

The Impact of Quality Assurance Practices on Employee Productivity in the Apparel Sector in Sri Lanka: Special Reference to Three Leading Apparel Manufacturers in Sri Lanka

Gayan Bandara¹, Nisha Jayasuriya² and Hansi Dominguhewa³

Abstract

The purpose of this research is to measure the impact of quality assurance practices on employee productivity in the apparel sector in Sri Lanka. In doing so, it is expected to minimize the quality assurance failures and increase employee productivity in the Apparel industry whilst applying quality standards on production. The research is designed as a quantitative study and a sample of 300 participants from three apparel companies is selected through the simple random sampling technique. Data collection was performed through a questionnaire survey. Mean value of variables and multiple linear regression model with forward regression technique are used to analyze the responses and determine the relationship among variables. The questionnaire is checked for validity and reliability. The results reveal that quality assurance practices of six sigma, 5S, and total quality management have a significant positive impact on employee productivity, but benchmarking has an insignificant negative impact on employee productivity. The managers can provide training to employees to achieve positive outcomes of quality assurance practices. Self-accountability can be improved by allocating employee time for work and social networking. Optimizing the organization's working conditions can be arranged based on infrastructure, ventilation, and minimal disturbances to motivate employees to be more productive. Quality assurance practices explored in this study contribute to providing flexibility and more opportunities for workers and addressing the role conflicts with strong impacts on the employee well-being. This leads to positive organizational outcomes.

¹ Assistant Lecturer, SLIIT Business School, Sri Lanka Institute of Information Technology, Malabe Sri Lanka, Email: gayan.b@sliit.lk

² SLIIT Business School, Sri Lanka Institute of Information Technology, Malabe Sri Lanka

³ University of Hertfordshire, United Kingdom

Keywords: Apparel industry, Benchmarking, Employee productivity, Quality assurance, Six sigma, Sri Lanka, Total quality management, 5S.

Introduction

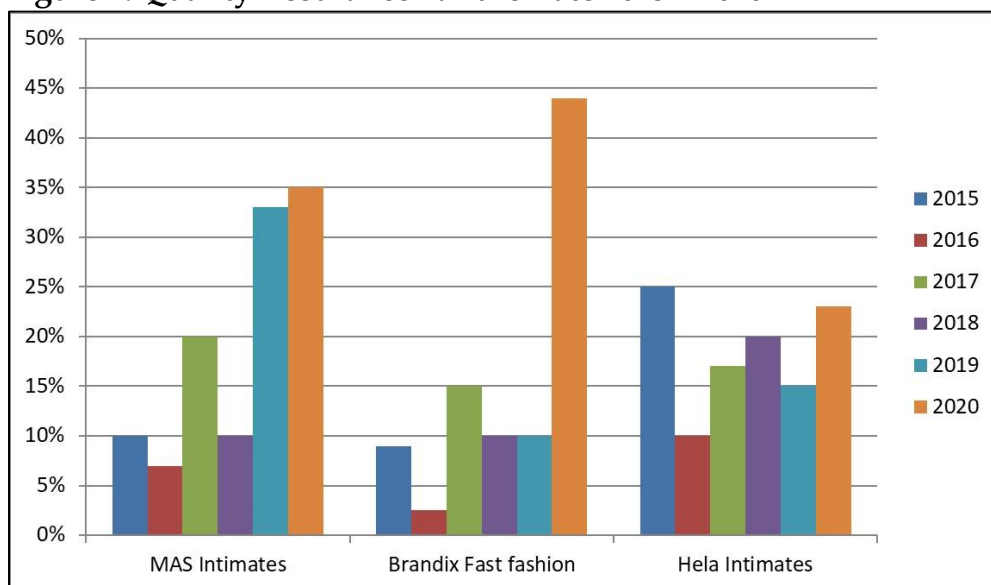
Quality assurance can be explained as any systematic process of determining whether a product or service meets its specific requirements (Gillis, 2019). In other words, it is a strategy that establishes and maintains a set of requirements for developing or manufacturing reliable products. A quality assurance system is the overall process developed to increase customer confidence and company credibility while improving work processes and efficiency. This enables the company to offer a higher product/service quality and better compete with others. The main aim of any production and manufacturing process is to achieve high quality standards and provide reliable products to customers. When considering the apparel industry, quality is crucial since customer expectations for quality garments is high. In the apparel industry, quality assurance and quality control techniques are widely used to meet customer expectations. These methods ensure that production processes meet relevant quality standards. Currently, the four main quality practices used in Sri Lankan apparel industry are six sigma, 5S, benchmarking, and total quality management (Anand and Kodali, 2008; Gapp et al., 2008; José Tarí, 2005; Schroeder et al., 2008).

Through the last few decades, Sri Lankan apparel industry has been ranked as the number one export industry based on a sizeable growth in revenue (38%) from 1996 to 1997 that generated \$2.18 billion in earnings and employed about 300,000 people in 800 factories. In the 2000s, the Sri Lankan apparel industry contributed to 39% of the country's gross domestic production and represented 43% of the country's largest source of export revenue. The apparel industry directly employs 400,000 people and indirectly provides a further two million jobs. The design, manufacturing and exporting of textiles and apparel products are one of the biggest industries, which plays a vital role in advancing Sri Lanka's economy. About 15% of the country's workforce is from the apparel industry, which accounts for nearly half

of the total exports in Sri Lanka. Sri Lanka is among the top apparel producing countries in the world relative to its population (Samanthi, 2021).

During past years, the quality failure rate was escalating in the apparel industry in Sri Lanka. Figure 1 shows the failures rates of quality assurance practices in MAS Intimates, Brandix and Hela intimates from 2015 to 2020.

Figure 1: Quality Assurance Failure Rate 2015 - 2020



Source: Internal Company Data

As key players in the industry accounting for the lion’s share of exports, HINT, MAS and Brandix have made several attempts to introduce quality assurance approaches to increase product quality. Quality assurance failures negatively impact the current and future business. Since these companies are engaged in the export business, they must meet relevant quality standards to satisfy the customers and gain new business opportunities. Moreover, these apparel giants supply renowned international brands for which adhering to stringent requirements is mandatory. If not, large scale buyers are most likely hesitant to continue purchasing products due to non-compliance with standards and lower product quality. In such a scenario, these companies will earn losses continuously, as unsatisfied customers may

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shift to other brands. Customers often look for quality products, while some prefer excellent quality. Hence, in this kind of competitive setting, it is mandatory for these companies to enhance their quality assurance practices. But limited research publications are available in this area of research in the Sri Lankan context.

In Sri Lanka, various scholars have studied quality assurance covering several sectors like the tea industry (Atupola and Gunarathne, 2022), construction projects (Rajaratnam, Jayawickrama and Perera, 2022) etc. Likewise, Mallawarachchi and Dharmarathna (2022) evaluated the quality of medical sector in Sri Lanka. However, quality assurance in the apparel sector remains unaddressed so far. Firstly, the authors conduct a study addressing this literature gap.

Secondly, this research finds ways to decrease quality assurance failures and increase employee productivity in the apparel industry whilst applying quality standards on production. Thirdly, the main objective is to measure the impact of quality assurance practices on employee productivity in the apparel sector in Sri Lanka.

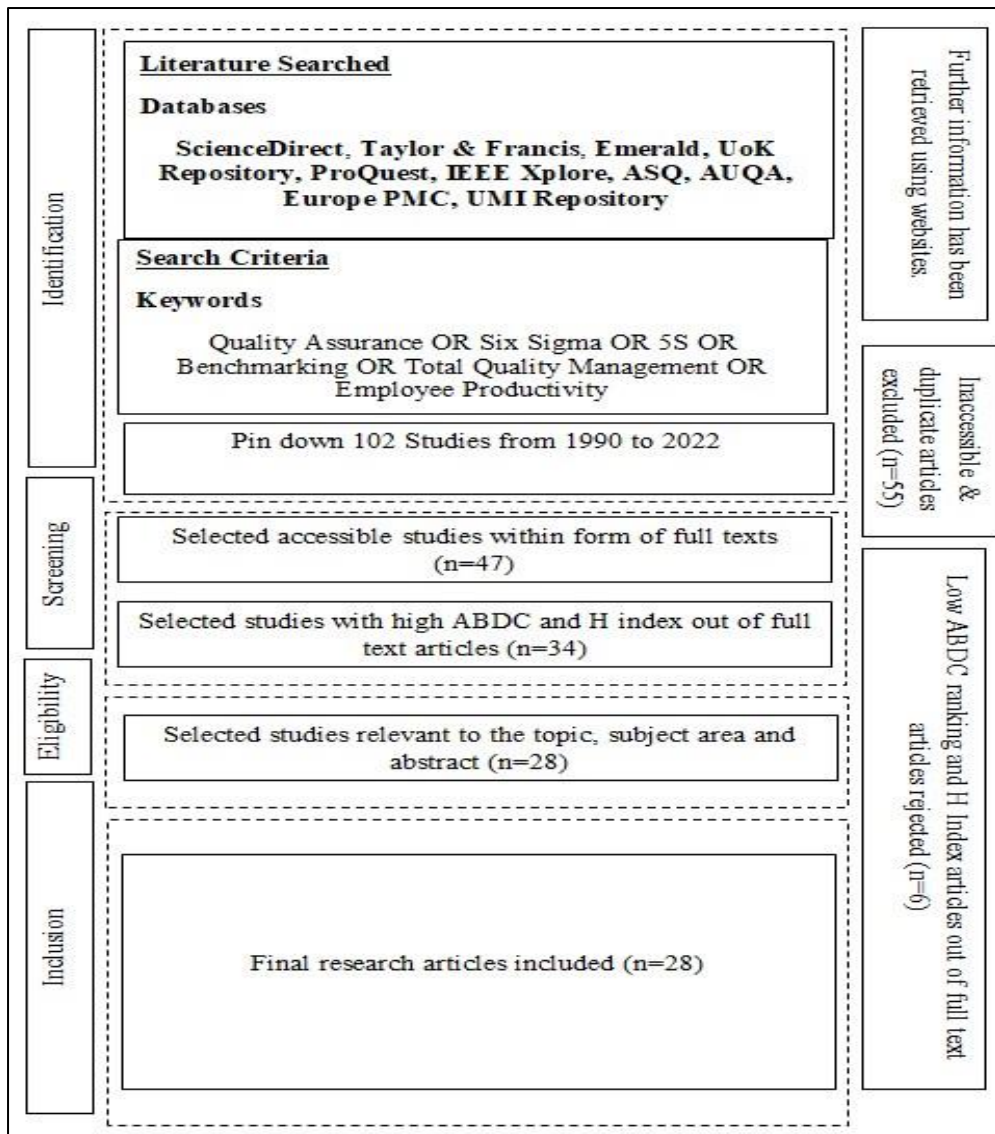
In the rest of the paper, Section 2 elaborates the literature review. Section 3 covers data and methodology. Section 4 explains the results and discussion. Section 5 reveals the conclusion.

Literature Review

Literature Search Strategy

The databases of ScienceDirect, Taylor and Francis, Emerald, UoK Repository, ProQuest, IEEE Xplore, ASQ, AUQA, Europe PMC, and UMI Repository were referred to search relevant research articles. The key words like "Quality Assurance", "Six Sigma", "5S", "Benchmarking", "Total Quality Management", and "Employee Productivity" were used to search articles in the databases. Initially, 102 relevant articles published during 1990 - 2022 were identified. Out of these, 55 articles were removed due to inaccessibility and duplication. Hence, 47 accessible articles were selected, then filtered and later, 34 articles with high ABDC and H index were selected. These were further filtered to remove 6 articles with low ABDC and H index. Finally, 28 articles relevant to the topic, subject area and abstract, were selected. Figure 2 illustrates the literature search strategy.

Figure 2: Literature Search Strategy



Source: Authors' compilation

Six Sigma and Employee Productivity

Six sigma could be identified as a project-driven management approach that companies apply to reduce process defects and improve quality (Kwak and Anbari, 2006). Al-Mishari and Suliman (2008) explain three possible approaches to implement six sigma in an organization. First, it is about transforming the conventional working

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conditions to gain new customers and regain lost customers. Second, it is a strategic improvement approach to identify major opportunities and reduce the weaknesses in working processes. The third method is a problem-solving approach targeting existing problems in working processes. The existing literature suggests DMAIC and DFSS as the most suitable methods of implementing six sigma (Edgeman and Dugan, 2008). Mainly, DMAIC was the method much praised. This is because it generally focuses on cost reduction and retrenchment, thus minimizing room for unnecessary costs and value adding activities. Most organizations have expanded DMAIC along with DFSS (Mader, 2006). Six sigma is well known as a customer-focused and well-defined method. Further it provides a comprehensible set of tools for process advancement (van Iwaarden et al., 2008).

Check sheets, flow charts, histograms and regression analysis were the most common six sigma tools widely used and available in various forms (Ferrin et al., 2005). The most important factor in implementing six sigma was that those tools can make working processes more mature and reduce errors in complex manufacturing (Raja, 2006). Though those tools differed from each other, it was essential to apply the right tool at the right time. Throughout the years, organizations had applied six sigma tools to their working processes to improve the efficiency and effectiveness of daily work and eradicate the gaps (Bunce et al., 2008). Simply, six sigma could be described as a model that improved knowledge management and built competitive advantage (Gowen III et al., 2008). Moreover, it could be identified as a strategy that guided cultural changes to increase profitability (Antony et al., 2005). In addition, six sigma could be defined as a complementary approach to the lean concept, connected with total quality management. Here six sigma acted as a structured method for increasing the system performance and continuous improvement in organizational culture. The commitment of top management and training are crucial for the success of six sigma implementation. Top management embracing this concept, providing leadership to produce high quality products is a key contributor for the successful implementation of six sigma. This results in a marked increase in quality, agility, and speed in the production lines (Thomas, 2009). Most scholars presented the DMAIC approach to combine six sigma with

lean practices. However, having two methodologies, lean and six sigma, would generate more benefits for increasing organizational performance. Supply chain processes too could be improved by using six sigma metrics. Six sigma also keeps the total quality management practices on track such as employee engagement, customer focus, and process improvement. Based on the literature above, the following hypothesis can be derived.

H1: There is a significant positive impact of six sigma on employee productivity.

5S and Employee Productivity

Some studies have accepted 5S as a method of housekeeping (Eckhardt, 2001; Becker, 2001). However, 5S could be linked with Japanese management approaches such as total productive maintenance and Just-In-Time manufacturing (Ahuja and Khamba, 2008). One factory survey in Iran indicated that 5S execution provided better conditions for implementing of total productive maintenance (Moradi et al., 2011). As mentioned in several studies, the 5S method was perceived to improve health and safety standards and performance in a holistic operation with a high level of efficiency (Khamis et al., 2009). The strong correlation between 5S and total quality management further approved the role of 5S as a training tool for total quality management and the need for a sound approach towards total quality management. A considerable decrease was evident in the rate of injuries in the companies where the objective was to improve safety through the 5S practice. Many successful organizations worldwide, perhaps inadvertently, had already included some aspects of the 5S in their daily operational activities without complete awareness of its benefits. Moreover, 5S was applied in most factories and given priority in manufacturing sections against other sectors in various ways, which could be attributed to the maturity of the 5S program (Warwood and Knowles, 2004). Mixing lean manufacturing initiatives through 5S with safety yields results well aligned with the rest of the organization. Hubbard (1999) showed that orderliness was one of the five pillars of the visual workplace, which intended to eliminate three types of waste: searching waste, the difficulty of use waste, and the waste of returning items to their proper

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place. The above literature supports developing the following hypothesis.

H2: There is a significant positive impact of 5S on employee productivity.

Benchmarking and Employee Productivity

The most important benefit of benchmarking is that it engages in discovering innovative approaches and highlighting the defects and potential for improvement (Meade, 1994). To maximize the positive outcomes of benchmarking, organizations conducting self-analysis about their processes and working conditions can be more effective (Epper, 1999). Organizations could use different types of benchmarking such as sector internal, competitive, industry and best-in-class. Internal benchmarking involves internal working processes, while competitive benchmarking focuses on applying global measures in a competitive working environment. Industry benchmarking focuses on the distribution of resources and resource structuring, while best-in-class benchmarking moves beyond traditional competitive boundaries (Stella and Woodhouse, 2007). Based on this literature, the following hypothesis is developed.

H3: There is a significant positive impact of benchmarking on employee productivity.

Total Quality Management and Employee Productivity

Organizations face competitiveness and diverse challenges due to highly volatile working environments (Oakland, 2005). Here, organizations should be ready to face those challenges to satisfy customers by producing high-quality products. Organizations worldwide have used quality strategically to win customers. Total quality management is a widely used concept of ensuring the production quality of organizations to gain a competitive advantage. As a good method to promptly overcome challenges faced by organizations, total quality management mainly focuses on improving the efficiency and effectiveness of organizational performance. Organizational convergence is a must to successfully implement the

total quality management approach (Ramlawati, 2018). According to this literature, the following hypothesis is developed.

H4: There is a significant positive impact of total quality management on employee productivity.

Additionally, 5S was linked to total productive maintenance and Just-In-Time manufacturing, thus aiding employee productivity improvement. It reduced the rate of injuries and amended health and safety standards and performance related to employee productivity. Benchmarking helps identify innovative approaches, defects, and the ability to improve, which are necessary for enhancing employee productivity. It made the organization self-analyze its processes and working conditions, which were essential in improving employee productivity. Internal benchmarking improved internal working processes and competitive benchmarking improved global competitiveness. Both aspects led to an improvement in employee productivity. Likewise, industry benchmarking helped to distribute resources among employees adequately, while best-in-class benchmarking helped employees improve themselves beyond traditional boundaries. Total quality management helps the organization gain a competitive advantage, overcome challenges on time, and improve performance efficiency, effectiveness, and teamwork. Hence, it certainly led to an improvement in employee productivity.

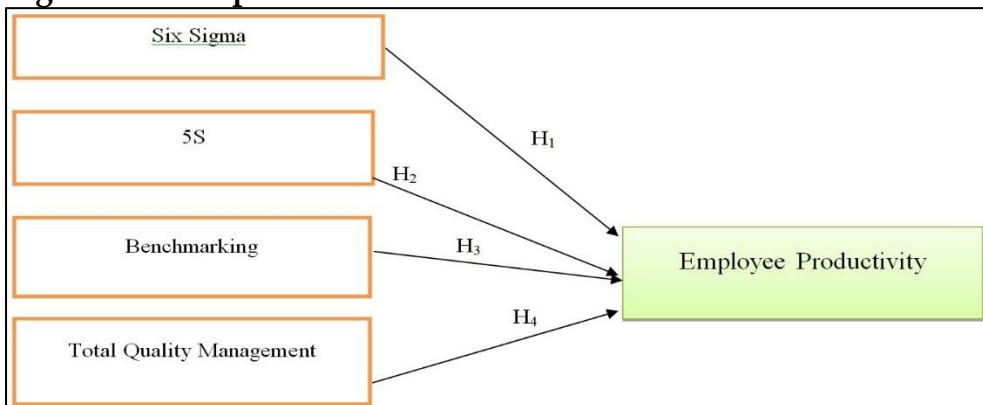
Employee productivity was the amount of work a person or a group could do in each period. It differed from person to person based on the time he spent completing the task. It led to employee growth, organizational cultural development, increased company profitability, work efficiency and effectiveness management, organizational productivity, profitability, decision-making, and problem-solving. Employee motivation, mentoring, empowerment, organizational culture, conflict, creativity, goal clarity and solidarity positively impact employee productivity.

Data and Methodology

Data

Primary data was collected through the Likert scale questionnaire for hypothesis testing. Section A and section B made up the questionnaire. Section A indicates details about the gender, age, designation, and work experience of the participants. Section B consisted of participants' opinions on independent variables of six sigma, benchmarking, 5S and total quality management, and the dependent variable of employee productivity. Questionnaires were distributed through Google forms and social media, and direct observations were also conducted to gather more accurate data. The study adopted the deductive approach. The total number of respondents is 300, who are the employees at HINT, MAS and Brandix. The convenient sampling approach was used to select the respondent sample, i.e., employees selected from these organizations. The questionnaire is tested for reliability and validity, i.e. to clarify the questionnaire's ability to produce quality information for the analysis. This analysis used a Pearson correlation value to describe the association between factors. The most critical aspect of the relationship was its meaning, which necessitated using a significant value in the correlation table. Multiple regressions with the forward stepwise regression technique were used for regression analysis. The reason for applying the forward stepwise technique is to pick variables in each specification without difficulty. The calculations are the same as the stepwise regression method as the forward regression technique. Figure 3 shows the conceptual framework.

Figure 3: Conceptual Framework



Source: Authors' compilation

Results and Discussion

The convergent validity of the dataset was confirmed through the KMO, Bartlett’s Test of Sphericity, Average Variance Extracted, and Composite Reliability (Hair et al., 2012). Cronbach’s alpha examined the reliability of the dataset. Multicollinearity is checked using VIF, including tolerance, to verify that independent variables are not highly correlated. The VIF and tolerance are low (Maximum tolerance level is 0.445 and VIF maximum level is 2.246.), suggesting that multicollinearity is not significant in this study.

Table 1 shows Cronbach’s alpha value on independent variables. The questionnaire in this study has high internal consistency since Cronbach’s value for each variable is greater than 0.7. Hence, the questions in this questionnaire can be used to produce highly accurate results.

Table 1: Cronbach’s Alpha Value on Independent Variables

Variable	Reliability (Cronbach’s alpha)	Number of question items
Six Sigma	0.968	7
5S	0.947	8
Benchmarking	0.941	5
Total quality management	0.945	5
Overall Cronbach’s alpha	0.982	25

Source: Authors’ compilation

Table 2 depicts descriptive statistics. Gender-wise, males comprised 51.7% and females comprised 48.3% of the 300 participants. Respondents between the ages of 25 to 30 were 46%, the largest in the age categories. In addition, the study includes 57% of participants under executive grade and 44.7% of participants with 1-5 years of work experience.

Table 2: Descriptive Statistics

Demographics	Categories	N	Percentage
Gender	Male	155	51.7%
	Female	145	48.3%
		Total 300	Total 100%
Designation	Staff	101	33.7%
	Executive	171	57%
	Manager	28	9.3%
		Total 300	Total 100%
Age	18-24	42	14%
	25-30	138	46%
	31-40	106	35.3%
	40 above	14	4.7%
		Total 300	Total 100%
Work Experience	Below 1 year	28	9.3%
	1-5 years	134	44.7%
	5-10 years	117	39%
	Above 10 years	21	7%
		Total 300	Total 100%

Source: Authors' compilation

Table 3 summarizes the participants' views on all independent and dependent variables considered in this study. The mean value of 4.2700 for the dependable variable, employee productivity, explains the participants' agreement related to each question item. The standard deviation of 0.4738 means that most respondents have a similar view, as the dispersion of values is closer to the mean value. The skewness of the data with 0.779 and the skewness between 0.5 and 1 means that the data are positively skewed. The kurtosis value -0.616 implies that the distribution is too flat. The independent variable, six sigma, has a mean value of 4.2067, indicating the participants' agreement related to each question item and that six sigma impacts employee productivity. The mean values of other variables are 4.2300 for 5S, 4.0833 for benchmarking and 4.2333 for TQM, which also depict that the participants' agreement related to each question item impacts employee productivity. The standard deviation of 0.45237 for six sigma, 0.48774 for 5S, 0.61453 for benchmarking, and 0.46864 for TQM

mean that most respondents have a similar view as the mean value since the standard deviation is close to zero. The skewness values are 0.779 for six sigma, 0.298 for 5S, -0.485 for benchmarking and 0.465 for TQM. Hence, the skewness of six sigma, 5S and TQM are between 0.5 and 1, and those are positively skewed. The data with -0.485 for benchmarking are highly skewed since the skewness is less than -1.

Table 3: Descriptive Statistics of the Variables

	Six sigma	5S	Benchmarking	TQM	Employee Productivity
N	300	300	300	300	300
Mean	4.2067	4.2300	4.0833	4.2333	4.2700
Std. error of mean	.02612	.02816	.03548	.02706	.02736
Std. deviation	.45237	.48774	.61453	.46864	.47383
Variance	.205	.238	.378	.220	.225
Skewness	.779	.298	-.485	.465	.656
Std. error of skewness	.141	.141	.141	.141	.141
Kurtosis	.235	.957	1.310	1.100	-.616
Std. error of kurtosis	.281	.281	.281	.281	.281

Source: Authors' compilation

Correlation results are given in Table 4. All correlations are positive. Here, all the relationships indicating the association between quality assurance practices and employee productivity have a Pearson correlation value of 0.772, which explains a high correlation. Six sigma and employee productivity have a Pearson correlation value of 0.737, indicating a high correlation. Similarly, 5S and employee productivity have a Pearson correlation value of 0.772 which is a high correlation. Benchmarking and employee productivity have a Pearson correlation value of 0.474, a moderate correlation. Finally, total quality management and employee productivity have a Pearson correlation value of 0.724, a high correlation.

Table 4: Correlation Results

	Six sigma	5S	Benchmarking	TQM	Employee productivity
Six sigma	1				
5S	.830**	1			
Benchmarking	.660**	.605**	1		
TQM	.845**	.745**	.606**	1	
Employee productivity	.737**	.772**	.474**	.724**	1

Note: **significant at 1%

Source: Authors' compilation

The regression results are shown in Table 5. In the first model of this table, significant positive signs of quality assurance practices indicate a positive and significant impact of quality assurance practices on employee productivity. This is in line with the study's main objective to determine the effect of quality assurance practices on employee productivity in the apparel industry in Sri Lanka. To be more precise, there would be a 14.4% effect from six sigma, 49.2% effect from 5S, 29.6% effect from total quality management and -0.098 from benchmarking on employee productivity. Hence, six sigma, 5S and total quality management significantly positively impact employee productivity. However, benchmarking has a negative but insignificant impact on employee productivity. Furthermore, the R square value of 0.654 means that a 65.4% variance in quality assurance practices can be predicted using all independent variables.

Table 5: Regression Results

Variable	Model 1	Model 2
Six sigma	0.144***	
5S	0.492***	0.523
Benchmarking	-0.098	
TQM	0.296***	0.335
Constant	0.656	0.687
R squared	0.654	0.647

Variable	Model 1	Model 2
Adj. R squared	0.649	0.644
Std. error of the estimate	0.28060	0.28265
Observation	300	300

Note: **significant values

Source: Authors' compilation

In model 2, the forward regression technique is used. Here the 5S and total quality management practices are included. 5S technique has a 52.3% effect and total quality management technique has a 33.5% effect. This indicates that these two quality assurance practices significantly and positively impact employee productivity since six sigma and benchmarking techniques have been excluded. Furthermore, the R square value of 0.647 means that a 64.7% variance of quality assurance practices can be predicted using independent variables of 5S and TQM.

Based on these results, the first, second and fourth hypothesis is accepted because of the significant positive impact of six sigma, 5S and total quality management on employee productivity. But the third hypothesis is rejected because of the insignificant negative impact of benchmarking on employee productivity.

Based on the regression analysis findings, six sigma has a significant positive impact on employee productivity. This agrees with the findings of Antony et al. (2005), Gowen III et al. (2008) and Thomas (2006) who pointed out that six sigma helped in improving knowledge management, competitive advantage, profitability, system performance, organizational culture, and production quality and agility.

According to this study, there is a significant positive impact of 5S on employee productivity. This aligns with the findings of Ahuja and Khamba (2008) and Moradi et al. (2011). They showed that 5S was linked to total productive maintenance and Just-In-Time manufacturing which aided in improving employee productivity. Moreover, Khamis et al. (2009) and Warwood and Knowles (2004)

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revealed that 5S reduced the rate of injuries and uplifted health and safety standards and performance are related to employee productivity. Hence, the findings of this study conform with past literature.

Regression analysis results of this study indicate a negative impact of benchmarking on employee productivity, which is not significant. Henceforth, when the company performs benchmarking, employee productivity starts to decline but is insignificant. The previous literature explained that benchmarking improved employee productivity by identifying innovative approaches, defects, and the ability to improve (Meade, 1994). Additionally, benchmarking made the organization self-analyze its processes and working conditions which were essential in improving employee productivity (Epper, 1999). Also, internal, competitive, industry, and in-class benchmarking helped improve employee productivity (Stella and Woodhouse, 2007). Since the previous research studies have been based in other countries, the Sri Lankan context may vary based on country-specific factors and organizational factors of key industry players, in how TQM has been adopted.

Furthermore, this study indicates the significant positive impact of total quality management on employee productivity. This finding agrees with those of Ramlawati (2018), who pointed out that total quality management provided the setting for the organization to gain a competitive advantage, overcome challenges on time, improve performance efficiency and effectiveness, and teamwork leading to the improvement of employee productivity. Hence, these findings align with the findings of past literature.

Conclusion

The results reveal that quality assurance practices like six sigma, 5S and total quality management substantially impact employee productivity. In contrast, benchmarking has an insignificant negative impact on employee productivity. Both the employee and employer in the apparel industry need to consider these variables carefully. Findings demonstrate that the age groups between 25 and 30 years and employees in the executive category greatly impact quality assurance

practices. In addition, maintaining high quality creates more opportunities for employees in apparel companies. In Sri Lanka, quality assurance practices and employee productivity must be perceived beyond a mere quick fix to sustain the economy. The managers can improve the company training policy to provide employee training to achieve positive outcomes of six sigma, 5S, and total quality management. Self-accountability can be improved by allocating employee working time for working and social networking. The organizational working environment can be optimized by providing a conducive setting with proper infrastructure, ventilation, and minimal disturbances to motivate employees to be more productive. Six sigma, 5S and total quality management can be incorporated into the organizational practices and policies and thereby reflected in organizational working processes. Overall, allowing flexibility and more opportunities for workers and a proactive approach to addressing role conflicts with strong impacts on the well-being of employee productivity can help achieve positive organizational outcomes in the long run. Yielding favorable results can be beneficial for the apparel industry in Sri Lanka to formulate policies and set up corporate strategies and processes to sustain the competitive advantage.

Further Research

This research concentrated on a large sample size and used quantitative data for analytical purposes. As a result, it significantly influences and comprehends in-depth issues of the effects on employee productivity. Hence, future researchers should concentrate on qualitative or mixed method research because it significantly impacts identifying the in-depth situation concerning employee productivity. This study centered on three apparel companies. Therefore, future researchers may study other apparel companies to gain a better understanding of the impact of quality control practices on employee productivity and how to improve quality practices to improve employee productivity. These enhance the validity, relevance, and usability of the company policies. All in all, approaches of this kind can set the country on track to enforce the best policies that positively affect industry and employees.

Limitations

The study's results and analysis were limited to only three apparel companies, totaling 300 employees and deployed Google forms for online questionnaires. Therefore, future research can involve many other apparel companies' employees with interviews, document reviews and the use of secondary sources for data collection.

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