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Comparing the frequency of quality control checks during day and night shifts on the production floor of a paper sack plant in Ghana

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ABSTRACT

Continuous Quality Control (QC) inspections are essential for preventing defective products in manufacturing. Although QC is widely practiced, limited research compares inspection practices between day and night shifts. This study investigated inspection frequency across shifts in a Ghanaian paper sack plant over an eight-month period. Data was collected from four production teams operating under a two-shift, 12-hour system. Statistical analysis revealed that at a 95% confidence level, no significant difference existed between day and night inspections. However, at a 90% confidence level, day shifts recorded more inspections than night shifts. The findings highlight the potential influence of fatigue and circadian rhythms on inspection performance. Recommendations include implementing rotational duties during night shifts and exploring organizational strategies to improve QC consistency across shifts. This study contributes to scholarship on manufacturing quality management by providing empirical evidence on inspection frequency variations between day and night shifts, a largely underexplored dimension in shift-work research.

Keywords: Quality Control, Shift Work, Manufacturing, Inspection Frequency, Production Management.

INTRODUCTION

Product quality is a central concern in manufacturing, as failures on the production floor can lead to significant economic losses and customer dissatisfaction. Both human and non-human factors contribute to quality deterioration. Human-related factors include fatigue, reduced concentration, job dissatisfaction, and absenteeism, while machine failures, raw material defects, and inadequate maintenance represent non-human contributors. To mitigate such risks, quality control (QC) inspections are employed throughout production processes to detect and remove defective products.[1]

[1] William Winchell, *Inspection and Measurement in Manufacturing: Keys to Process Planning and Improvement* (Society of Manufacturing Engineers, 1996).

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Historically, firms have competed on cost and differentiation, but in today's markets, achieving high product quality is equally essential.[2] The implementation of effective QC practices reduces rework, minimizes waste, and enhances customer satisfaction. However, inspection frequency lacks universal standards and depends on multiple factors, including product complexity, supplier quality history, and customer tolerance.[3]

Given that many industries operate multiple shifts to meet demand, it is crucial to investigate whether QC practices remain consistent across day and night operations. Circadian rhythm disruptions during night work may impair worker alertness and performance Boivin and Boudreau potentially influencing inspection outcomes.[4] This study, therefore, compares QC inspection frequencies between day and night shifts in a Ghanaian paper sack production plant.

LITERATURE REVIEW

Shift work has become increasingly common due to global production demands, with approximately 20% of the labor force engaged in such systems.[5] Historical developments such as the Fair Labor Standards Act (1938) shaped modern shift patterns.[6] While shift systems increase production capacity, they also pose challenges to worker health, performance, and job satisfaction.[7] Night work, in particular, is associated with increased fatigue, reduced cognitive performance, and higher perceived injury risks.[8] Leadership approaches and organizational support structures may therefore need adjustment to mitigate these effects.[9] Research has also shown that day shifts often yield higher productivity and lower defect rates compared to night shifts.[10] In manufacturing, determining optimal QC inspection frequency involves balancing inspection costs with defect prevention benefits.[11] Studies across various sectors—from radiotherapy to construction and packaging—confirm that systematic QC improves accuracy, reduces disputes, and minimizes product defects.[12] However, little empirical evidence exists comparing inspection practices across different shifts, creating a gap that this study seeks to address.

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[2] Francisco Javier Blanco-Encomienda, Elena Rosillo-Díaz, and Juan Francisco Muñoz-Rosas, "Importance of Quality Control Implementation in the Production Process of a Company," *European Journal of Economics and Business Studies* 10, no. 1 (March 2, 2018): 248, https://doi.org/10.26417/ejes.v10i1.p248-252; Andrzej Szajna et al., "The Production Quality Control Process, Enhanced with Augmented Reality Glasses and the New Generation Computing Support System," *Procedia Computer Science* 176 (2020): 3618–25, https://doi.org/10.1016/j.procs.2020.09.024.

[3] S. Wong, " 5 Factors for Deciding Inspection Frequency in Manufacturing," InTouch Quality, n.d., https://www.intouch-quality.com/blog/5-factors-for-deciding-inspection-frequency-in-manufacturing.

[4] D.B. Boivin and P. Boudreau, "Impacts of Shift Work on Sleep and Circadian Rhythms," *Pathologie Biologie* 62, no. 5 (October 2014): 292–301, https://doi.org/10.1016/j.patbio.2014.08.001.

[5] Kenneth P. Wright, Richard K. Bogan, and James K. Wyatt, "Shift Work and the Assessment and Management of Shift Work Disorder (SWD)," *Sleep Medicine Reviews* 17, no. 1 (February 2013): 41–54, https://doi.org/10.1016/j.smrv.2012.02.002.

[6] J. Grossman, "Fair Labor Standards Act of 1938: Maximum Struggle for a Minimum Wage.," *Monthly Labor Review* 101, no. 6 (June 1978): 22–30; Sandra L King and Harry B Williams, "Shift Work Pay Differentials and Practices in Manufacturing," *Monthly Lab. Rev.* 108 (1985): 26.

[7] Adrian Furnham and Kieran Hughes, "Individual Difference Correlates of Nightwork and Shift-Work Rotation," *Personality and Individual Differences* 26, no. 5 (May 1999): 941–59, https://doi.org/10.1016/S0191-8869(98)00199-8; Prashant Sharan et al., "A Novel Approach for Produced Water Treatment: Supercritical Water Oxidation and Desalination," *Desalination* 532 (June 2022): 115716, https://doi.org/10.1016/j.desal.2022.115716.

[8] T. Akerstedt, "Psychological and Psychophysiological Effects of Shift Work.," *Scandinavian Journal of Work, Environment & Health* 16 (1990): 67–73, https://doi.org/10.5271/sjweh.1819; Yueng-Hsiang Huang et al., "Roles of Safety Climate and Shift Work on Perceived Injury Risk: A Multi-Level Analysis," *Accident Analysis & Prevention* 39, no. 6 (November 2007): 1088–96, https://doi.org/10.1016/j.aap.2007.02.006.

[9] Brenda Joy Holdnak, *An Examination of Leadership Style and Its Relevance to Shift Work in an Organizational Setting* (The University of Southern Mississippi, 1990).

[10] Keeley McConkey and Ekaterina Koromyslova, "A Comparative Study of Shift Work: Days, Nights, and Weekends: Which Shift Yields Higher Output and Lower Defects," *Journal of Management and Strategy* 9, no. 3 (June 20, 2018): 18, https://doi.org/10.5430/jms.v9n3p18.

[11] John F. Kelly, M. Claire Greene, and Brandon G. Bergman, "Beyond Abstinence: Changes in Indices of Quality of Life with Time in Recovery in a Nationally Representative Sample of U.S. Adults," *Alcoholism: Clinical and Experimental Research* 42, no. 4 (April 23, 2018): 770–80, https://doi.org/10.1111/acer.13604.

[12] Z. Zhen-yu, L. Ming, and F. Jian-zhong, "Clinical Application of X-Ray Simulators in Quality Assurance and Control," *Chinese Journal of Radiological Medicine and Protection* 24, no. 1 (2004): 50–54; Angeline Sutrisno, Erna Andajani, and Fitri Novika Widjaja, "The Effects of

Burnout is a multidimensional construct rooted in the Maslach Burnout Model, which identifies exhaustion, cynicism/detachment, and reduced personal accomplishment as the core dimensions.[13] These outcomes arise from chronic work-related stressors, particularly in demanding environments where recovery is limited.Shift work, especially night and rotating shifts, constitutes a chronic stressor that places employees at risk for burnout. Biological and social rhythms are disrupted, recovery opportunities are reduced, and exposure to artificial lighting negatively impacts circadian cycles.[14] These factors combine to increase fatigue, impair health, and reduce job engagement.

Shift Work and Burnout

Prior research demonstrates that shift workers experience higher rates of health complications compared to non-shift workers, including:

- **Physical health issues**: gastrointestinal disorders, cardiovascular strain, headaches, and body injuries.[15]
- **Mental health issues**: higher rates of depression, anxiety, and occupational stress.[16]
- **Performance decline**: lower concentration, reduced productivity, and higher error rates.
- These outcomes align closely with the three burnout dimensions:
- **Exhaustion** – due to sleep deprivation and circadian misalignment.
- **Cynicism/Detachment** – as employees disengage from work to cope with ongoing strain.
- **Reduced Effectiveness** – reflected in decreased motivation, job quality, and output.

Conceptual Linkage to Job Performance

This study applies the burnout model to **shift schedules** to examine their impact on **work performance**, using the number of quality checks as a measurable indicator.

- Day-shift employees are expected to perform better due to alignment with natural circadian rhythms and better recovery opportunities.
- Night-shift employees are expected to show signs of performance decline, potentially linked to burnout symptoms (exhaustion, detachment, inefficacy).

Hypotheses

Based on this framework, the study proposes the following hypothesis:

H1: Employees on night shifts will conduct fewer quality checks than those on day shifts.

Service Quality on Customer Satisfaction and Loyalty in a Logistics Company," *KnE Social Sciences*, October 17, 2019, https://doi.org/10.18502/kss.v3i26.5360; Justyna Górna et al., "The Identification of Quality Control Methods Used in the Packaging Production Process," *Scientific Papers of Silesian University of Technology. Organization and Management Series* 2022, no. 162 (2022): 197–211, https://doi.org/10.29119/1641-3466.2022.162.11.

[13] Christina Maslach and Susan E Jackson, "The Measurement of Experienced Burnout," *Journal of Organizational Behavior* 2, no. 2 (1981): 99–113; Christina Maslach and Michael P. Leiter, "It's Time to Take Action on Burnout," *Burnout Research* 2, no. 1 (March 2015): iv–v, https://doi.org/10.1016/j.burn.2015.05.002.

[14] S. A. Shields, *Speaking from the Heart: Gender and the Social Meaning of Emotion* (Cambridge University Press, 2002).

[15] John M. Violanti et al., "Shift-work and Suicide Ideation among Police Officers," *American Journal of Industrial Medicine* 51, no. 10 (October 4, 2008): 758–68, https://doi.org/10.1002/ajim.20629.

[16] Shields, *Speaking from the Heart: Gender and the Social Meaning of Emotion*.

METHODOLOGY

Research Design

This study adopted a quantitative, comparative design to examine the effect of shift schedules on job performance, with performance operationalized as the number of quality control (QC) inspections conducted. By comparing day and night shifts across production teams, the study sought to determine whether shift-related stressors contribute to measurable declines in output, consistent with the burnout model.

Sampling Procedure

A purposive sampling method was employed, focusing on a cement paper bag manufacturing plant in Ghana. The plant was selected due to its reliance on a two-shift system (day and night), each lasting 12 hours. To ensure operational continuity, four rotating teams manage the shifts on a rolling basis. This structure provided a natural context for comparing performance across day and night schedules.

Production Process and Quality Control

The manufacturing process involves four sequential stages:

1. **Tuber section** – forming the paper tube.
2. **Bottomer section** – attaching and sealing the bottom.
3. **Drying section** – ensuring moisture control and durability.
4. **Palletizing section** – packaging and stacking for shipment.

Quality control inspectors are stationed at each stage to perform sampling and defect detection checks**.** These inspections serve as a direct measure of performance, reflecting attentiveness, accuracy, and consistency in task execution.

Data Collection

Data were collected continuously over an eight-month period (March–October 2023)**.** For each shift, records were compiled on the number of QC inspections performed by inspectors at all production stages. This approach provided a robust dataset capturing both daily variation and long-term patterns across teams and shifts.

Data Analysis

The data were analyzed using both descriptive and inferential statistics**.** Descriptive statistics (means, standard deviations, and frequency distributions) summarized overall QC activity across shifts and teams. To test for statistical differences:

- **Independent-samples t-tests** compared QC inspections between **day and night shifts**.
- **Two-factor ANOVA without replication** examined differences **among teams** and **between shifts** simultaneously.

All analyses were conducted using *Excel*, with significance set at $p < 0.05$ and $p < 0.10$.

Ethical Considerations

This study adhered to ethical research standards. Permission to access and analyze QC inspection records was formally obtained from the plant's management. To protect confidentiality, data were aggregated at the team and shift levels, ensuring that no individual employee could be identified. Worker anonymity was strictly maintained, and no personal or sensitive information was collected. The study was conducted in line

with the principles of voluntary participation, confidentiality, and responsible data use as outlined in standard ethical research guidelines.

PRESENTATION OF FINDINGS

Analysis of the eight-month dataset revealed a moderate positive correlation ($r = 0.58$) between day and night shift inspections, indicating that higher inspection rates during the day were generally accompanied by higher rates at night. ANOVA results showed no significant differences at the 95% confidence level between day and night shifts ($F = 7.58$, $p > 0.05$) or across teams ($F = 2.94$, $p > 0.05$). At the 90% confidence level, however, significant differences were found between day and night shifts, with day shifts recording more inspections. These findings suggest subtle but meaningful variations influenced by shift timing.

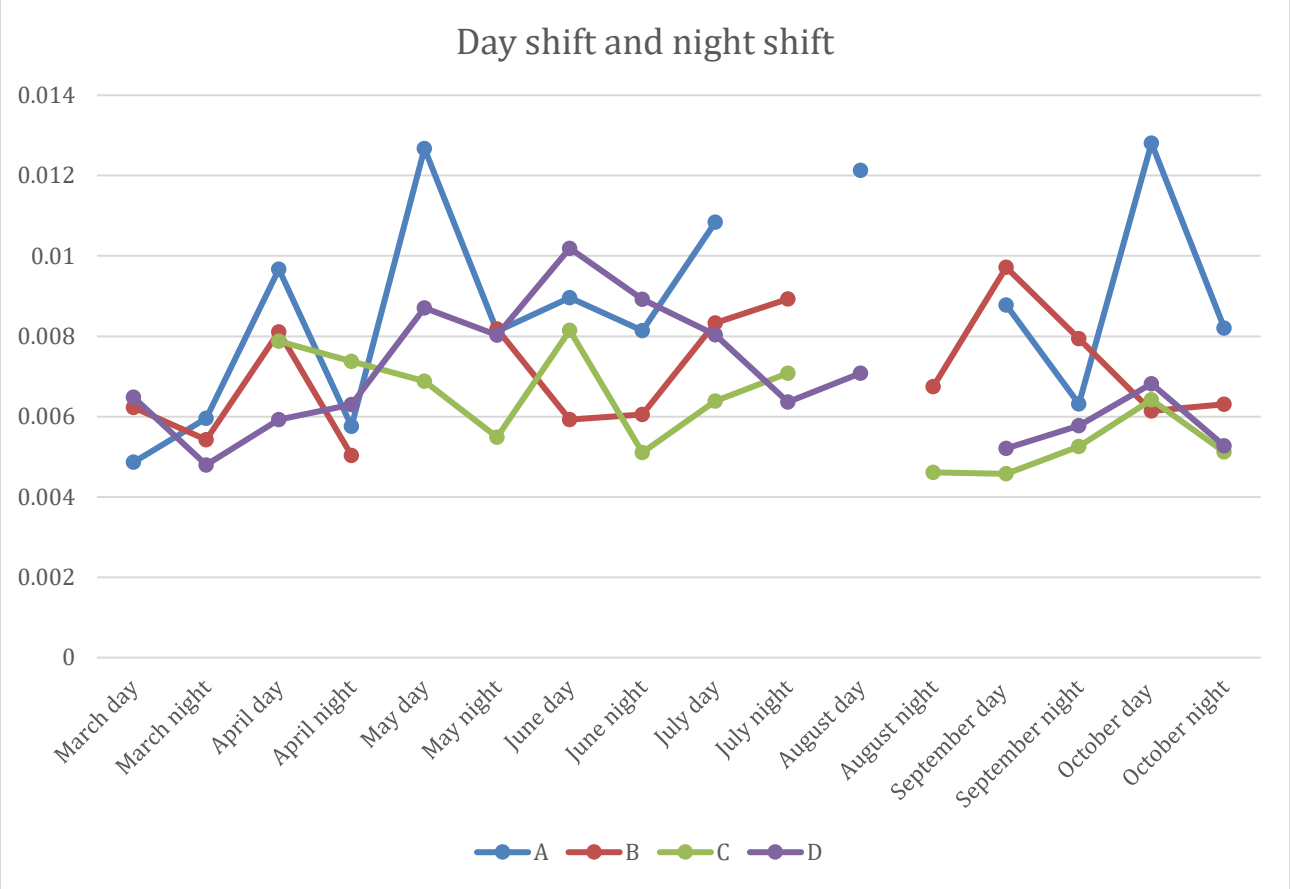

Figure 1- Four teams operating during the daytime and nighttime

Table 1: Anova: Two-Factor Without Replication(95% Confidence Level)

SUMMARY	***Count***	***Sum***	***Average***	***Variance***		
A	2	0.015728	0.007864	2.46E-06		
B	2	0.014156	0.007078	2.16E-08		
C	2	0.012546	0.006273	7.78E-07		
D	2	0.012933	0.006467	4.26E-07		

DAY	4	0.029981	0.007495	9.88E-07		
NIGHT	4	0.025383	0.006346	3.88E-07		
ANOVA						
Source of Variation	***SS***	***df***	***MS***	***F***	***P-value***	***F crit***
Rows	3.08E-06	3	1.03E-06	2.943554	0.199456	9.276628
Columns	2.64E-06	1	2.64E-06	7.575414	0.070603	10.12796
Error	1.05E-06	3	3.49E-07			
Total	6.77E-06	7				

Table 2: Anova: Two-Factor Without Replication (90% Confidence Level)

SUMMARY	***Count***	***Sum***	***Average***	***Variance***		
A	2	0.015728	0.007864	2.46E-06		
B	2	0.014156	0.007078	2.16E-08		
C	2	0.012546	0.006273	7.78E-07		
D	2	0.012933	0.006467	4.26E-07		
DAY	4	0.029981	0.007495	9.88E-07		
NIGHT	4	0.025383	0.006346	3.88E-07		
ANOVA						
Source of Variation	***SS***	***df***	***MS***	***F***	***P-value***	***F crit***
Rows	3.08E-06	3	1.03E-06	2.943554	0.199456	5.390773
Columns	2.64E-06	1	2.64E-06	7.575414	0.070603	5.538319
Error	1.05E-06	3	3.49E-07			
Total	6.77E-06	7				

DISCUSSION

The results indicate that while QC practices are generally consistent across teams, day shifts tend to record more frequent inspections than night shifts. This pattern is evident both statistically and visually: Figures 2 and 3 confirm that day inspections are consistently higher, and the decline during night shifts is subtle but observable across all teams. This supports prior findings linking night work with fatigue, reduced alertness, and lower job satisfaction.[17] Given the importance of QC in preventing production defects, these findings underscore the need for interventions to enhance inspection rigor during night operations. Potential strategies include implementing rotational duty schedules, providing structured rest breaks, and integrating automated inspection tools to reduce reliance on manual checks. The graphical evidence strengthens the case for managerial attention to human factors, as visual differences across shifts may be more compelling for practitioners than statistical thresholds alone.

RECOMMENDATIONS

The findings of this study carry important implications for manufacturing management. First, managers should consider redesigning night shift schedules to include structured rest breaks and task rotations, which may reduce fatigue-related lapses in inspection performance.

Second, investment in automated or semi-automated QC tools could help balance human limitations at night with consistent product quality requirements.

Finally, the integration of visual reporting tools, such as bar and line charts used in this study, can provide managers with intuitive dashboards to monitor inspection consistency across shifts and teams. Together, these strategies can strengthen quality control systems, reduce defects, and sustain customer satisfaction in continuous-shift production environments.

CONCLUSION

This study demonstrates that quality control inspections are more frequent during day shifts than night shifts in a Ghanaian cement paper sack production plant. Although differences are not significant at the 95% confidence level, they become apparent at the 90% threshold, suggesting human factors play a role. Managers should consider strategies to sustain inspection quality across shifts, particularly at night. Future research could expand to multiple plants to improve generalizability and explore the integration of automated QC systems.

This research advances scholarly understanding of quality management in continuous-shift production by showing that inspection frequency differs subtly between day and night shifts. The results underscore the importance of integrating organizational and human-factor perspectives into quality control systems. Practically, the findings guide plant managers in developing targeted interventions for night shifts, while academically, they enrich the literature on shift work, manufacturing efficiency, and inspection planning.

Limitations and Recommendations for Future Research

While this study provides valuable insights, it is not without limitations. First, the data were drawn from a single cement paper sack production plant, which may restrict the generalizability of the findings to other industries or regions. Second, the study measured only the frequency of inspections, not the quality or accuracy of those inspections, which could provide a more comprehensive view of QC performance.

Third, the reliance on a single eight-month dataset means that seasonal or long-term variations were not captured. Future research should therefore extend to multiple plants across different manufacturing sectors, integrate measures of inspection accuracy, and explore longer data collection periods.

[17] Akerstedt, "Psychological and Psychophysiological Effects of Shift Work."; Furnham and Hughes, "Individual Difference Correlates of Nightwork and Shift-Work Rotation."

Additionally, qualitative methods such as interviews with inspectors could enrich understanding of the human factors influencing inspection practices.

Declarations

Ethics approval and consent to participate: Not applicable
Consent for publication: Not applicable
Availability of data and materials: Available upon request
Competing interests: The author declares no competing interests
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BIBLIOGRAPHY

Akerstedt, T. "Psychological and Psychophysiological Effects of Shift Work." *Scandinavian Journal of Work, Environment & Health* 16 (1990): 67–73. https://doi.org/10.5271/sjweh.1819.

Blanco-Encomienda, Francisco Javier, Elena Rosillo-Díaz, and Juan Francisco Muñoz-Rosas. "Importance of Quality Control Implementation in the Production Process of a Company." *European Journal of Economics and Business Studies* 10, no. 1 (March 2, 2018): 248. https://doi.org/10.26417/ejes.v10i1.p248-252.

Boivin, D.B., and P. Boudreau. "Impacts of Shift Work on Sleep and Circadian Rhythms." *Pathologie Biologie* 62, no. 5 (October 2014): 292–301. https://doi.org/10.1016/j.patbio.2014.08.001.

Furnham, Adrian, and Kieran Hughes. "Individual Difference Correlates of Nightwork and Shift-Work Rotation." *Personality and Individual Differences* 26, no. 5 (May 1999): 941–59. https://doi.org/10.1016/S0191-8869(98)00199-8.

Górna, Justyna, Krzysztof Wójcicki, Marta Biegańska, and Beata Paliwoda. "The Identification of Quality Control Methods Used in the Packaging Production Process." *Scientific Papers of Silesian University of Technology. Organization and Management Series* 2022, no. 162 (2022): 197–211. https://doi.org/10.29119/1641-3466.2022.162.11.

Grossman, J. "Fair Labor Standards Act of 1938: Maximum Struggle for a Minimum Wage." *Monthly Labor Review* 101, no. 6 (June 1978): 22–30.

Holdnak, Brenda Joy. *An Examination of Leadership Style and Its Relevance to Shift Work in an Organizational Setting*. The University of Southern Mississippi, 1990.

Huang, Yueng-Hsiang, Jiu-Chiuan Chen, Sarah DeArmond, Konstantin Cigularov, and Peter Y. Chen. "Roles of Safety Climate and Shift Work on Perceived Injury Risk: A Multi-Level Analysis." *Accident Analysis & Prevention* 39, no. 6 (November 2007): 1088–96. https://doi.org/10.1016/j.aap.2007.02.006.

Kelly, John F., M. Claire Greene, and Brandon G. Bergman. "Beyond Abstinence: Changes in Indices of Quality of Life with Time in Recovery in a Nationally Representative Sample of U.S. Adults." *Alcoholism: Clinical and Experimental Research* 42, no. 4 (April 23, 2018): 770–80. https://doi.org/10.1111/acer.13604.

King, Sandra L, and Harry B Williams. "Shift Work Pay Differentials and Practices in Manufacturing." *Monthly Lab. Rev.* 108 (1985): 26.

Maslach, Christina, and Susan E Jackson. "The Measurement of Experienced Burnout." *Journal of Organizational Behavior* 2, no. 2 (1981): 99–113.

Maslach, Christina, and Michael P. Leiter. "It's Time to Take Action on Burnout." *Burnout Research* 2, no. 1 (March 2015): iv–v. https://doi.org/10.1016/j.burn.2015.05.002.

McConkey, Keeley, and Ekaterina Koromyslova. "A Comparative Study of Shift Work: Days, Nights, and Weekends: Which Shift Yields Higher Output and Lower Defects." *Journal of Management and Strategy* 9, no. 3 (June 20, 2018): 18. https://doi.org/10.5430/jms.v9n3p18.

Sharan, Prashant, Sonal K. Thengane, Tae Jun Yoon, Jeremy C. Lewis, Rajinder Singh, Robert P. Currier, and Alp Tugrul Findikoglu. "A Novel Approach for Produced Water Treatment: Supercritical Water Oxidation and Desalination." *Desalination* 532 (June 2022): 115716. https://doi.org/10.1016/j.desal.2022.115716.

Shields, S. A. *Speaking from the Heart: Gender and the Social Meaning of Emotion*. Cambridge University Press, 2002.

Sutrisno, Angeline, Erna Andajani, and Fitri Novika Widjaja. "The Effects of Service Quality on Customer Satisfaction and Loyalty in a Logistics Company." *KnE Social Sciences*, October 17, 2019. https://doi.org/10.18502/kss.v3i26.5360.

Szajna, Andrzej, Roman Stryjski, Waldemar Woźniak, Norbert Chamier-Gliszczyński, and Tomasz Królikowski. "The Production Quality Control Process, Enhanced with Augmented Reality Glasses and the New Generation Computing Support System." *Procedia Computer Science* 176 (2020): 3618–25. https://doi.org/10.1016/j.procs.2020.09.024.

Violanti, John M., Luenda E. Charles, Tara A. Hartley, Anna Mnatsakanova, Michael E. Andrew, Desta Fekedulegn, Bryan Vila, and Cecil M. Burchfiel. "Shift-work and Suicide Ideation among Police Officers." *American Journal of Industrial Medicine* 51, no. 10 (October 4, 2008): 758–68. https://doi.org/10.1002/ajim.20629.

Winchell, William. *Inspection and Measurement in Manufacturing: Keys to Process Planning and Improvement*. Society of Manufacturing Engineers, 1996.

Wong, S. " 5 Factors for Deciding Inspection Frequency in Manufacturing." InTouch Quality, n.d. https://www.intouch-quality.com/blog/5-factors-for-deciding-inspection-frequency-in-manufacturing.

Wright, Kenneth P., Richard K. Bogan, and James K. Wyatt. "Shift Work and the Assessment and Management of Shift Work Disorder (SWD)." *Sleep Medicine Reviews* 17, no. 1 (February 2013): 41–54. https://doi.org/10.1016/j.smrv.2012.02.002.

Zhen-yu, Z., L. Ming, and F. Jian-zhong. "Clinical Application of X-Ray Simulators in Quality Assurance and Control." *Chinese Journal of Radiological Medicine and Protection* 24, no. 1 (2004): 50–54.

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Dr. Kwame Asamoah is currently the Dean of Business School of Dr. Hilla Limann Technical University in the Upper West region of Ghana. I hold PhD (Management) with special emphasis on Sustainable Supply Chain Management from Putra Business School, Malaysia in completing in 2022. In 2011, he graduated from Kwame Nkrumah University of Science and Technology (KNUST) with MBA (Logistics and Supply Chain Management). He also graduated from University of Cape Coast with a Bachelor's Degree (Foundations) in 2000. In 2012, he was engaged as a Lecturer at the then Wa Polytechnic (now Dr. Hilla Limann Technical

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