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Identification of major critical factors for the transportation waste in industries using statistical tools

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Abstract. Transportation waste is recognized as a major problem in industries that has important implications both for the efficiency industry and for the environmental impact of construction projects. Moreover, it plays a vital role in the management of production systems since it affects their performance. Various factors have been included in the transportation waste like Multiple storage locations, Poor Layout, Potential damage to products etc. Most of these transportation waste can be avoided by developing inexpensive preventive measures, mostly related to huge marginal improvements

1. Introduction

Transportation waste is one of the major problems in the industrial environment. To know in details, we focus on showing the several different kinds of literature based on the transportation waste and its related factors. The six factors are considered for the minimization of transportation waste. Those are Complex material flow, Unnecessary material handling, Poor design process, Multiple storage locations, Poor layout, Large batch size, from these six factors we focus mainly on the Unnecessary material handling, Multiple storage locations, Potential Damage To Products. Material handling is mainly deals with the protection, movement, control, and storage of materials as well as products throughout the manufacturing, warehousing, distribution, consumption, and disposal. A company's material handling system and processes square measure place in situ to enhance client service, cut back inventory, shorten delivery time and lower overall handling prices in producing, distribution and transportation. The value of fabric handling contributes considerably to the full cost of producing. within the era of competition, this has nonheritable larger importance as a result of growing would like for reducing the producing value. The importance of fabric handling operate is larger in those industries wherever the quantitative relation of handling charge process cost is large. these days material handling is justly thought-about mutually of the foremost probably moneymaking areas for reduction of prices. There are excellent reasons why batch size is very important. First up, once we work with tiny batch sizes, every batch makes it through the total lifecycle faster than a bigger batch will. we have a tendency to recuperate we have a tendency to improve and come back at doing things we do fairly often, thus once we cut back batch size, we have a tendency to build every step within the method considerably additional economical. Smaller batch sizes conjointly mean you'll deliver quicker and reach project completion earlier. varied studies have established that larger batch sizes cause a longer cycle and delivery times – and an extended wait to search out if you've delivered price to your client

2. Literature review

El-Awadyattiaanad Ashraf Megahed [1] stated that Workforce capacities are greatly influenced by the manufacturing progress process or organizational learning. William G. Sullivan [2] stated that Huge capital investments are made in high-volume operations due to

that large fixed costs are maintained for production. John S. W. Fargher [3] stated that case studies are used to illustrate the steps in the implementation of lean manufacturing and remanufacturing, providing actual, very positive results. Ma Ga(Mark)Yang et al.[4] stated that the valid evidence with a large sample size that environmental management practices become an important mediating variable to resolve the conflicts between lean manufacturing and environmental performances. Taho Yang et al [5] stated that VSM is a lean- management method discuss with the present scenario and estimate with future designing methods for doing continues the process that makes a product or service that reach from its beginning through to the customer. Gabor Bohacs, Angela Rankacs [6] stated that further problems arise on the processes change over time and pose a big data problem as well. To cope with these issues adaptive simulations are more and frequently used. Peter Telek & Tamas Banyai [7] stated that that the material flow systems have in general very complex structure and relations. Hohera [8] stated that the motion of every single discrete element is explicitly realized by means of a physically based simulation. Carlos T. Formoso [9] stated that most of the wastage can be reduced by implementing inexpensive preventive measures, mostly related to managerial improvements. Nimseha Vilasini [10] stated that most of the waste has been raised from coordinating labor and managing, moving, and installing materials. Yeqing Zaho [11] stated that Iron and steel industry is one of the most important industry in the country, especially, have a direct impact on the whole national economy. Flitta and T. Sheppard [12] stated that Raw material is stored in one location and production is done in some other location due to the manufacturing of a product takes some more time and results in an increase in unnecessary costs. Richaud [13] stated that the evolution of each mean of transportation along with the increased awareness about the importance of passenger's safety pushed research and development. Xueping Zhen [14] stated that If a disruption occurs, a firm can exert efforts to resume its transportation, although its unit transportation cost during the recovery process is uncertain. E. J. Skilling [15] stated that methods and equipment are discussed from a human factors perspective, taking account of manual account of materials handling used within the industry.

3. Problem statement

Transportation usually results in operations having to attend for a product to be delivered attributable to delays. so, cost accounting you extra money for extending your lead times and making delivery issues. There are several causes that contribute to the waste of transport, the most one being the waste of overrun that successively results in the waste of transportation that then needs to be transported throughout your facility or between factories and even continents. The causes of this overrun are often everything from excessive setup times and therefore the want for economic batch sizes to the very fact that is the approach we've continuously done it. additionally, to overrun our organization's layouts usually cause the necessity to move product, we have a tendency to are usually organized in purpose. we've discreet areas for specific functions like attachment, pressing, molding etc. This results in the necessity to move product from every one of those areas to succeeding and sometimes back once more when everyone performs is completed. Even inside every purposeful space, we have a tendency to depart excessive gaps between operations requiring the necessity to use things like pump trucks to operate product concerning.

3.1 Methodology

In this paper, the statistical methodology was used to find out the Identification of Major Critical Factors For The Transportation Waste In Industries Using Statistical Tools. A literature survey has been conducted based upon the various transportation waste related papers. Based on the previous studies the problem has been identified. To investigate further a questionnaire has been framed and sent to the various industrial experts. The collected feedback was analyzed using the SPSS software and results were given accordingly.

4. Results and discussion

4.1 Hypothesis 1. Is any steps are taken to operate multiple storage locations and Have all the employers are through with potential damage to products

Ho- There is no significant relationship between the employers are through with multiple storage locations and Have all the employers are through with poor layout

H1- There is a significant relationship between employers are through with multiple storage locations and Have all the employers are through with poor layout

The observed degree of freedom for the chi-square test is 9 is 4.168 and but the calculated value is 11.853 which is greater than the table value So Ho is rejected and H1 is accepted it states that there is significant relationship between employers are through with multiple storage locations and Have all the employers are through with poor layout which has achieved a lot of benefits from the lean implementation over a period of 5 years in any manufacturing company.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	11.853	9	.222
Likelihood Ratio	15.079	9	.089
Linear-by-Linear Association	1.663	1	.197

N of Valid Cases	52		

a. 16 cells (100.0%) have expected count less than 5. The minimum expected count is 2.08.

4.2 Hypothesis 2. Is any steps are taken to operate multiple storage locations and Is any steps are taken to operate on potential damage to products
Ho- There is no significant relationship between the employers are through with multiple storage locations and Have all the employers are through with poor layout
H1- There is a significant relationship between employers are through with multiple storage locations and Have all the employers are through with poor layout
The observed degree of freedom for the chi-square test is 9 is 4.168 and but the calculated value is 13.480 which is greater than the table value So Ho is rejected and H1 is accepted it states that there is significant relationship between employers are through with multiple storage locations and Have all the employers are through with poor layout which has achieved a lot of benefits from the lean implementation over a period of 5 years in any manufacturing company.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	13.480[a]	9	.142
Likelihood Ratio	14.643	9	.101
Linear-by-Linear Association	.491	1	.484
N of Valid Cases	52		

a. 14 cells (93.8%) have expected count less than 5. The minimum expected count is 1.08..

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4.3 Hypothesis 3: Is any steps are taken to operate multiple storage locations and Are there any guidelines for potential damage to products
Ho- There is no significant relationship between the employers are through with multiple storage locations and Have all the employers are through with poor layout
H1- There is a significant relationship between employers are through with multiple storage locations and Have all the employers are through with poor layout
The observed degree of freedom for the chi-square test is 9 is 4.168 and but the calculated value is 6.354 which is greater than the table value So Ho is rejected and H1 is accepted it states that there is significant relationship between employers are through with multiple storage locations and Have all the employers are through with poor layout which has achieved a lot of benefits from the lean implementation over a period of 5 years in any manufacturing company.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6.354[a]	9	.704
Likelihood Ratio	6.590	9	.680
Linear-by-Linear Association	.452	1	.501
N of Valid Cases	52		

a. 16 cells (100.0%) have expected count less than 5. The minimum expected count is 2.31.

4.4 Hypothesis 4: Is any steps are taken to operate multiple storage locations and Is any wastage happens with potential damage to products
Ho- There is no significant relationship between the employers are through with multiple storage locations and Have all the employers are through with poor layout
H1- There is a significant relationship between employers are through with multiple storage locations and Have all the employers are through with poor layout
The observed degree of freedom for the chi-square test is 9 is 4.168 and but the calculated value is 6.014 which is greater than the table value So Ho is rejected and H1 is accepted it states that there is significant relationship between employers are through with multiple storage locations and Have all the employers are through with poor layout which has achieved a lot of benefits from the lean implementation over a period of 5 years in any manufacturing company.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6.014[a]	9	.739
Likelihood Ratio	7.308	9	.605
Linear-by-Linear Association	.210	1	.647
N of Valid Cases	52		

a. 15 cells (93.8%) have expected count less than 5. The minimum expected count is 1.35.

4.5 Hypothesis 5: Is any steps are taken to operate multiple storage locations and Weather any steps are followed to reduce the potential damage to products

Ho- There is no significant relationship between the employers are through with multiple storage locations and Have all the employers are through with poor layout
H1- There is a significant relationship between employers are through with multiple storage locations and Have all the employers are through with poor layout
The observed degree of freedom for the chi-square test is 9 is 4.168 and but the calculated value is 13.349 which is greater than the table value So Ho is rejected and H1 is accepted it states that there is significant relationship between employers are through with multiple storage locations and Have all the employers are through with poor layout which has achieved a lot of benefits from the lean implementation over a period of 5 years in any manufacturing company.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	13.349[a]	9	.147
Likelihood Ratio	14.513	9	.105
Linear-by-Linear Association	.303	1	.582
N of Valid Cases	52		

a. 16 cells (100.0%) have expected count less than 5. The minimum expected count is 2.08.

4.6 Hypothesis 6: Are there any guidelines for multiple storage locations and Is any steps are taken to operate poor layout
Ho- There is no significant relationship between the employers are through with multiple storage locations and Have all the employers are through with poor layout
H1- There is a significant relationship between employers are through with multiple storage locations and Have all the employers are through with poor layout
The observed degree of freedom for the chi-square test is 9 is 4.168 and but the calculated value is 6.628 which is greater than the table value So Ho is rejected and H1 is accepted it states that there is significant relationship between employers are through with multiple storage locations and Have all the employers are through with poor layout which has achieved a lot of benefits from the lean implementation over a period of 5 years in any manufacturing company.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6.628[a]	9	.676
Likelihood Ratio	6.927	9	.645
Linear-by-Linear Association	.770	1	.380
N of Valid Cases	52		

a. 14 cells (87.5%) have expected count less than 5. The minimum expected count is 1.38.

4.7 Hypothesis 7: Are there any guidelines for multiple storage locations and Are there any guidelines for poor layout handling
Ho- There is no significant relationship between the employers are through with multiple storage locations and Have all the employers are through with poor layout
H1- There is a significant relationship between employers are through with multiple storage locations and Have all the employers are through with poor layout
The observed degree of freedom for the chi-square test is 9 is 4.168 and but the calculated value is 10.859 which is greater than the table value So Ho is rejected and H1 is accepted it states that there is significant relationship between employers are through with multiple storage locations and Have all the employers are through with poor layout which has achieved a lot of benefits from the lean implementation over a period of 5 years in any manufacturing company.
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Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	10.859[a]	9	.285
Likelihood Ratio	12.787	9	.173
Linear-by-Linear Association	.223	1	.637
N of Valid Cases	52		

a. 13 cells (81.3%) have expected count less than 5. The minimum expected count is 1.21.

4.8 Hypothesis 8: Are there any guidelines for multiple storage locations and Is any wastage happens with the poor layout
Ho- There is no significant relationship between the employers are through with multiple storage locations and Have all the employers are through with poor layout
H1- There is a significant relationship between employers are through with multiple storage locations and Have all the employers are through with poor layout
The observed degree of freedom for the chi-square test is 9 is 4.168 and but the calculated value is 12.060 which is greater than the table value So Ho is rejected and H1 is accepted it states that there is significant relationship between employers are through with multiple storage

locations and Have all the employers are through with poor layout which has achieved a lot of benefits from the lean implementation over a period of 5 years in any manufacturing company.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	12.060[a]	9	.210
Likelihood Ratio	13.867	9	.127
Linear-by-Linear Association	.162	1	.687
N of Valid Cases	52		

a. 13 cells (81.3%) have expected count less than 5. The minimum expected count is 1.38.

4.9 Hypothesis 9: Are there any guidelines for multiple storage locations and Weather any steps are followed to reduce the poor layout

Ho- There is no significant relationship between the employers are through with multiple storage locations and Have all the employers are through with poor layout

H1- There is a significant relationship between employers are through with multiple storage locations and Have all the employers are through with poor layout

The observed degree of freedom for the chi-square test is 9 is 4.168 and but the calculated value is 5.589 which is greater than the table value So Ho is rejected and H1 is accepted it states that there is significant relationship between employers are through with multiple storage locations and Have all the employers are through with poor layout which has achieved a lot of benefits from the lean implementation over a period of 5 years in any manufacturing company.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	5.589[a]	9	.780
Likelihood Ratio	6.145	9	.725
Linear-by-Linear Association	1.352	1	.245
N of Valid Cases	52		

a. 14 cells (87.5%) have expected count less than 5. The minimum expected count is 1.56.

4.10 Hypothesis 10: Have all the employers are through with multiple storage locations and Is any wastage happens with the poor layout

Ho- There is no significant relationship between the employers are through with multiple storage locations and Have all the employers are through with poor layout

H1- There is a significant relationship between employers are through with multiple storage locations and Have all the employers are through with poor layout

The observed degree of freedom for the chi-square test is 9 is 4.168 and but the calculated value is 7.935 which is greater than the table value So Ho is rejected and H1 is accepted it states that there is significant relationship between employers are through with multiple storage locations and Have all the employers are through with poor layout which has achieved a lot of benefits from the lean implementation over a period of 5 years in any manufacturing company.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7.935[a]	9	.541
Likelihood Ratio	7.571	9	.578
Linear-by-Linear Association	.008	1	.929
N of Valid Cases	52		

a. 16 cells (100.0%) have expected count less than 5. The minimum expected count is 1.38.

Conclusion

In hypothesis 1 the two factors are cross-tabulated between any steps are taken to operate multiple storage locations and all the employers are through with potential damage to products in this analysis Ho is rejected and H1 accepted. So, it states that there is a strong relation between any steps are taken to operate multiple storage locations and all the employers are through with potential damage to products. In hypothesis 2 the two factors are cross-tabulated between any steps are taken to operate multiple storage locations and any steps are taken to operate on potential damage to products in this analysis Ho is rejected and H1 accepted. So, it states that there is a strong relation between any steps are taken to operate multiple storage locations and any steps are taken to operate on potential damage to products. In hypothesis 3 the two factors are cross-tabulated between any steps are taken to operate multiple storage locations and there any guidelines for potential damage to products in this analysis Ho is rejected and H1 accepted. So, it states that there is a strong relation between any steps are taken to operate multiple storage locations and there any guidelines for potential damage to products. In hypothesis 4 the two factors are cross-tabulated between any steps are taken to operate multiple storage locations and any wastage happens with potential

damage to products in this analysis Ho is rejected and H1 accepted. So, it states that there is a strong relation between any steps are taken to operate multiple storage locations and any wastage happens with potential damage to products. In hypothesis 5 the two factors are cross-tabulated between any steps are taken to operate multiple storage locations and any steps are followed to reduce the potential damage to products in this analysis Ho is rejected and H1 accepted. So, it states that there is a strong relation between any steps are taken to operate multiple storage locations and any steps are followed to reduce the potential damage to products. In hypothesis 6 the two factors are cross-tabulated between there any guidelines for multiple storage locations and any steps are taken to operate poor layout in this analysis Ho is rejected and H1 accepted. So, it states that there is a strong relationship between there any guidelines for multiple storage locations and any steps are taken to operate poor layout. In hypothesis 7 the two factors are cross-tabulated between there any guidelines for multiple storage locations and there any guidelines for poor layout handling in this analysis Ho is rejected and H1 accepted. So, it states that there is a strong relationship between there any guidelines for multiple storage locations and there any guidelines for poor layout handling. In hypothesis 8 the two factors are cross-tabulated between there any guidelines for multiple storage locations and any wastage happens with the poor layout in this analysis Ho is rejected and H1 accepted. So, it states that there is a strong relationship between there any guidelines for multiple storage locations and any wastage happens with the poor layout. In hypothesis 9 the two factors are cross-tabulated between there any guidelines for multiple storage locations and any steps are followed to reduce the poor layout in this analysis Ho is rejected and H1 accepted. So, it states that there is a strong relationship between there any guidelines for multiple storage locations and any steps are followed to reduce the poor layout. In hypothesis10 the two factors are cross-tabulated between all the employers are through with multiple storage locations and any wastage happens with the poor layout in this analysis Ho is rejected and H1 accepted. So, it states that there is a strong relationship between all the employers are through with multiple storage locations and any wastage happens with the poor layout. Hence all these factors show that reduction of these waste in the industrial environment improves the profit level of the organization.

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