

IMPACT OF TECHNOLOGICAL ADVANCEMENTS ON EMPLOYEE-PERCEIVED PRODUCTIVITY IN THE APPAREL INDUSTRY OF SRI LANKA

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Abstract

The apparel industry is one of Sri Lanka's biggest sectors, making a significant contribution to both employment and economic growth. Employee roles and industrial processes are changing because of rapid technology breakthroughs, including Automation and Robotics, Digital tools and software, Smart wearable technology, and Big Data. The influence of these technologies on employee-perceived productivity, which is the employees' self-evaluation of how well they perform their jobs, is examined in this study. 130 workers, including supervisors, quality inspectors, administrative personnel, and machine operators from five of the apparel firms in the Colombo area, participated in a quantitative, cross-sectional study. Every variable was measured using a five-point Likert scale, which was modified from well-established literature. Descriptive statistics, multiple regression, and correlation analysis were used in SPSS to analyse the data. The results show that employee-perceived productivity is greatly and favorably impacted by automation and robots, smart wearable technologies, and digital tools and software, with automation having the most impact. However, big data revealed no significant correlation, indicating a low level of integration into day-to-day operations. The report provides managers in the Sri Lankan apparel industry with useful insights by highlighting the strategic significance of matching labor capabilities with technology investments to improve operational efficiency and employee engagement.

Keywords: Apparel industry, employee-perceived productivity, technology advancement

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Introduction

Every industry is changing due to technological advancements, and the apparel industry is no exception. This sector is essential to Sri Lanka's economic development, and becoming more competitive requires the use of cutting-edge technologies, including automation and robotics, digital tools and software, smart wearable technology, and big data. These technologies increase productivity, simplify processes, and have the power to modify how workers view their output, which in turn impacts engagement, job satisfaction, and adaptability. Although objective metrics like line productivity and on-time delivery are still crucial, employee opinions provide insightful information for matching labor skills with technology expenditures. Understanding these impressions is crucial for maintaining operational effectiveness and staff engagement in a world of intense global competition (Bresnahan & Trajtenberg, 2013).

Even while international clothing manufacturers have embraced technology at a quick pace to increase efficiency and personalization, many Sri Lankan organizations continue to struggle to reap the benefits (Kamalendu & Ansar, 2020). Sometimes, technology expenditures are made without defined implementation methods, which leads to outmoded tools and underutilization, which hinders employee performance. Studies that have already been conducted in Sri Lanka have concentrated on organizational agility and ICT adoption; however, there is no empirical data on how certain technical developments impact workers' perceptions of productivity in the apparel industry (Hanifah et al., 2024). Because employee perceptions may impact the success or failure of technology adoption, particularly in sectors where worker adaptation and operational efficiency are essential for survival in a fiercely competitive global market, this gap is crucial (Monika et al., 2020).

By investigating the effects of four technological factors—digital tools and software, smart wearable technology, automation and robotics, and big data—on employee-perceived productivity in Sri Lanka's apparel sector, this study closes an important gap in existing knowledge. The main objective of the study is to examine how these technological advancements influence employees' perceptions of their productivity and to determine which technologies have the most significant impact. This human-centred perspective focuses on employees' experiences rather than purely objective performance indicators, offering industry-specific insights through a quantitative analysis. The study is significant as it provides valuable implications for multiple stakeholders. For apparel industry managers, the findings offer guidance on selecting and implementing technologies that enhance both efficiency and employee engagement. Policy makers and industry bodies can use the outcomes to design strategies that encourage technology-driven innovation while ensuring workforce adaptability. Furthermore, academics and researchers will benefit from the empirical evidence generated, which contributes to the literature on technology adoption and human productivity in developing economies. Ultimately, the study strengthens understanding of how aligning technological investment with employee readiness can improve competitiveness and sustainable growth in Sri Lanka's apparel industry.

Literature Review

Employee perceived productivity

Employee-perceived productivity is a person's estimate of how well and efficiently they can accomplish tasks at work using the resources at their disposal (Guendalina, 2021). Perceived productivity, as opposed to objective productivity metrics like queue efficiency or cost per minute, offers important information about the work experience and influences engagement, job satisfaction, and adaptability (Bresnahan & Trajtenberg, 2013). Employee impressions may make or break new systems in the garment industry, as technology adoption is progressively influencing labor processes. Using viewpoints from innovation diffusion theory and socio-technical systems thinking, the current study investigates how four technological elements, digital tools and software, automation and robotics, smart wearable technology, and big data, influence perceived productivity (Monika et al., 2020).

Automation and robotics

The production of clothing is being revolutionized by automation and robots, which increase uniformity, speed, and precision while decreasing manual labor and mistakes (Kamalendu & Ansar, 2020). They make it possible for both customized and large-scale manufacturing, relieving workers of monotonous work so they may concentrate on higher-value endeavours. These technologies can increase employees' perceived productivity by boosting their confidence in their performance when properly integrated and backed by the right training (Dilshan & Wanninayake, 2022).

Digital tools and software

Digital tools and software, such as communication platforms, workflow management systems, and specialized production programs, facilitate decision-making, enhance collaboration, and simplify information flow. These tools aid workers in manufacturing environments by helping them plan jobs, cut down on delays, and instantly access vital data. The way that individuals assess their own productivity can be positively influenced by this operational openness and control (Miriam, 2018).

Smart wearable technology

Smart wearables, such as health sensors, safety monitors, and performance trackers, are being utilized more and more in manufacturing to track job progress and enhance operational safety. By offering immediate feedback, these technologies encourage self-control and skill improvement, which can improve worker well-being and efficiency, two important aspects of perceived productivity (Deepika & Jung, 2016).

Big data

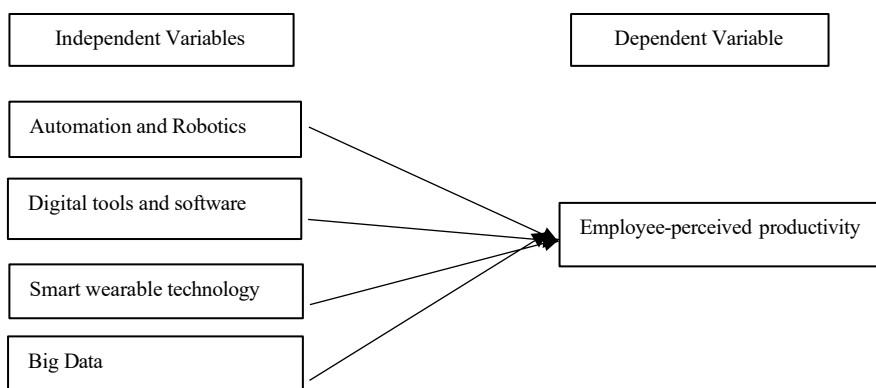
Big data analytics is the process of improving decision-making by gleaning useful insights from huge, intricate databases. Big data may help with production scheduling, quality assurance, and demand forecasting in the apparel industry. Employee perceptions of its worth, however, rely on how easily the insights can be accessed and applied to everyday work. Big data's influence on perceived productivity could be restricted if operational responsibilities lack concrete applicability (Nada & Ahamed, 2014).

There is little empirical study, particularly in Sri Lanka, that examines the combined impact of these technologies on employee-perceived productivity in the garment business, despite the fact that previous studies have looked at each technology separately. By evaluating the connections between automation and robotics, digital tools and software, smart wearable technology, and big data, this study fills that knowledge gap and offers industry-specific data to support efficient technology integration that complements workforce capabilities and boosts competitiveness.

Methodology

This study adopted a quantitative, cross-sectional design to examine the impact of technological advancements on employee-perceived productivity in Sri Lanka's apparel sector. The sample consisted of 130 employees from five leading apparel manufacturing firms in the Colombo district, selected through convenience sampling based on their technological adoption, operational scale, and accessibility. Colombo was chosen as it is the main industrial hub of Sri Lanka's apparel industry. The structured questionnaire contained five sections: demographic details and measures for automation and robotics (10 items), digital tools and software (6 items), smart wearable technology (7 items), big data (7 items), and employee-perceived productivity (8 items), all rated on a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). The questionnaire was prepared in English and translated into Sinhala to ensure clarity among operational-level employees. Content validity was verified through expert review and a pilot test with 20 respondents. Reliability analysis using Cronbach's alpha confirmed strong internal consistency, with all constructs scoring above 0.70.

Figure 1
Conceptual framework



Source: Authors' work

- H1: There is a positive relationship between Automation and Robotics and Employee Perceived Productivity.
 H2: There is a positive relationship between Digital tools and Software and Employee Perceived Productivity.
 H3: There is a positive relationship between Smart Wearable Technology and Employee Perceived Productivity.
 H 4: There is a positive relationship between Big Data and Employee Perceived Productivity.

Results and Discussion

Table 1
Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Gender	130	1.00	2.00	1.4769	.50140
Age	130	1.00	5.00	2.7154	.98228
Education	130	1.00	5.00	3.7308	1.19293
Employment	130	1.00	4.00	2.9231	.96139
Income level	130	1.00	5.00	3.6154	.97555
Valid N (listwise)	130				

Source: Survey data (2025)

The demographic profile of the respondents shows a near-balanced gender distribution. The average age group was between 26–35 years, with most respondents holding a diploma or equivalent qualification. Employment type averaged close to supervisory or mid-level positions, and the mean income level corresponded to the mid-range bracket. These results indicate that the sample represents a mix of genders, relatively young to middle-aged employees, with varied educational backgrounds, job roles, and income levels.

Table 2
Reliability table

	Cronbach's Alpha	N of Items
Employee_Productivity	.803	8
Automation_and_Robotics	.843	10
Digital_tools_and_software	.867	6
Smart Wearable Technology	.899	7
Big_Data	.822	7

Source: Survey Data (2025)

This table measures the internal consistency or reliability of the constructs analysed in the study. All constructs demonstrate Cronbach's Alpha values exceeding 0.8, Cronbach’s Alpha value which reflects good to excellent internal consistency. These figures indicate that the items within each construct are well correlated.

Table 3
KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.818
Bartlett's Test of Sphericity	Approx. Chi-Square	743.376
	df	10
	Sig.....	.000

Source: Survey data (2025)

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett’s Test of Sphericity indicates that the data is suitable for factor analysis. A KMO value above 0.8 is considered good, which confirms that the study's sample size and distribution of variables are adequate for further analysis. The significant result of Bartlett’s Test ($p < 0.001$) further validates that there are significant relationships between the variables, making factor analysis a relevant tool to explore the data structure in subsequent analyses.

Table 4
Correlations

		Employee_Productivity	Automation_and_Robotics	Digital_tools_and_software	Smart wearable technology	Big_Data
Employee_Productivity	Pearson Correlation	1	.778**	.403**	.143	-.122
	Sig. (2-tailed)		.000	.000	.105	.167
	N	130	130	130	130	130

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

Source: Survey data (2025)

The results show a strong, positive, and significant correlation between employee-perceived productivity and automation and robotics ($r = 0.778$, $p < 0.01$), indicating that higher automation is associated with higher perceived productivity. A moderate, significant positive correlation was also found with digital tools and software ($r = 0.403$, $p < 0.01$). Smart wearable technology showed a weak, non-significant positive relationship ($r = 0.143$, $p > 0.05$), while big data displayed a weak, non-significant negative correlation ($r = -0.122$, $p > 0.05$).

Table 5
Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. Change
1	.752 ^a	.724	.532	.253	.554	738.576	4	125	.000

Source: Survey data (2025)

Table 6
ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	36.924	4	9.231	738.576	.000 ^b
	Residual	1.562	125	.012		
	Total	38.486	129			

Source: Survey data (2025)

Table 7
Multiple regression coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Beta	Beta		
		1	(Constant)	-.042		
	Automation and Robotics	.893	.040	.911	22.114	.000
	Digital tools and software	.060	.026	.044	2.268	.025
	SWT	.098	.045	.088	2.170	.032
	BigData	-.055	.045	-.035	-1.201	.232

Source: Survey data (2025)

The regression analysis aimed to examine the influence of four technological advancements, automation and robotics, digital tools and software, smart wearable technology, and big data, on employee-perceived productivity in Sri Lanka’s apparel sector. The model summary indicated an R value of 0.752, demonstrating a strong positive relationship between the combined independent variables and the dependent variable. The R² value of 0.724 revealed that approximately 72.4% of the variance in employee-perceived productivity can be explained by the four technological factors. This suggests that technological advancements collectively play a substantial role in shaping employees’ perceptions of their productivity, aligning with previous research highlighting the productivity-enhancing potential of technology integration in manufacturing (Kamalendu & Ansar, 2020; Hanifah et al., 2024).

The ANOVA results confirmed that the regression model was statistically significant ($F = 738.576$, $p < 0.001$), indicating that at least one of the technological factors significantly predicts employee-perceived productivity. This finding supports the study’s conceptual framework, which proposed that modern technological systems contribute meaningfully to how employees evaluate their own work performance. The significance of the overall model reinforces the necessity for apparel companies to strategically implement and integrate technology to maximize workforce efficiency and engagement.

Examining the regression coefficients, automation and robotics had a $\beta = 0.911$, $p < 0.001$, signifying a strong, positive, and statistically significant effect on employee-perceived productivity. This outcome is consistent with prior studies (Dilshan & Wanninayake, 2022), which found that automation reduces repetitive tasks, improves accuracy, and increases production speed, thereby enhancing employees’ perceived efficiency. Digital tools and software also showed a statistically significant effect ($\beta = 0.044$, $p = 0.025$), suggesting that real-time communication, streamlined workflows, and improved task management foster higher productivity perceptions (Miriam, 2018). Smart wearable technology recorded a $\beta = 0.088$, $p = 0.032$, indicating a positive and statistically significant relationship, although weaker than automation and digital tools. While previous research (Deepika & Jung, 2016) highlighted the benefits of wearable devices in monitoring performance and safety, the present result suggests that adoption in Sri Lanka’s apparel industry is still developing, which may limit its overall perceived value. In contrast, big data had a $\beta = -0.035$, $p = 0.232$, indicating a weak and non-significant negative relationship with employee-perceived productivity. Although big data analytics can enhance decision-making (Nada &

Ahamed, 2014), its practical impact on individual productivity perceptions may depend on the extent to which insights are accessible and applied in daily operations.

The model demonstrates both statistical and practical significance, providing strong support for most of the study's hypotheses. The results indicated that H1, H2, and H3 were accepted, while H4 was rejected. Specifically, automation and robotics (H1) showed a strong positive and significant relationship with employee-perceived productivity, aligning with previous findings (Dilshan & Wanninayake, 2022), which confirmed that automation enhances efficiency and employee confidence by reducing repetitive tasks. Digital tools and software (H2) also demonstrated a significant positive impact, who highlighted that digital systems improve communication and workflow transparency (Miriam, 2018). Smart wearable technology (H3) recorded a weaker yet significant positive relationship, the wearable devices can enhance self-monitoring and workplace safety, though adoption in the apparel industry remains limited (Deepika & Jung, 2016). In contrast, big data (H4) showed a non-significant negative relationship, leading to its rejection. The big data's limited practical integration into day-to-day apparel operations reduces its perceived impact among employees (Nada & Ahamed, 2014). Overall, the findings confirm that technologies directly embedded in daily work processes—such as automation and digital tool generate higher employee-perceived productivity than those used for managerial or analytical purposes.

Conclusion

This research examined how employee perceptions of productivity in Sri Lanka's apparel industry are influenced by technological advancements automation and robotics, digital tools and software, smart wearable technologies, and big data. The results demonstrate that automation and robotics, as well as digital tools and software, have strong and significant positive effects on employee-perceived productivity, while smart wearable technology and big data show weaker, non-significant relationships. These findings suggest that employees experience the greatest perceptual benefits from technologies directly embedded in daily tasks and workflows. Therefore, apparel manufacturers should prioritize investments in automation and digital systems, supported by proper training and process alignment, to maximize productivity outcomes.

The findings of this study carry important theoretical and practical implications. Theoretically, the study enriches the literature on technology adoption and employee perceptions by providing empirical evidence from a developing economy context. Practically, it offers valuable insights for apparel industry managers and policy makers to design technology integration strategies that enhance both operational efficiency and employee engagement.

However, the study is not without limitations. It focused only on five apparel firms in the Colombo district, which may limit the generalizability of findings to other regions or industries. The cross-sectional design also restricts the ability to observe long-term effects of technological changes on employee perceptions.

Based on these limitations, future studies are encouraged to include a larger and more geographically diverse sample across Sri Lanka's apparel sector or other manufacturing industries. Longitudinal studies could provide deeper insights into how technology-driven changes evolve over time. Moreover, incorporating qualitative approaches such as interviews or focus groups could capture richer perspectives on how employees adapt to and experience new technologies in their work environments.

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