools used, and the geographical factors influencing their adoption, and provides with a more holistic and practical understanding of the impact of digitalisation and automation in the SSI sector across varied economic and infrastructural environments in India.

## 3. Research methodology

### 3.1 Overview

The study is conducted across two geographically and economically different region of north India which are the national capital of India and Uttar Pradesh (UP). The primary motive of this study is to conduct a cross-sectional comparative analysis of digital transformation with a metropolitan environment (Delhi) and a tier-2 city (Uttar Pradesh).

While Delhi represents a region with a well-built technological infrastructure and higher capital accessibility, Uttar Pradesh represents a region where modern technology is still emerging. By taking these two regions the study aims to identify the differences in digital literacy (ability of employees to handle and make use of technology to make their work faster) and infrastructure ability (employees' access to hardware and software tools to adapt technology).

The study is designed to evaluate using collected data how Workforce Dynamics, productivity of employees, and operational efficiency in the Small-Scale Industry (SSI) is directly influenced by these regional factors.

### 3.2 Objectives of the study

- To examine the digital literacy and technological adoption levels of employees working in the SSIs of Delhi and Uttar Pradesh.
- To compare the impact of digitalization and automation on employee performance in metropolitan (Delhi) and Tier-2 (UP) regions.
- To identify the infrastructural, regional, and organizational factors influencing digital transformation in SSIs.

### 3.3 Hypotheses of the study

**H1:** Employees in Delhi-based SSIs have higher digital literacy and greater automation exposure compared to those in Uttar Pradesh.

**H2:** Automation and Digitalization in SSIs improve employee productivity and work efficiency.

**H3:** Infrastructural availability, regional characteristics, and organizational support significantly influence the level of digital transformation in SSIs.

### 3.4 Sampling technique

This study uses a Convenient Sampling technique. This technique has been chosen due to limited time constraints, along with practical difficulties in accessing a large number of data samples within the specified timeframe. This approach allows you to collect high-quality data that is easily accessible and is representative of the broader population.

### 3.5 Statistical techniques used

To understand the data and to test the hypotheses the following methods are used for the data collected through questionnaire: Mean, Percentage, Correlation, Regression, Crosstab, and T-test analysis.

### 3.6 Scope of the study

**Geographical area:** The study is conducted across two different regions of India in order to capture differences in digital adoption in two different economic settings:

- **Delhi:** Delhi represents a metropolitan region of India with a well-developed infrastructure and a high level of digital adoption.
- **Uttar Pradesh:** It represents a tier-2 city of India with a variety of industries and different levels of digital adoption.

- The scope of the study is restricted to Delhi and Uttar Pradesh, which provide a meaningful comparison between metropolitan and tier-2 areas. The findings might not be relevant for other parts of India with diverse economic and technological environments.
- The data is cross-sectional as it is gathered only at one point in time, it does not account for the digital transformation over time.
- Other important factors, such as organizational culture, management support, and financial constraints, were not explored in depth.

**Variables**

Independent variables	Dependent variables
Digital literacy	Level of digitalization
Automation and digitalization	Employee productivity and efficiency, quality of work, ease of doing work
Infrastructure facilities	Increased adoption rate

**3.7 Limitations of the study**

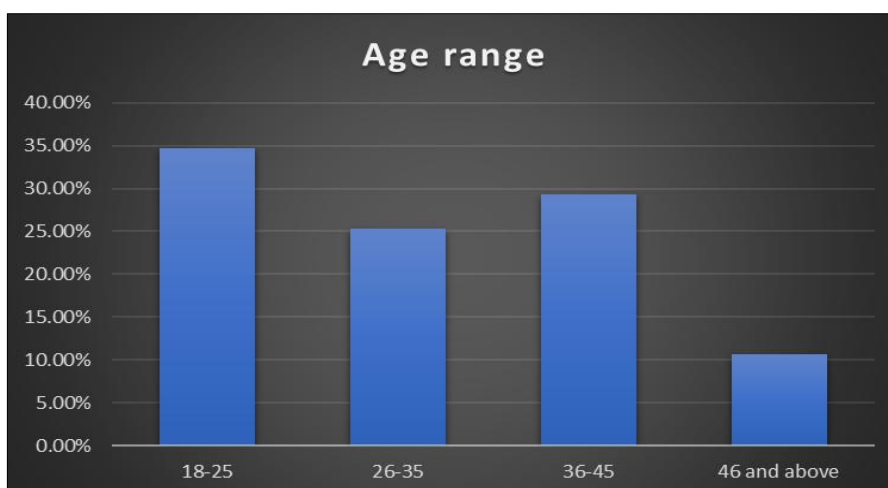
The study has some limitation that should be acknowledged:

- Due to a limited time frame, only 150 responses were collected, as 1/3 of the population, i.e, the sample size of the 382 respondents, is more reliable and suitable.
- The study is based on a convenience sampling technique, which makes it hard to generalize the findings since responses are based on accessibility.

**4. Result and Analysis**

**4.1 Demographic profile of respondents**

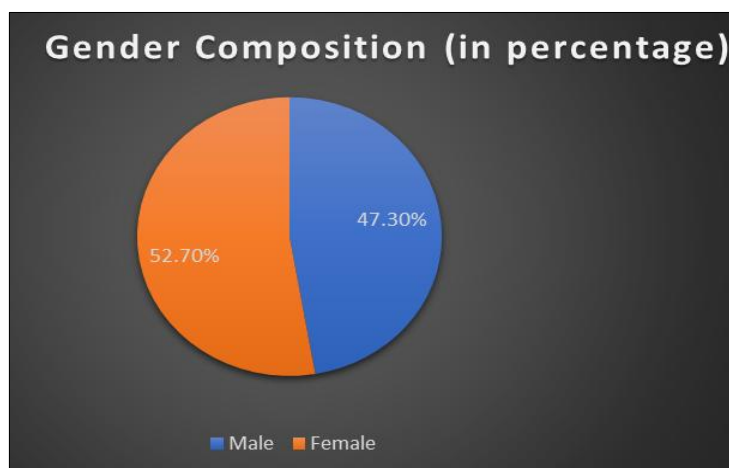
Till now, the primary data for this research is collected from the 150 respondents working in the Small-Scale Industries (SSIs) across Delhi and Uttar Pradesh, for the purpose of analysis. The largest share of responses is received from the age group of 18–25 years, are of 34.7%, then followed by those in the 36–45 age bracket at 29.3%, 25.3% in the 26–35 years category, and 10.7% above 46 years.



**Fig 4.1.1:** Age range

The gender split was fairly balanced with 52.7% female respondents and 47.3% male, a near-equal representation that

lends credibility to the sample.



**Fig. 4.1.2:** Gender composition

Geographically, respondents came from two distinct regions, 43.3% respondents are from Delhi, while 56.7% belongs to

Uttar Pradesh. This blend of a major metro and a tier-2 region adds meaningful geographic range to the data.

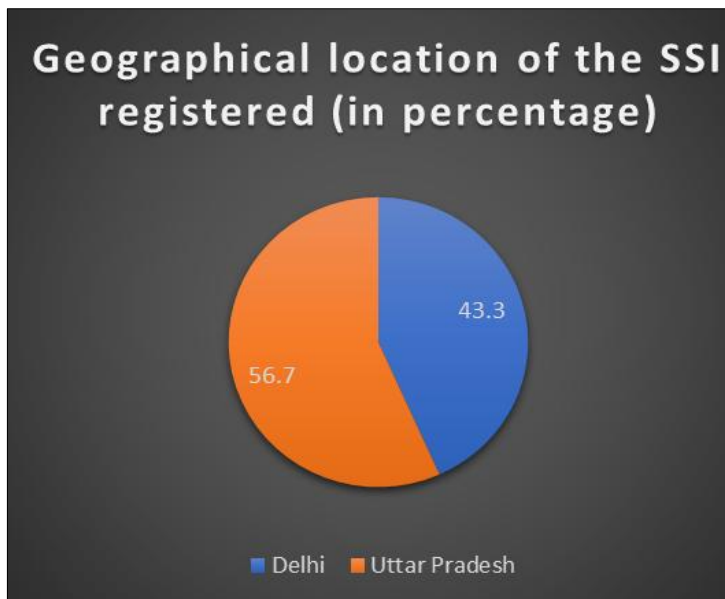


Fig 4.1.3: Geographical location of the SSI registered

Regarding educational qualification, postgraduates formed the largest group (34.7%), followed by graduates (28%), high

school (24.7%), and professional courses (12.7%).

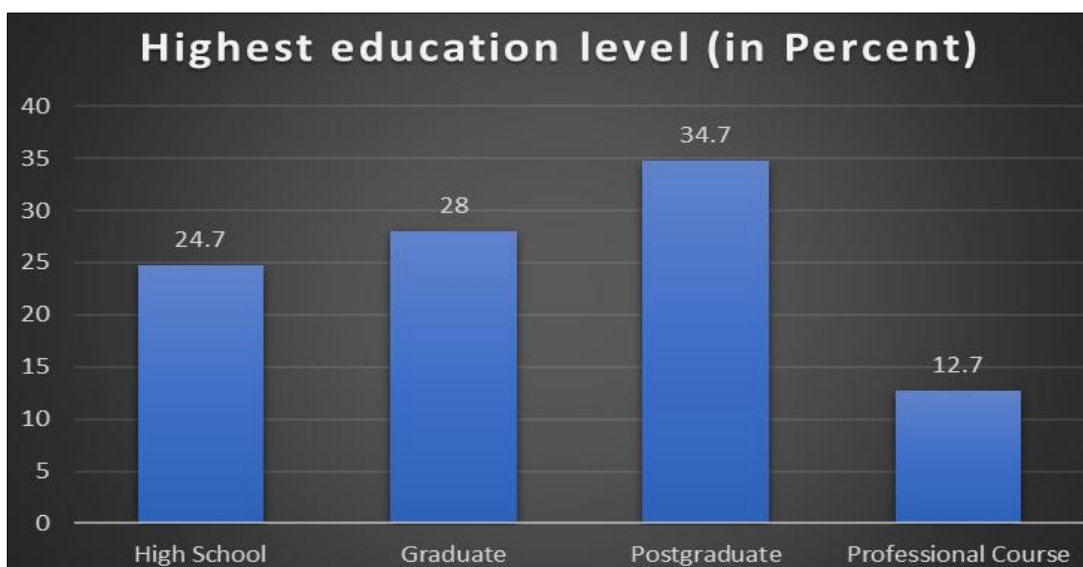


Fig. 4.1.4: Highest education level

The occupations of the respondents are very diverse, from Operators (30%), Admin Staff (20%), Supervisors (18.7%), Managers (18%) and others (13.3%). The majority of respondents were from the service industry (48%), followed by

trading (29%) and manufacturing (21%).

4.2 Descriptive statistics analysis

Table 4.2.1: Descriptive statistics

Variables	Mean	Standard deviation
Digital literacy	1.2844	.32400
Level of digitalization	1.3280	.31004
Automation and digitalization	1.1533	.31700
Increased adoption rate	1.1900	.27581
Employment performance	1.1378	.27630

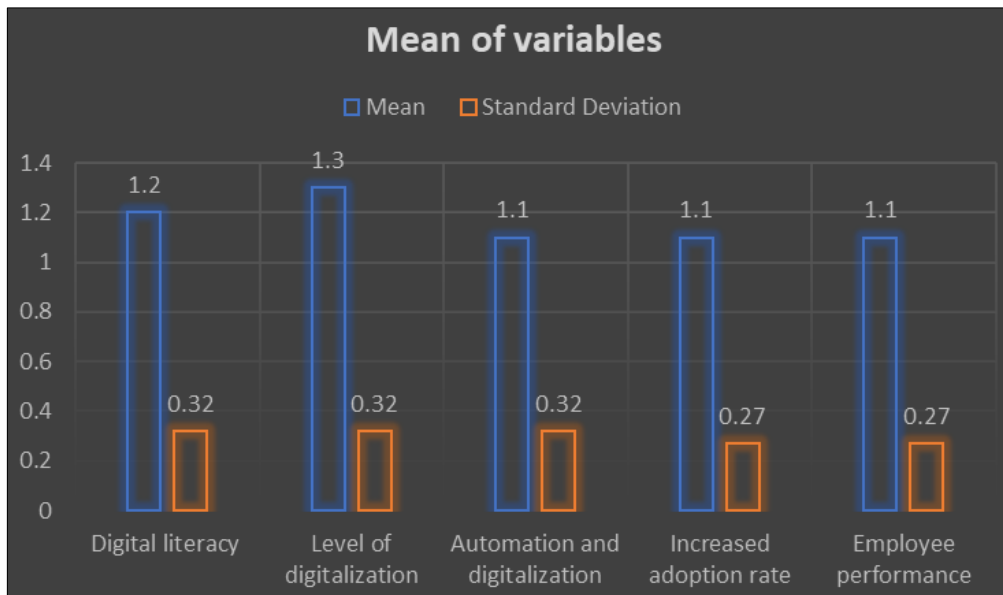


Fig. 4.2.1: Mean of variables

The descriptive analysis data shows respondents' level of readiness for digital transformation in various areas. Digital Literacy had an average score of 1.28, which shows that respondents have gained a good understanding of digital tools and technology. They're not new to the technology, but still have plenty of learning to do. Digitalization averaged slightly higher at 1.33, which means that organizations are actively integrating digital processes, but it's still in mid-way stage of development.

Adoption Rates averaged 1.19, showing that, though people are slowly embracing digital processes and tools, there is still some hesitancy and unevenness in adoption rates. The lowest average was 1.14 for Employment Performance, meaning that while there is a digital transformation, there have been only limited improvements in employee performance so far (or perhaps it takes a while to notice). To understand this trend more clearly, a graphical representation has been given below:

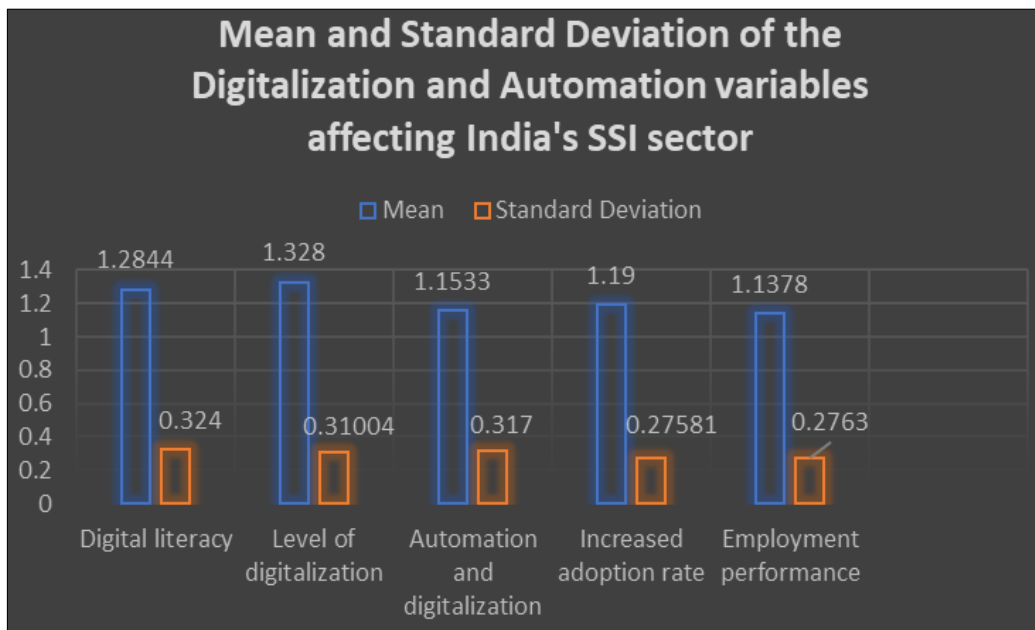


Fig. 4.2.2: Mean and standard deviation of the digitalization and automation variables

Across all these measures, there is relatively small variation in responses (low standard deviation), which tells us that people are responding consistently. That is, it's not that some people experience very rapid change in the digital space and others don't. Rather, the organisation or sector is uniformly showing conservative progress towards the digital transformation with

small steps but a lot of room for speeding up the process.

**4.3 Reliability analysis**

To check the consistency of the variables, Cronbach's Alpha was calculated. The Cronbach's Alpha is 0.773, which shows that it is good. The questions asked are reliable, allowing us to have confidence in the data for further analysis.

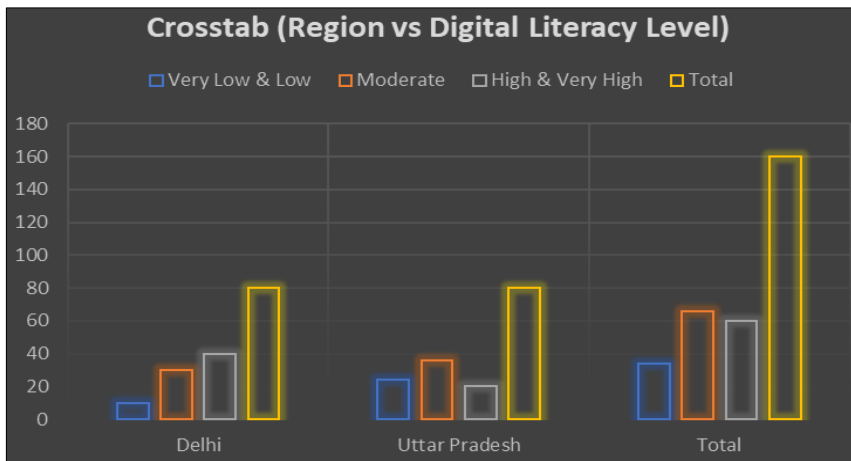


Fig 4.3.1: Crosstab (Region vs Digital literacy level)

The result shows a better distinction between respondents from Delhi and Uttar Pradesh in terms of their digital literacy as the respondents from Delhi are largely in the "High & Very High" category while the respondents from Uttar Pradesh are largely

in the "Low" and "Moderate" category. It indicates that the workforce of Delhi's SSI is more digitally literate and is more familiar with the use of technology for work.

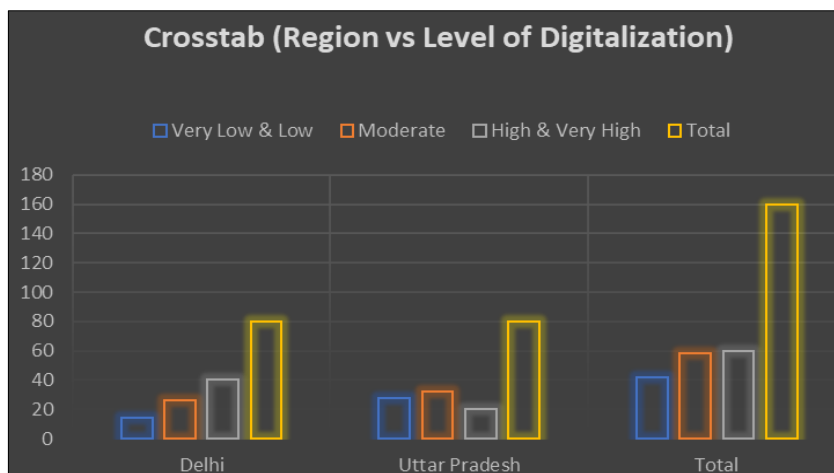


Fig 4.3.2: Crosstab (Region vs level of digitalization)

The answers show that there are more respondents in the "High & Very High" digitalization category in Delhi compared to Uttar Pradesh where there are more respondents in the "Low" and "Moderate" levels.

The responses indicate that Delhi has more firms which are more experienced in using digital systems and tools, while Uttar Pradesh is still catching up. This might be due to the superior infrastructure and exposure of technology in urban areas.

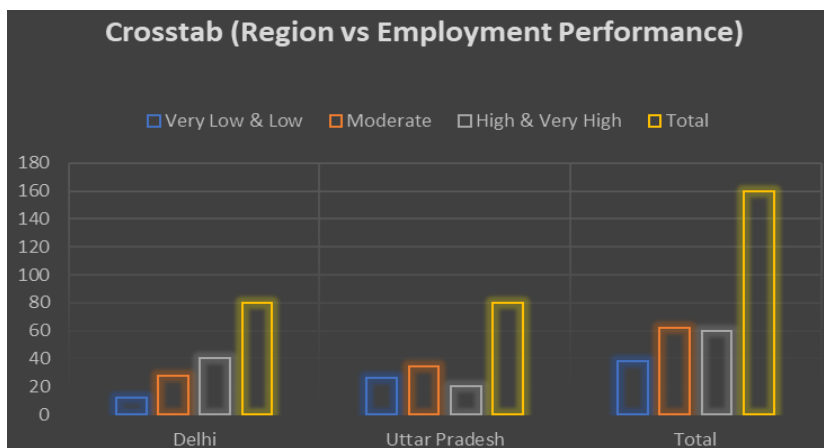


Fig 4.3.3: Crosstab (Region vs Employment Performance)

The findings indicate that the better digital adoption in Delhi is associated with high employee efficiency. Conversely, less digitalization in Uttar Pradesh is impeding efficiency and

productivity.

#### 4.4 Correlation analysis

Table 4.4.1: Correlation

Variables	Digital literacy	Level of digitalization	Automation and digitalization	Increased adoption rate	Employment performance
Digital literacy	1	.562***	.280***	.317***	.317***
Level of digitalization	.562***	1	.441***	.251**	.500***
Automation and digitalization	.280***	.441***	1	.202*	.945***
Increased adoption rate	.317***	.251**	.202*	1	.241**
Employment performance	.317***	.500***	.945***	.241**	1

The correlation analysis was done to understand the association among digital transformation variables, and the results show that the variables are positively and significantly associated.

There is a positive relationship between digital literacy and digitalization ( $r = 0.562, p < 0.001$ ), which means that knowing how to use tech means it will be used.

Digitalization and automation ( $r = 0.280, p < 0.001$ ) also demonstrates that digital literacy also supports teams in adopting automation and accelerates the pace of tool adoption ( $r = 0.317, p < 0.001$ ).

Employment performance ( $r = 0.317, p < 0.001$ ) because when people know how to use tech, they will have better employment

performance.

There is a very strong positive relationship between automation and digitalization and employment performance ( $r = 0.945, p < 0.001$ ), meaning automation of routine tasks allows employees to focus on important tasks, resulting in improved performance. Also, Digital modernization also has a positive impact on performance ( $r = 0.500, p < 0.001$ ). To conclude, the correlation analysis results show that the improvement in digital literacy, digitalization and automation is associated with performance improvement and increased adoption rates.

#### 4.5 Regression analysis

Table 4.5.1: Regression analysis summary

Variables	Unstandardized coefficient (B)	Standardized coefficient (Beta)	t-value	Significance (p-value)
(Constant)	0.107	—	2.898	0.004
Digital literacy	0.008	0.010	0.315	0.753
Level of digitalization	0.088	0.099	2.941	0.004
Automation & Digitalization	0.783	0.899	31.033	< 0.001

Statistic	Value
R	0.950
R <sup>2</sup>	0.902
Adjusted R <sup>2</sup>	0.900
F-value	445.833
Significance	< 0.001

The regression analysis was performed to investigate the effect of digital literacy, digitalization, and automation on performance.

The model accounts for a significant amount of variance in performance ( $R^2 = 0.902$ , which means 90.2% of the variance in employee performance can be attributed to these factors).

The ANOVA table ( $F = 445.833, p < 0.001$ ) indicates the model is significant. The degree of automation and digitalization is the strongest predictor of performance ( $\beta = 0.899$ ) followed by level of digitalization ( $\beta = 0.099, p = 0.004$ ).

Contrary to expectations, digital literacy ( $p = 0.753$ ) doesn't significantly improve performance, which indicates the importance of a robust organisational structure.

#### 4.6 One-sample T-test analysis

Table 4.6.1: One-sample t-test results

Variables	t-value	p-value (Sig. 2-tailed)	Result
Digital literacy	48.553	< 0.001	Significant
Level of digitalization	52.460	< 0.001	Significant
Automation & digitalization	44.559	< 0.001	Significant
Increased adoption rate	52.841	< 0.001	Significant
Employment performance	50.434	< 0.001	Significant

One sample t-test was used to check if the variables had statistically significant differences from the baseline.

The outcomes of the one-sample t-test show that all variables are significant at  $p < 0.001$  which suggests that the digital transformation and its impact are present among the selected respondents.

The mean values for all variables are greater than the t-value which suggests that the respondents demonstrate that digital transformation and its impact are present. This demonstrates that digital transformation is not missing but present in the selected SSIs.

## 4.7 Hypothesis testing

### 4.7.1 Hypothesis 1

#### Null hypothesis ( $H_{01}$ ):

Employees in Delhi-based SSIs do not have higher digital literacy and greater automation exposure compared to those in Uttar Pradesh.

#### Alternative hypothesis ( $H_{11}$ ):

Employees in Delhi-based SSIs have higher digital literacy and greater automation exposure compared to those in Uttar Pradesh.

#### Result

The results reveal that the respondents from Delhi are more likely to be categorised in the high category of digital literacy and exposure to automation, while the respondents from Uttar Pradesh are more likely to be categorised in the low and moderate categories.

#### Decision

Null Hypothesis ( $H_{01}$ ) is Rejected Alternative Hypothesis ( $H_{11}$ ) is Accepted.

#### Conclusion

The level of digital literacy and automation exposure among employees is greater in SSIs of Delhi than in Uttar Pradesh.

### 4.7.2 Hypothesis 2

#### Null hypothesis ( $H_{02}$ ):

Automation and digitalization do not significantly improve employee productivity and work efficiency in SSIs.

#### Alternative hypothesis ( $H_{12}$ ):

Automation and digitalization significantly improve employee productivity and work efficiency in SSIs.

#### Result

The results of the correlation analysis indicate a significant positive correlation between automation and employment performance ( $r = 0.945$ ,  $p < 0.001$ ). The regression analysis also shows a positive impact of automation and digitalization on employee performance ( $\beta = 0.899$ ,  $p < 0.001$ ).

#### Decision

Null Hypothesis ( $H_{02}$ ) is Rejected Alternative Hypothesis ( $H_{12}$ ) is Accepted.

#### Conclusion

Automation and digitalization improve productivity and efficiency of employees in SSIs.

### 4.7.3 Hypothesis 3

#### Null hypothesis ( $H_{03}$ ):

Infrastructural availability, regional characteristics, and organizational support do not significantly influence the level of digital transformation in SSIs.

#### Alternative hypothesis ( $H_{13}$ ):

Infrastructural availability, regional characteristics, and organizational support significantly influence the level of digital transformation in SSIs.

#### Result

The study shows that the level of digitalization is higher in Delhi than in Uttar Pradesh. Regression also reveals that digital literacy significantly impacts the adoption rate ( $\beta = 0.253$ ,  $p = 0.008$ ), suggesting the need for infrastructure and organisation readiness.

#### Decision

Null Hypothesis ( $H_{03}$ ) is Rejected Alternative Hypothesis ( $H_{13}$ ) is Accepted.

#### Conclusion

Regional, infrastructure and organisational support are important factors in digital transformation of SSIs.

Table 4.7.4: Summary of hypothesis testing

Hypothesis	Null hypothesis result	Alternative hypothesis result
H <sub>1</sub>	Rejected	Accepted
H <sub>2</sub>	Rejected	Accepted
H <sub>3</sub>	Rejected	Accepted

## 5. Conclusion

The purpose of the study is to investigate the effects of digital transformation on employee performance in Small Scale Industries (SSIs) in the context of Delhi and Uttar Pradesh. The results reveal that digitalization, automation, and infrastructure is closely related to employee efficiency and performance.

The study shows that the workforce in Delhi are more digitally literate, adopt and use more automation as compared to the workforce in Uttar Pradesh. This suggests that there are regional differences between the two states, where Delhi is endowed with superior infrastructure, access to digital tools and knowledge of digital technology innovations.

Moreover, the study reveals that there is a presence of positive association between digitalization and productivity. The regression analysis shows that the most crucial factors that influence the efficiency and productivity of the employees are automation and digitalization, while digital literacy does not have a direct effect on employee productivity unless coupled with the use of digital tools.

The study also supports that it is the age of digital transformation but it is not equally adopted. The effective use of digital tools is highly dependent on the availability of infrastructure, support from the organisation and training of the employees.

Additionally, the research also shows that the adoption of digital technology is not influenced by age and gender, suggesting that digital transformation is increasingly inclusive. But education is an important factor in improving digital knowledge and skills.

In conclusion, the study emphasizes that digital transformation is a key driver of improved performance in SSIs. But to unlock its full potential, there needs to be an improvement in the digital infrastructure, training and awareness of its importance, particularly in the backward states like Uttar Pradesh. This will not only boost the productivity of workers but also improve the performance and competitiveness of the sector.

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