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Factors Affecting Waste Elimination: A Case of Confectionery Food

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ABSTRACT

This research identified the factors related to waste elimination in the confectionery industry. The rationale for conducting this research is the increasing issue of waste elimination in the confectionary sector of Pakistan and the limited research being carried out on this particular topic. The methodology used in this research was based on quantitative data collected through surveys conducted by supply chain professionals. The data was analyzed with the help of using different statistical techniques such as reliability analysis, regression and correlation analysis, and factor analysis. The patterns of findings derived through regression analysis illustrated that various factors of production related to skilled labor, automation, material quality, and machine efficiency positively impact waste elimination in Pakistan's confectionary industry. On the other hand, the results of correlation illustrated that out of different factors of production, the factor which is most influential on waste elimination is skilled labor as its value was reported at 0.867, which was the highest amongst all the variables in the research. The theoretical implications of the findings are that they were very much aligned with the existing literature and contributed to it positively. On the other hand, practical implications are related to supply chain managers as these managers, in the context of the confectionary industry, can use these findings to improve the efficiency of the production process through waste elimination.

Keywords: *Sustainability, Green supply chain management, Skilled labor, Automation, Material quality, Machine efficiency*

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1. Introduction

The production department in any organization consists of a group of different functions that is responsible to manufacture the goods for the company. The duties of the production department further involve identifying the inputs scheduling the production, minimize production costs, ensuring production quality and improving the existing products (Rashid et al., 2023). The production department usually involves the whole process that is responsible to converting the raw materials into the finished goods. During the process it is very important for the department to improve the work efficiency and the assembly line to get better outputs. The output targets are also set by the company to ensure the finish products final quality and provide the best value and quality to the consumers (Müller et al., 2018; Baloch & Rashid, 2022). In production manufacturing the supply chain plays an important role because it facilitates the transformation of raw materials to the finished products. The customer satisfaction totally relies upon the distribution of products on the right time with high quality. The supply chain involves in the manufacturing of products a lot because it builds the connection. The network during the production process based upon the supply chain because it involves manufacturing, sourcing and purchasing with logistics and much more (Munir et al., 2020; Shaheen 2022).

Similarly, on the other hand the production waste usually involves the unusable or unwanted products during production. The material that is produced during the production that is unwanted or unusable is known as the production best. The product wastage most of the time is useless and discarded material but when it comes to the major wastes it results in loss for the company as well. During the production process the wastage sometimes results in possible errors (Rashid et al., 2022a). Implementing some new lean strategies wood reduce the production wastage but cannot totally eliminate it. There are several causes of waste during production process and dealing with them is the most important aspect of any organization. Some of the most problematic areas that need to be avoided by the organization are the waste during production. Sometimes due to the poor communication by the controller of a packaging machine results in the product wastage. Some critical events during production, shorten time also causes the production wastage (Rashid & Rasheed, 2023). Usually, the organizations also face the waste during production due to inadequate physical layout in the industries. There is no proper connection between the inputs and outputs of the machinery's which causes the growth in production wastage. Moreover, sometimes the insufficient training of the workers also highlights the factor of production wastage. During manufacturing the insufficient automation in the machineries or the production plants leads to words the manufacturing waste. The production waste is always affected on the profitability of any organization (Anwar, 2022). The top management becomes unhappy because of the loss of raw material and the trouble environment in the industry. Supply chain also plays an important role in reducing the issues during production. The delays in production and shipment or insufficient shipment methods are sold by the supply chain. During the process of workflow, the information order fulfillment and supply demand matching is also the role of supply chain management during production.

The confectionery industry includes the production of candies, chocolates and the other sweet treats. Sometimes they face the several production and supply chain issues. The most common issue faced by the confectionery industry is related to the raw material availability (Rasheed et al., 2023). The industry relies upon the supply of ingredients like sugar, nuts and the flavourings. The disruption in the availability of the raw material impact upon the production results in the supply chain disruption. On the other hand, there is also an issue of shelf life and perishability. Most of the confectionery product has limited shelf life which contains dairy and the perishable ingredients. The another most common issue is about the quality control and consistency. Such confectionery Items offer required the precise formulation because of the consistency in taste texture and the appearance. So maintaining the quality control standards can be challenging (Goryńska-Goldmann et al., 2020; Amjad, 2022; Rasheed, 2022).

Moreover, another issue faced by the confectionery industry related to production and supply chain is about the packaging and labelling requirements. The confectionery products must comply with the various packaging and the labelling regulations. Meeting those requirements is very necessary to have a consistent across the product lines and the market which is very complex. Furthermore, the confectionery industry relies heavily upon the transportation and logistics. Due to the several delays, damages and the inadequate issues or the control the transportation can impact upon the product availability and the quality (Rasheed & Rashid, 2023). Similarly, the demand forecasting is very crucial for the efficient production planning and the management of inventory in the confectionery industry. The fluctuation in the consumer demand because of several trends like season or the economic conditions may become challenging for demand forecasting. However, the overproduction or the underproduction can result in various supply chain losses for the company. It is recognised that maintaining the strong relationship with the reply suppliers ensure the consistent quality of the supply chain smoothly (Kazibudzki & Trojanowski, 2020; Muhammad, 2022a).

1.1 Issue of Waste Management in Supply Chain of Confectionery Food

The issue of waste management in the supply chain industry of confectionery is the important concern for both the economic and the environmental reasons. The confectionery industry can have the key aspect issues consideration which includes packing (Rashid et al., 2022b). The products are often come in excessive and non-recyclable cable packing which is a significant contribution towards based. Moreover, the raw material sourcing plays an important role in the waste reduction. It is very important for the manufacturers to work with the suppliers and prioritise sustainable practices. Moreover, the efficient manufacturing processes can significantly reduce the waste generation. It's very important for the confectionery industry to implement the lean manufacturing principles to identify the waste in the production process (Adami & Schiavon, 2021, Ahmed, 2022). Furthermore, the another most common issue of waste management in the supply chain industry is based upon the inventory management. The manufacturers can have excessive overproduction which results in waste. These products might get expired or become obsolete. On the other hand, the distribution and logistics also contributes as an issue in the confectionery industry supply chain. During the transportation and logistics process, the waste can also occur. The handling practices and the risk of damage and spoilage can increase the chance of wastage in the supply chain. Similarly, there is also a chance of retail and consumer wastage. So, it is very essential to raise awareness about responsible consumption and waste reduction (Fathollahi-Fard et al., 2020; Wahab, 2022). Production waste is a very critical issue because it relates with the environmental, social and economic conditions. The waste generated in the industries during production results in the loss of raw material and the resources of the organization. The waste in the industries would be of any shape that is not transformed from the raw materials into the items that customers are willing to pay for (Kusi-Sarpong et al., 2019; Muhammad, 2022b). "The minimization of waste in the industry is very important. The problem statement focuses on the investigation of the production waste in field confectionery industry. The problem focuses around the wastage of the products in the industry during wrapping, steps reprocessing of chocolate and sweets, syrup cooking steps, poor automation, human error and reliable processes (Goryńska-Goldmann et al., 2021; Hashmi, 2022; Hyder et al., 2023)." The aim of the research is to analyze the impact of different factors related to waste elimination in the confectionery food.

1.2 Research Questions

The questions identified for the study are as follows:

- What is the impact of skilled labor on elimination of waste?
- What is the effect of automation on elimination of waste?
- What is relationship between quality of material and eliminating waste?
- What is the impact of machine efficiency on waste elimination?

1.3 Research Objectives

The main objective of this paper is to investigate the impact of different elements related to waste in the confectionery food. On the other hand, the sub-objectives of this paper are illustrated below:

- To determine the effect of skilled labor on waste elimination
- To determine the effect of automation on waste elimination
- To determine relationship between material quality and elimination of waste
- To determine the impact of machine efficiency on waste elimination

2. Literature Review

Waste management theory is found to prevent waste that causes harm to human body, health and surroundings that includes all living animals too. Dumping of this waste without any proper precautions have destroyed this planet to the maximum. Waste can be of four types, industrial, commercial, domestic, and agricultural. Further, there are four R's of waste management that are reducing, reusing, recycling and recovering. Industries try having a system that creates as minimum waste as possible. Pilarska et al. (2018) said that it follows from the laws of thermodynamics, that it produces a byproduct from the waste. It has been constantly considerable that both industrial ecology and waste management overlaps with each other. The principal distinction comes from the bigger size of IE: it comes to a long way past the dividers of a modern office, and supports capable conjunction with the general climate and making interlocking eco-frameworks with different organizations to accomplish a productive flow of materials. Paradigm of industrial ecology gives a company its goals for resourcing optimally. We need to see it through social aspects too; there are different principles like morals and responsibilities that need to be introduced into these goals. Most of apparatuses that are to be adjusted to modern waste administration begin in IE; notwithstanding, a few instruments are likewise affected by design theory. Social viewpoints are additionally considered, standards, for example, adequacy, ethics and obligations should be brought into the objectives and values to be followed. From "this present reality" encompassing the waste administration space, human requirements and assumptions additionally influence the goals set out by government.

Gupta et al. (2019) stated that the waste generated in the confectionery industry is not used for consumption purposes, but it causes environmental hazards also. To know the real problem, historic records regarding the waste in production were recognized in the article. Assuring the production's food safety needs to be focused on the high standard requirements to deliver the right products to the customers. But still, the production waste due to the satisfy specifications is somehow difficult to reduce. Sometimes the specifications in the confectionery production result in machinery malfunctions which directly impact the production line waste. The article focuses on the author also stating that the defective items in food production, especially in conventionally industry, also result in production waste. The author highlighted a lollipop Production line as a confectionery industry in the article. The actual waste indicators during the production were highlighted to identify the problem. Usually, the production waste occurs in syrup cooking, hopper placement, mold placement, and expulsion. During The syrup cooking step of confectionery items, the mismanagement of the equipment results in the production waste. While on the other hand, the product placement into the hopper also causes production waste. The author also recognized that due to the mismanagement of the equipment, the lollipop's end product was also found out defected. When the end product is defective, it results in production waste and cannot deliver to the end consumer. Even in the small to the medium-sized confectionery manufacturing industry, there is a problem of production waste. The major waste generating activities involve the process's stages, monitoring, cleaning, testing, and storage. There are also some major environmental wastes in the confectionery industries during production. During the wrapping of products, some dust materials, powders, and syrups are the major source of industrial waste. Implementing the waste management processes requires proper improvement in planning. In the range

of confectionery products, the rejected sweets or chocolate that are not suitable for reprocessing are also wasted and become the residue.

Sadh et al. (2018), stated that the manufacturing waste is not valuable to the end customers. Even sometimes, there is also a waste of inventory during production when the confectionery industry tries to meet unexpected demand. The author emphasizes lean manufacturing, which is used as the better option for removing waste during production. Some poor-quality controls during the production level result in the wastage of products. Most of the time, poor machine repair, lack process standards, and some unskilled workers turn out to be wastage in confectionery products. Even sometimes the production wastage occurs due to poor communication among the workers, human error, or some slow processes in approval of machinery. Even unreliable processes, poor automation, and delayed setup times in machines also result in confectionery production waste. Singh et al. (2019), also stated that the waste in the production might occur due to the overproduction factor. The raw materials were wasted because they were unused products. The manufacturing industry, especially the confectionery, does not dispose of their waste products in a good manner. The waste in the production sector is also associated with unprocessed inventory due to heat light or expiry issues. Even sometimes, when the confectionery items are in the motion stage in the industry results in product wastage. Sometimes the machine error also causes in the motion stage turns out to be product wastage. The author also emphasizes the factors of over-processing of the products and transportation. Usually, transportation does not come under the production sector, but still, the products might waste during the movement from one place to another.

According to Debeaufort (2021), the waste during production in the confectionery factories results in many environmental hazards. If the industry does not dispose of the waste material in a good manner, it can badly impact climate change. Even if the industries burn the waste material, it also impacts the wildlife, public health, and marine life. According to the author, improvement in waste management during production is not an easy stage because it requires creative ideas and the adoption of advanced technology. The solution implemented in the confectionery industries needs to have proper control for a long-term basis. Another research carried out by Salihoglu et al. (2018), emphasizes that the waste generated in different industries during production cannot be recycled. The action of production waste is a process that cannot add value to the customer. The unnecessary production waste during manufacturing is something the customer does not want to pay. The company also bears the production waste because it is unwanted or unusable material. The author implemented the lean 6 Sigma project to reduce the waste during confectionery production in the industries. The author determines that it will surely decrease the waste during production and help the company optimize the process. Reducing errors and increasing efficiency will also decrease the waste during production in the confectionery industries. Process innovation is described as the introduction of a revolutionary or considerably better production or delivery method, which may include considerable modifications in procedures, equipment, and/or software. It wants to cut logistics and production costs, improve quality, and create/deliver new or considerably better products. Companies who don't pursue continuous improvement after introducing process innovation are more likely to fall back into old habits. Lean manufacturing (LM) has proven to be beneficial.

In order to stay competitive in the food business, lean principles are used. LM is still an underutilized strategy, according to the author. Adopting this mindset can help simplify processes, increase the percentage of value-adding activities, and improve operational performance. The effective use of LM principles and techniques would drastically reduce non-value-added time, waste, and associated expenses, resulting in better customer service and higher levels of satisfaction. Companies were at various stages of implementation in the two case studies detailed in this work. In the first instance, lean concepts had only recently been introduced, and workplaces were generally disorganized. This resulted in a few non-value-added activities (e.g., searching for specific tools, a lack of cleanliness, and so on) that had to be addressed; the 5S methodology was used. Later, the main identified issue was changeover times. Because of the previously identified characteristics of the food and beverage industries, this problem was also discovered in the second case study. SMED (single-minute exchange of die) was used to address this.

Likewise, article is based on the causes, magnitude, and scope for reducing food losses in baking and confectionery industry. The authors claim that one of the obstacles in obtaining global food security and modernizing present food system is minimizing food waste. As cereal manufacturing is so essential to human health, researchers in Poland conducted a study to analyze food losses in baking and confectionery industry (BCI) (Goryńska-Goldmann, 2021). For the collection of data two methods were used, quantitative data as case studies and qualitative data by interviewing 17 industry experts. The companies covering 9.7 to 14.4% of total production with daily average losses range from 0.8 to 6.4 tons. The most losses were incurred by transport and retail returns, 94 secondary and 31 primary losses were identified by Ishikawa concept (Lowe et al., 2018; Hashmi 2023). Inside organization, by using the probability of losses a set of tools for waste prevention and control was identified across all the departments from raw materials till transportation, including specialization of employees in several areas like logistics and sales, technology, collaborations etc. This research provides essential information for designing new strategies for eliminating and minimizing food losses in BCI. Multiple solutions were presented to encounter additional cost by having the potential to save money (Hashmi et al., 2020a.

Due to consequences for economic, environmental and social aspects of sustainability, it has now become obvious that food loss and waste (FLW) is one of the most major drivers of food production inadequacies and a major problem worldwide. FLW is known as a key barrier for the sustainability of food chain by preventing the losses of crops and other resources required for the food production. By knowing the challenges and barriers in food Waste, a triangle method was used to acquire numerous observations in order to accomplish a goal. In Poland, there are almost 11,000 entities of baking and confectionery businesses from diverse economic backgrounds. Because of the intense competition products of different bakeries are uniform. The 96 entities were invited to take part in the research from which the 5 companies were selected (2 micro-businesses, 2 large businesses, 1 mid-sized business), because many companies do not want share their sensitive data (Nayak & Waterson, 2017; Hashmi et al., 2021a, b). Figure 1 illustrates the research model of this study.

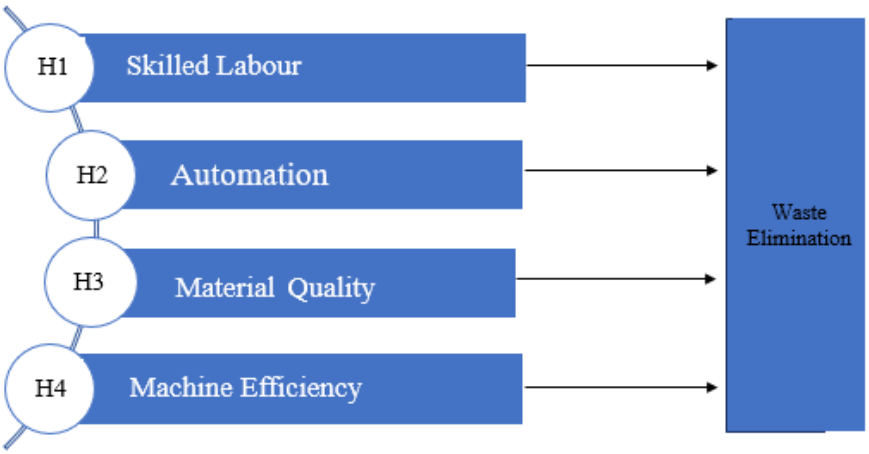

Figure 1: Research Framework

2.1 Hypothesis Development

H1: There is a positive relationship between skilled labor and waste elimination.

H2: There is a positive relationship between automation and waste elimination.

H3: There is a positive relationship between material quality and waste elimination.

H4: There is a positive relationship between machine efficiency and waste elimination.

3. Methodology

The approach used in the current research is explanatory. This is because the research under consideration is about developing hypotheses and then testing them for determining the presence of association between the independent and dependent variables. Therefore, the use of explanatory approach is used in the current study for providing explanation regarding the association between different aspects related to production and elimination of waste in the construction industry. According to Knight et al. (2022), explanatory design is used in quantitative researches for formulating hypotheses and designing methodology for the purpose of data collection with the objective of testing the overall theory (Khan, et al., 2022a, b). The other aspect related to the adoption of research approach is the choice of deductive approach. The justification of using the deductive approach is the involvement of hypotheses and then testing them for analyzing the relationship between independent and dependent variables. Quantitative research design is being used in the current study for determining the degree or the extent to which different factors identified (Lakens, 2022; Rashid & Rasheed, 2022). Out of different types of research designs that can be applied, the one that is applicable in the current research is the causal design (Hashmi et al., 2020a, b). This is because it is a kind of research that is based on analyzing cause and effect relationship between the variables which is a key aspect of any particular quantitative study (Sürücü & Maslakçi, 2020).

3.1 Sampling

The target population for this study is supply chain professionals as they were considered to be in the most suitable position to provide relevant information about the issue of waste that exists in the production process in the confectionery industry. The professionals associated with the manufacturing department of different confectionery companies were therefore chosen as the target population of the study (Rashid et al., 2020). The sample size derived for the research is of 170 individuals. The technique of sampling that was used for deriving the sample size is convenience sampling. In line with this particular technique of sampling, those respondents were included in the survey that were readily available and willing to participated in the study (Stratton, 2021; Rashid et al., 2021). The instrument that is used for collecting data is the questionnaire. The questionnaire was developed on the basis of Likert scale which included different options from where respondents could choose the right kind of option. The justification of using Likert scale in the questionnaire is that it facilitates the process of collecting numerical data which is part of the key requirement of the research (Alrazehi et al., 2021). Besides, the use of Likert scale is important for gathering large volume of data that can assist in making proper justification of findings (Braun et al., 2020; Hashmi & Mohd, 2020; Khan et al., 2023). The data during the survey was collected from supply chain professionals working closely with the production department in different confectionery companies operating in Karachi (Reñosa et al., 2021; Rashid, 2016).

3.6 Statistical Technique

There are different statistical techniques used for deriving the required findings for the study with regards to determining the impact of independent variables on the dependent one along with determining the suitability of the procedures adopted for conducting research. One of the statistical tools applied is reliability analysis which was used for evaluating the internal consistency of scales used in the questionnaire. The other tool that was applied for demographic analysis for determining the characteristics of individuals involved such as the proportion of age and gender of individuals taking part in the survey (Rashid & Amirah, 2017; Khan et al., 2021). Apart from that, there are techniques used such as regression, correlation along with ANOVA test for testing the relationship between different independent and dependent variables. Besides, the use of exploratory factor analysis was made for determining the overall validity of the results (Ananda et al., 2022; Rashid et al., 2019).

4. Data Analysis

4.1 Descriptive Profile of the Data

The objective of highlighting descriptive profile of the data is to analyze and evaluate trends related to the responses derived for the study. The analysis regarding descriptive profile has been carried out through evaluation of values related to mean and standard deviations derived regarding all the independent and dependent variables. The results showed the mean values around 4.5 which suggests that majority of respondents agreed with statements included in the questionnaire. On the other hand, the values of standard deviation derived were over 1 which suggests that there were not much variations between the values of mean which shows the overall consistency of responses. The other part of the profile of data was about determining and evaluating the demographics of respondents who participated in the research. Regarding gender of respondents, it was illustrated through the findings that out of the 170 respondents that participated in the study, 144 of them were males; whereas, the remaining 26 of them were females. When it comes to the age group of respondents, the findings indicate that majority of the respondents i.e., 27.6% were between age group of 38 to 42 years. Apart from that, the analysis of the working experience of respondents suggests that majority of them have the experience of working for more than 4-5 years.

4.2 Validation of Model

Before validating the model of the research, the application of Cronbach alpha reliability statistics was made for demonstrating the internal consistency of scales used in research. The results found that the Cronbach alpha for all variables is above 0.8 which provides evidence of strong internal consistency of scales in the questionnaire. The value of Cronbach alpha between 0.826 and 0.936 is evidence of the presence of strong internal consistency within scales (Agha et al., 2021; Haque, et al., 2021). The findings of correlation demonstrated different values which demonstrated the degree of association between variables. Out of different variables the correlation with the highest value was of skilled labor which reported the value of 0.867. This shows that amongst all the variables included, the variable of skilled labor was reported to have the most significant impact or influence on waste elimination in the context of confectionery industry. Regarding the issue of validity, the tool that was applied was exploratory factor analysis. The first step related to factor analysis was the analysis of results related to KMO and Bartlett's test. Table 1 shows the value of KMO and Bartlett's test derived was 0.9 which lies within the accepted range. This proves that the model developed is valid and therefore further analysis can be performed on the basis of this particular finding. The other important component of factor analysis is about the issue of total variance explained. The cumulative loadings or factor loadings extracted and presented here are above 80% which is within the acceptable range. This provided further evidence of the overall validity of results. Based on the results derived in the context of factor loading, the composite reliability that was derived was around 72%. On the other hand, the value of average variance was calculated as 0.6 (Das et al., 2021).

Table 1: KMO-Test

Kaiser-Meyer-Olkin Adequacy.	Measure of Sampling	.909
Bartlett's Test of Sphericity	Approx. Chi-Square	1026.143
	df	10
	Sig.	<.001

Source: SPSS output

The hypotheses of the research were calculated through applying regression statistics. The significance values derived related to all regression values were below the threshold value of .001 which suggests that hypotheses can be accepted and therefore it can be concluded that all the independent variables such as machine efficiency, automation, skilled labor and material quality have a positive impact on waste elimination.

Table 2: Hypotheses assessment

S.NO	Hypothesis	β	S.E	Value	Status
1	There is a positive relationship between skilled labor and waste elimination.	0.996	0.044	<.001	Accepted
2	There is a positive relationship between automation and waste elimination	0.073	0.055	<.001	Accepted
3	There is a positive relationship between material quality and waste elimination	0.910	0.051	<.001	Accepted
4	There is a positive relationship between machine efficiency and waste elimination	0.801	0.051	<.001	Accepted

Source: SPSS output

5. Discussion

The discussion of overall findings is performed in line with the questions of the research. The first sub-question that was developed for the research was about analyzing the impact of skilled labor on waste elimination. The finding derived related to this question illustrated that there is a positive impact of having skilled labor on reduction of waste in the production process of confectionery industry. The findings can be supported through the literature of Sharma et al. (2020), which stated that the presence of skilled and competent labors or workers improves the efficiency of entire production process which leads towards waste reduction. The second sub-question was about analyzing the effect of automation on waste in the context of the confectionery industry. The findings derived in this regard reported positive association between variables which suggests that the use of automation has a positive impact on reducing waste in the production process of confectionery industry. According to Fatimah et al. (2020), automation in the production process has the capability to save time which reduces the possibilities of waste generation within operations.

The third sub-question that was developed was related to determining the impact of material quality and waste elimination. The finding extracted suggest that there is a significant positive association between the variables which highlights the importance of quality of material in terms of waste reduction in the context of confectionery industry. The results derived related to this question are in line with the literature of Salmenperä et al. (2021), which state that material quality improves the quality of the overall production outcome which subsequently contributes towards waste elimination. The fourth sub-question that was developed was regarding determining the impact of machine efficiency on eliminating waste. The findings related to this sub-question were similar to that of other sub-questions where positive impact was witnessed related to different independent and dependent variables. Consequently, it can be stated that machine efficiency in confectionery organizations has a significant positive influence on reducing the waste generated from the production facilities.

5.1 Implications and Limitations

The theoretical implication of this research is that findings can contribute to the existing body of knowledge related to confectionery industry and the impact that its production processes have on reducing waste. On the other hand, practical implication of the research is that the results can be used for improving the efficiency of production processes in the confectionery industry. The policy implications of the study are mainly concerned with improving the policies directed towards production process as part of supply chain management within confectionery industry.

The key limitations identified regarding this research are, the findings are limited to the confectionery industry due to which it is difficult to generalize the results because different industries have different dynamics which can have an impact on the overall production process. The other potential limitation of the study is the development of sample size based on the use of convenience sampling. Major limitations related to convenience sampling include limited representativeness, sampling biasness along with limited external validity.

5.2 Recommendations

The recommendations have been provided regarding conducting further study in the context of the topic of this study. One of the areas that can be explored in the future regarding the topic of the current research is related to identifying the ways through which strategies can be optimized for minimization of waste. It is recommended to conduct further research in the context of the confectionery industry regarding the application of lean management principles along with methodologies for the identification and elimination of waste within production process. The researchers in the future can explore ways through which technology can be utilized within the production procedures implemented within the confectionery industry. Regarding the impact on stakeholders, it is suggested that policy makers in the confectionery industry should identify the ways through which skills and capabilities of employees or professionals in the industry can be improved in line with the requirements of waste elimination.

5.3 Conclusion

The purpose of this research was to analyze the relationship between different factors related to production have an impact on the process of waste elimination in the context of confectionery industry. The methods applied are related to quantitative research where the data is gathered with the help of conducting surveys through using questionnaire. Further details regarding the findings of the research will be provided in the following sections of this chapter. The overall conclusion of this study is that different factors related to production such as machine efficiency, automation, skilled labor along with material quality have a significant positive impact on elimination of waste in the confectionery industry. Out of different factors of production, the factor that has the most significant impact is the skilled labor which demonstrated the value of Pearson correlation at 0.867. The findings derived can be considered to have practical as well as theoretical significance. The practical significance of the study is that findings can be used by managers in the confectionery industry to improve the quality of their production process by eliminating waste. On the other hand, the theoretical significance of this research is that the results derived through this study can be used for conducting further research on this particular topic.

References

Adami, L., & Schiavon, M. (2021). From circular economy to circular ecology: A review on the solution of environmental problems through circular waste management approaches. *Sustainability, 13*(2), 925. https://doi.org/10.3390/su13020925

Agha, A. A., Rashid, A., Rasheed, R., Khan, S., & Khan, U. (2021). Antecedents of Customer Loyalty at Telecomm Sector. *Turkish Online Journal of Qualitative Inquiry, 12*(9), 1352-1374.

Ahmed, A. (2022). Influence of Green Purchasing and Green Packaging on Sustainability and Operational Performance: A Case Study from E-Commerce Industry. *South Asian Journal of Operations and Logistics, 1*(2), 16-29. https://doi.org/10.57044/SAJOL.2022.1.2.2207

Alrazehi, H. A. A. W., Amirah, N. A., Emam, A. S., & Hashmi, A. R. (2021). Proposed model for entrepreneurship, organizational culture and job satisfaction towards organizational performance in International Bank of Yemen. *International Journal of Management and Human Science, 5*(1), 1-9.

Amjad, S. (2022). Role of Logistical Practices in Quality Service Delivery at Supermarkets: A Case Study from Pakistan. *South Asian Journal of Operations and Logistics, 1*(1), 39-56. https://doi.org/10.57044/SAJOL.2022.1.1.2204

Ananda, M. M. A., Dag, O., & Weerahandi, S. (2022). Heteroscedastic two-way ANOVA under constraints. *Communications in Statistics: Theory and Methods*, 1–16. https://doi.org/10.1080/03610926.2022.2059682

Anwar, M. F. A. (2022). The Influence of Inter-Organizational System Use and Supply Chain Capabilities on Supply Chain Performance. *South Asian Journal of Operations and Logistics, 1*(1), 20-38. https://doi.org/10.57044/SAJOL.2022.1.1.2203

Baloch, N. & Rashid, A. (2022). Supply Chain Networks, Complexity, and Optimization in Developing Economies: A Systematic Literature Review and Meta-Analysis. *South Asian Journal of Operations and Logistics, 1*(1), 1-13. https://doi.org/10.57044/SAJOL.2022.1.1.2202

Baloch, N. & Rashid, A. (2022). Supply Chain Networks, Complexity, and Optimization in Developing Economies: A Systematic Literature Review and Meta-Analysis. *South Asian Journal of Operations and Logistics, 1*(1), 1-13. https://doi.org/10.57044/SAJOL.2022.1.1.2202

Braun, V., Clarke, V., Boulton, E., Davey, L., & McEvoy, C. (2020). The online survey as a qualitative research tool. *International Journal of Social Research Methodology*, 1–14. https://doi.org/10.1080/13645579.2020.1805550

Das, S., Ghani, M., Rashid, A., Rasheed, R., Manthar, S., & Ahmed, S. (2021). How customer satisfaction and loyalty can be affected by employee's perceived emotional competence: The mediating role of rapport. *International Journal of Management, 12*(3), 1268-1277. DOI: 10.34218/IJM.12.3.2021.119

Debeaufort, F. (2021). Active biopackaging produced from by-products and waste from food and marine industries. *FEBS Open Bio, 11*(4), 984–998. https://doi.org/10.1002/2211-5463.13121

Fathollahi-Fard, A. M., Ahmadi, A., & Al-E-Hashem, S. M. J. M. (2020). Sustainable closed-loop supply chain network for an integrated water supply and wastewater collection system under uncertainty. *Journal of Environmental Management*, *275*(111277), 111277. https://doi.org/10.1016/j.jenvman.2020.111277

Fatimah, Y. A., Govindan, K., Murniningsih, R., & Setiawan, A. (2020). Industry 4.0 based sustainable circular economy approach for smart waste management system to achieve sustainable development goals: A case study of Indonesia. *Journal of Cleaner Production*, *269*(122263), 122263. https://doi.org/10.1016/j.jclepro.2020.122263

Ginga, C. P., Ongpeng, J. M. C., & Daly, M. K. M. (2020). Circular economy on construction and demolition waste: A literature review on material recovery and production. *Materials*, *13*(13), 2970. https://doi.org/10.3390/ma13132970

Goryńska-Goldmann, E., Gazdecki, M., Rejman, K., Kobus-Cisowska, J., Łaba, S., & Łaba, R. (2020). How to prevent bread losses in the baking and confectionery industry?—measurement, causes, management and prevention. *Agriculture*, *11*(1), 19. https://doi.org/10.3390/agriculture11010019

Goryńska-Goldmann, E., Gazdecki, M., Rejman, K., Łaba, S., Kobus-Cisowska, J., & Szczepański, K. (2021). Magnitude, causes and scope for reducing food losses in the baking and confectionery industry—A multi-method approach. *Agriculture*, *11*(10), 936. https://doi.org/10.3390/agriculture11100936

Gupta, N., Poddar, K., Sarkar, D., Kumari, N., Padhan, B., & Sarkar, A. (2019). Fruit waste management by pigment production and utilization of residual as bioadsorbent. *Journal of Environmental Management*, *244*, 138–143. https://doi.org/10.1016/j.jenvman.2019.05.055

Haque, I., Rashid, A., & Ahmed, S. Z. (2021). The Role of Automobile Sector in Global Business: Case of Pakistan. *Pakistan Journal of International Affairs, 4*(2), 363-383. https://doi.org/10.52337/pjia.v4i2.195

Hashmi, A. (2022). Factors affecting the supply chain resilience and supply chain performance. *South Asian Journal of Operations and Logistics, 1*(2), 65-85. https://doi.org/10.57044/SAJOL.2022.1.2.2212

Hashmi, A. R., & Mohd, A. T. (2020). The effect of disruptive factors on inventory control as a mediator and organizational performance in health department of Punjab, Pakistan. *International Journal*

of Sustainable Development & World Policy, *9*(2), 122-134. https://doi.org/10.18488/journal.26.2020.92.122.134

Hashmi, A. R., Amirah, N. A., & Yusof, Y. (2020a). Mediating effect of integrated systems on the relationship between supply chain management practices and public healthcare performance: Structural Equation Modeling. *International Journal of Management and Sustainability, 9*(3), 148-160. https://doi.org/10.18488/journal.11.2020.93.148.160

Hashmi, A. R., Amirah, N. A., & Yusof, Y. (2021a). Organizational performance with disruptive factors and inventory control as a mediator in public healthcare of Punjab, Pakistan. *Management Science Letters, 11*(1), 77-86. https://doi.org/10.5267/j.msl.2020.8.028

Hashmi, A. R., Amirah, N. A., Yusof, Y., & Zaliha, T. N. (2020b). Exploring the dimensions using exploratory factor analysis of disruptive factors and inventory control. *The Economics and Finance Letters, 7*(2), 247-254. https://doi.org/10.18488/journal.29.2020.72.247.254

Hashmi, A. R., Amirah, N. A., Yusof, Y., & Zaliha, T. N. (2021b). Mediation of inventory control practices in proficiency and organizational performance: State-funded hospital perspective. *Uncertain Supply Chain Management, 9*(1), 89-98. https://doi.org/10.5267/j.uscm.2020.11.006

Hashmi, R. (2023). Business Performance Through Government Policies, Green Purchasing, and Reverse Logistics: Business Performance and Green Supply Chain Practices. *South Asian Journal of Operations and Logistic*s, *2*(1), 1–10. https://doi.org/10.57044/SAJOL.2023.2.1.2301

Hyder, A., Uddin, B., Siddiqui, H., Naeem, M., & Waheed, A. (2023). Mediation of Reverse Logistics in Sustainable Resources and Organizational Performance: Sustainable Resources and Organizational Performance. *South Asian Journal of Operations and Logistics, 2*(1), 11–27. https://doi.org/10.57044/SAJOL.2023.2.1.2302

Kazibudzki, P. T., & Trojanowski, T. W. (2020). Examination of marketing mix performance in relation to sustainable development of the Poland's confectionery industry. *PloS One*, *15*(10), e0240893. https://doi.org/10.1371/journal.pone.0240893

Khan, S. K., Ahmed, S., & Rashid, A. (2021). Influence of social media on purchase intention and customer loyalty of generation Y with the mediating effect of conviction: a case of Pakistan. *Pakistan Journal of International Affairs*, *4*(2), 526-548. https://doi.org/10.52337/pjia.v4i2.207

Khan, S. K., Rashid. A., Benhamed, A., Rasheed, R., & Huma, Z. (2023). Effect of leadership styles on employee performance by considering psychological capital as mediator: evidence from airlines industry in emerging economy. *World Journal of Entrepreneurship, Management and Sustainable Development, 18*(6), 799-818. DOI: 10.47556/J.WJEMSD.18.6.2022.7.

Khan, S., Rasheed., R., Rashid, A., Abbas, Q., & Mahboob, F. (2022b). The Effect of Demographic Characteristics on Job Performance: An Empirical Study from Pakistan. *Journal of Asian Finance, Economics and Business, 9*(2), 283-294.

Khan, S., Rashid, A., Rasheed, R., & Amirah, N. A. (2022a). Designing a knowledge-based system (KBS) to study consumer purchase intention: the impact of digital influencers in Pakistan. *Kybernetes, 52*(5), 1720-1744. https://doi.org/10.1108/K-06-2021-0497

Knight, G., Chidlow, A., & Minbaeva, D. (2022). Methodological fit for empirical research in international business: A contingency framework. *Journal of International Business Studies*, *53*(1), 39–52. https://doi.org/10.1057/s41267-021-00476-5

Kusi-Sarpong, S., Gupta, H., & Sarkis, J. (2019). A supply chain sustainability innovation framework and evaluation methodology. *International Journal of Production Research*, *57*(7), 1990–2008. https://doi.org/10.1080/00207543.2018.1518607

Lakens, D. (2022). Sample size justification. *Collabra. Psychology*, *8*(1). https://doi.org/10.1525/collabra.33267

Lowe, A., Norris, A. C., Farris, A. J., & Babbage, D. R. (2018). Quantifying thematic saturation in qualitative data analysis. *Field Methods*, *30*(3), 191–207. https://doi.org/10.1177/1525822x17749386

Muhammad, A. H. (2022a). Importance of Green Supply Chain Management in Hospitality Business. *South Asian Journal of Operations and Logistics*, *1*(2), 1-15. https://doi.org/10.57044/SAJOL.2022.1.2.2206

Muhammad, A. H. (2022b). Improving Supply Chain Performance: A Case Study of Interwood Mobel. *South Asian Journal of Operations and Logistics*, *1*(2), 53-64. https://doi.org/10.57044/SAJOL.2022.1.2.2208

Müller, R., Vette-Steinkamp, M., Hörauf, L., Speicher, C., & Burkhard, D. (2018). Development of an intelligent material shuttle to digitize and connect production areas with the production process planning department. *Procedia CIRP*, *72*, 967–972. https://doi.org/10.1016/j.procir.2018.03.216

Munir, M., Jajja, M. S. S., Chatha, K. A., & Farooq, S. (2020). Supply chain risk management and operational performance: The enabling role of supply chain integration. *International Journal of Production Economics*, *227*(107667), 107667. https://doi.org/10.1016/j.ijpe.2020.107667

Nayak, R., & Waterson, P. (2017). The Assessment of Food Safety Culture: An investigation of current challenges, barriers and future opportunities within the food industry. *Food Control*, *73*, 1114–1123. https://doi.org/10.1016/j.foodcont.2016.10.061

Pilarska, A. A., Pilarski, K., Wolna-Maruwka, A., Boniecki, P., & Zaborowicz, M. (2018). Use of confectionery waste in biogas production by the anaerobic digestion process. *Molecules (Basel, Switzerland)*, *24*(1), 37. https://doi.org/10.3390/molecules24010037

Rasheed, R., & Rashid, R. (2023). Role of Service Quality Factors in Word of Mouth through Student Satisfaction. *Kybernetes. Vol. ahead-of-print No. ahead-of-print.* http://dx.doi.org/10.1108/k-01-2023-0119

Rasheed, R., Rashid., A., Amirah, N. A., & Afthanorhan, A. (2023). Quantifying the Moderating Effect of Servant Leadership between Occupational Stress and Employee In Role and Extra-Role Performance. *Quality - Access to Success, 24(195), 60-68. https://doi.org/10.47750/QAS/24.195.08*

Rasheed, T. (2022). Supply Chain Sustainability Through Green Practices in Manufacturing: A Case Study from Pakistan. *South Asian Journal of Operations and Logistics*, *1*(1), 57-71. https://doi.org/10.57044/SAJOL.2022.1.1.2205

Rashid, A. & Rasheed, R. (2022). A Paradigm for Measuring Sustainable Performance Through Big Data Analytics–Artificial Intelligence in Manufacturing Firms. *Available at SSRN 4087758*. https://doi.org/10.2139/ssrn.4087758

Rashid, A. & Rasheed, R. (2023). Mediation of inventory management in the relationship between knowledge and firm performance, *SAGE Open*, *13*(2), 1-11. https://doi.org/10.1177/21582440231164593

Rashid, A. (2016). Impact of inventory management in downstream chains on customer satisfaction at manufacturing firms. *International Journal of Management, IT and Engineering*, *6*(6), 1-19.

Rashid, A. Rasheed, R., & Amirah, N. A. (2023a). Information Technology and People Involvement in Organizational Performance through Supply Chain Collaboration. *Journal of Science and Technology Policy Management. In press.* https://doi.org/10.1108/JSTPM-12-2022-0217

Rashid, A., & Amirah, N. A. (2017). Relationship between poor documentation and efficient inventory control at Provincial Ministry of Health, Lahore. *American Journal of Innovative Research and Applied Sciences*, *5*(6), 420-423.

Rashid, A., Ali, S. B., Rasheed, R., Amirah, N. A. & Ngah, A. H. (2022a). A paradigm of blockchain and supply chain performance: a mediated model using structural equation modeling. *Kybernetes, Vol. ahead-of-print No. ahead-of-print*. https://doi.org/10.1108/K-04-2022-0543

Rashid, A., Amirah, N. A., & Yusof, Y. (2019). Statistical approach in exploring factors of documentation process and hospital performance: a preliminary study. *American Journal of Innovative Research and Applied Sciences, 9*(4), 306-310.

Rashid, A., Amirah, N. A., Yusof, Y., & Mohd, A. T. (2020). Analysis of demographic factors on perceptions of inventory managers towards healthcare performance. *The Economics and Finance Letters, 7*(2), 289-294. https://doi.org/10.18488/journal.29.2020.72.289.294

Rashid, A., Rasheed, R., & Amirah, N. A., & Afthanorhan, A. (2022b). Disruptive Factors and Customer Satisfaction at Chain Stores in Karachi, Pakistan. *Journal of Distribution Science, 20*(10), 93-103. https://doi.org/10.15722/jds.20.10.202210.93

Rashid, A., Rasheed, R., Amirah, N. A., Yusof, Y., Khan, S., & Agha, A., A. (2021). A Quantitative Perspective of Systematic Research: Easy and Step-by-Step Initial Guidelines. *Turkish Online Journal of Qualitative Inquiry, 12*(9), 2874-2883.

Reñosa, M. D. C., Mwamba, C., Meghani, A., West, N. S., Hariyani, S., Ddaaki, W., Sharma, A., Beres, L. K., & McMahon, S. (2021). Selfie consents, remote rapport, and Zoom debriefings: collecting qualitative data amid a pandemic in four resource-constrained settings. *BMJ Global Health, 6*(1), e004193. https://doi.org/10.1136/bmjgh-2020-004193

Sadh, P. K., Kumar, S., Chawla, P., & Duhan, J. S. (2018). Fermentation: A boon for production of bioactive compounds by processing of food industries wastes (by-products). *Molecules (Basel, Switzerland), 23*(10), 2560. https://doi.org/10.3390/molecules23102560

Salihoglu, G., Salihoglu, N. K., Ucaroglu, S., & Banar, M. (2018). Food loss and waste management in Turkey. *Bioresource Technology, 248*, 88–99. https://doi.org/10.1016/j.biortech.2017.06.083

Salmenperä, H., Pitkänen, K., Kautto, P., & Saikku, L. (2021). Critical factors for enhancing the circular economy in waste management. *Journal of Cleaner Production, 280*(124339), 124339. https://doi.org/10.1016/j.jclepro.2020.124339

Shaheen, S. (2022). Quality management and operational performance: a case study from Pakistan. *South Asian Journal of Operations and Logistics, 1*(1), 14-19. https://doi.org/10.57044/SAJOL.2022.1.1.2201

Sharma, M., Joshi, S., Kannan, D., Govindan, K., Singh, R., & Purohit, H. C. (2020). Internet of Things (IoT) adoption barriers of smart cities' waste management: An Indian context. *Journal of Cleaner Production, 270*(122047), 122047. https://doi.org/10.1016/j.jclepro.2020.122047

Singh, R. S., Kaur, N., & Kennedy, J. F. (2019). Pullulan production from agro-industrial waste and its applications in food industry: A review. *Carbohydrate Polymers, 217*, 46–57. https://doi.org/10.1016/j.carbpol.2019.04.050

Stratton, S. J. (2021). Population research: Convenience sampling strategies. *Prehospital and Disaster Medicine, 36*(4), 373–374. https://doi.org/10.1017/S1049023X21000649

Sürücü, L., & Maslakçi, A. (2020). Validity and Reliability in quantitative research. *Business And Management Studies An International Journal, 8*(3), 2694–2726. https://doi.org/10.15295/bmij.v8i3.1540

Wahab, A. (2022). Lean manufacturing and sustainable performance with the moderation of organizational culture. *South Asian Journal of Operations and Logistics, 1*(2), 30-52. https://doi.org/10.57044/SAJOL.2022.1.2.2208

Appendices: Questionnaire

Variable: Machine efficiency

1. Improving machine efficiency can help reduce waste during production.
    a. Strongly disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly agree
2. The use of high-efficiency machines can improve production speed.
    a. Strongly disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly agree
3. Investing in machine upgrades can lead to improved production efficiency.
    a. Strongly disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly agree
4. Improving machine maintenance can increase machine efficiency and reduce downtime.
    a. Strongly disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly agree
5. Upgrading to more efficient machines can lead to energy savings during production.
    a. Strongly disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly agree
6. Efficient machines can help reduce the overall cost of production.
    a. Strongly disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly agree
7. Implementing machine monitoring systems can help identify and address inefficiencies during production.
    a. Strongly disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly agree
8. Efficient machines can help reduce the amount of raw materials used during production.
    a. Strongly disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly agree
9. Increasing machine efficiency can help improve the quality of production.
    a. Strongly disagree
    b. Disagree

   c. Neutral
   d. Agree
   e. Strongly agree
10. The use of automation technologies can help improve machine efficiency in production.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree

Variable: Automation

1. Automation in production can help minimize waste and delay.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
2. Implementation of automation technologies can increase productivity in production.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
3. Automated systems can improve quality control during production.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
4. The integration of automation in production can reduce labor costs.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
5. Automated systems can help minimize the risk of human error during production.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
6. The use of automation technologies can lead to a reduction in production time.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
7. Automated systems can help reduce the amount of raw materials used during production.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
8. The implementation of automation in production can lead to improved flexibility and customization capabilities.
   a. Strongly disagree

   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
9. Automated systems can help minimize the need for human supervision during production.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
10. The use of automation technologies can increase the overall efficiency of production.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree

Variable: Skilled labor

1. Skilled labor is essential for minimizing waste and delay during production.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
2. A lack of skilled labor leads to more waste and delays during production.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
3. Investing in the training and development of skilled labor can reduce waste and delay during production.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
4. The use of technology can reduce the need for skilled labor in production processes.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
5. Skilled labor plays a critical role in enhancing productivity in the manufacturing industry.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
6. Skilled labor can help identify areas of waste and inefficiency in the production process.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
7. A shortage of skilled labor can lead to lower product quality and customer satisfaction.

   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
8. Skilled labor is necessary for implementing new production technologies and processes.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
9. Investing in the recruitment and retention of skilled labor can lead to long-term productivity gains.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
10. Skilled labor is a critical component of a sustainable production system that minimizes waste and maximizes efficiency.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree

Variable: Material Quality

1. The material quality affects the efficiency of the production process.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
2. The use of high-quality materials leads to better product quality.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
3. The quality of the raw materials affects the overall cost of production.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
4. The company should prioritize the use of high-quality materials, even if they are more expensive.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
5. The production team should conduct regular quality checks to ensure that the materials meet the required standards.
   a. Strongly disagree
   b. Disagree

   c. Neutral
   d. Agree
   e. Strongly agree
6. The use of substandard materials can lead to delays in the production process.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
7. The quality of the materials used affects the level of customer satisfaction.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
8. The company should invest in improving the quality of its raw materials to enhance its competitiveness in the market.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
9. The quality of the materials used affects the safety of the end product.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
10. The company should have a system in place to ensure that only high-quality materials are used in the production process.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree

Variable: Waste Elimination

1. Waste reduction is a critical factor in enhancing production efficiency.
   Strongly disagree
   Disagree
   Neutral
   Agree
   Strongly agree
2. Lean manufacturing methodologies can minimize delays and increase productivity.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree
3. Technological advancements have the potential to streamline production and reduce waste.
   a. Strongly disagree
   b. Disagree
   c. Neutral
   d. Agree
   e. Strongly agree

4. Employee training programs can contribute to waste elimination and productivity improvement.
    a. Strongly disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly agree
5. Certain industries have successfully implemented waste elimination strategies to enhance productivity.
    a. Strongly disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly agree
6. Implementing waste elimination strategies often poses challenges to organizations.
    a. Strongly disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly agree
7. A comprehensive approach to waste elimination promotes sustained productivity improvement.
    a. Strongly disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly agree
8. Key performance indicators (KPIs) effectively measure waste elimination efforts in production.
    a. Strongly disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly agree
9. Waste elimination and productivity enhancement are interconnected goals in production environments.
    a. Strongly disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly agree
10. Waste elimination initiatives can positively impact an organization's performance and competitive edge.
    a. Strongly disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly agree