

**Factors affecting to the output efficiency of a production department:
A case study in Sri Lankan apparel industry**

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Output efficiency of a production department is essential for increasing the profit of an organization while satisfying the customers. A learning was regulated in a foremost apparel manufacturing factory in Western province. The main objective of the case study is identifying the factors which are affecting to the output efficiency of a production department while the specific objective is fitting a regression model to measure the effectiveness of those factors. A literature survey was conducted to get the expansive idea about the factors influencing and included them to a questionnaire to collect primary data from the factory. Six factors were selected from primary data analyses using Pearson correlation test and 5-point Likert scale method with 91% response rate. According to the correlation test, Absenteeism percentage, AQL output rate, Target efficiency, Average incentives, Hold quantity rate and Downtime rate were identified as significantly affected factors to output efficiency of the production department. Secondary data was collected from the factory based on those selected factors. 771 number of daily data were collected from the daily factory summary tables, attendance personal records, and preventive maintenance records of the factory. Line graphs were used to recognize the interaction effects of the variables. Variable centering method was utilized in order to remove the multicollinearity. The model was found at the 12th step of the forward selection procedure and model adequacy was examined using data subsetting lack of fit test. When checking the model diagnostics, the lack of fit tests between residuals versus predictor variables was applied to test the linear relationship between response and predictors. Residuals versus fitted plot was used to test the constant variance of the residuals. In order to investigate the normality of the residuals, Anderson Darling test and normal probability plot was used. It was confirmed that data not ill-conditioning by variance inflation factor values of predictors. According to the analysis of secondary data using the multiple linear regression main effects were identified from all first order explanatory variables except Accepted quality level output rate and Hold quantity rate. The interaction effects from the variables Absenteeism percentage, Accepted quality level output rate, Average incentives, Downtime rate were proved by the fitted model. Moreover, there were effects from second order terms of all explanatory variables except Hold quantity rate. As specified by the model, the predictors explain 55.2% of the variance in Output efficiency while the highest positive effect and the highest negative effect have made by target efficiency and downtime minutes respectively. Furthermore, Average incentives are affected slightly and there are considerable amounts of effects from interaction terms also. Using this model, the output efficiency of the production department can be increased by adjusting those factors necessarily and also it will ameliorate the productivity of the factory. Since the coefficient of multiple determination is 55.2% and the remaining 44.8% of the variability is still unaccounted, the model can be improved by adding more variables to the model. As a future work it will be worthwhile to use nonlinear regression method for curve fitting and measure the effects from these variables.

Keywords: Apparel industry, Multiple linear regression, Output efficiency