

# Factors Affecting the Effective Usage of Medical Equipment in Sri Lankan Hospitals

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**Abstract** - In Sri Lanka's public hospitals, a large portion of the medical equipment is nonfunctional, unusable, or poorly maintained. It is of paramount importance to limit the nation's resource wastage amid the current economic crisis where people's access to healthcare is compromised. Developing nations like Sri Lanka face several difficulties in striking a balance between limited resources and better-quality healthcare services. Therefore, it is important to make optimal use of available resources in the healthcare system. There are many factors that have influenced the usage of the most recent technology in Sri Lankan Hospitals. In this study, 26 factors that influence the effective usage of medical equipment in Sri Lankan Hospitals were identified using the literature survey. A factor analysis was done to identify the main 4 factors with a higher influence on the effective usage of medical equipment. This study applied a cross-sectional study design, and 384 employees including nurses, biomedical engineers, medical officers, and doctors were selected by a convenient sampling method. Data were collected using structured self-administered questionnaires and analyzed using the SPSS (Statistical package software suite) at the level of significance of  $p < 0.05$ . Three reliability tests were performed namely Pearson correlation, Cronbach's alpha, and Cohen's kappa for the questions. This study shows that there is a positive influence of key factors financial resources, policy and regulatory framework, and training and education on effective usage of medical equipment. However, the main factor contributing to the effective usage of medical equipment is maintenance. A comprehensive analysis of the factors that influence the implementation of medical equipment management systems for Sri Lankan Hospitals is presented in this research.

**Keywords** - Medical Equipment, Patient care, Inefficient usage, Health care system.

## I. INTRODUCTION

In Sri Lanka's hospitals, a major portion of the medical equipment is nonfunctional, unusable, or poorly maintained. As a result, the nation's resources are wasted, and access to quality patient care is compromised. The high rate of equipment failures has resulted in an increase in equipment downtime in Sri Lanka's public sector hospitals. It is shown that medical equipment maintenance is considered a financially advantageous strategy to boost equipment availability in health facilities in situations with

limited resources (Hillebrecht *et al.*, 2022). To get the most out of the available biomedical equipment, operating and maintaining it economically is crucial.

On the other hand, improper handling, and maintenance of them could result in inaccurate results and endanger the user's and patient's safety (Koggalage and De Alwis, 2019). Not only that, but it is also evident that the world is evolving amidst this economic crisis, hence it is the role of researchers to identify the approaches to overcome the crisis and assess the gaps and barriers hindering the process.

There are many factors that influence the effective usage of medical equipment in hospitals, such as maintenance costs (Salim *et al.*, 2019), lack of maintenance (Sritart *et al.*, 2023), and lack of documentation and records (Zamzam *et al.*, 2021). Lack of responsible authority to ensure the accuracy and reliability of medical equipment (Salim, Mazlan, and Salim, 2019), limited availability of resources and support for health professionals (Zamzam *et al.*, 2021), and continued use of obsolete components (Acevedo, Fuentes and Enderle, 2005) (Dasanayaka and Sardana, 2011), also have a main influence on decreasing the lifetime of medical equipment. Budget constraints or resource limitations, government regulations, and lack of proper technical infrastructure (Dasanayaka, 2001) have limited the usage of high-tech medical equipment in Sri Lankan hospitals. A few other reasons for this situation are the purchase of complex equipment which is underutilization because of a lack of knowledge and skills (Dasanayaka and Sardana, 2011) and improper use that shortens the lifetime of the equipment. Not only that, the lack of standards and policies has resulted in many management and governance issues such as corruptive underhand deals (Dasanayaka, 2001) relating to healthcare equipment. It has been recognized that Sri Lankan healthcare professionals currently employed in hospitals demonstrate a dearth of applied skills and competencies in handling advanced biomedical instruments.

There is currently no evidence that hospital systems for managing medical equipment have been adopted in Sri Lanka. The main barriers to implementing such efforts have been a lack of infrastructure, external pressures, internal distractions, and a lack of human commitment

because Sri Lanka's governance framework is fragmented (Jayawardena, 2017).

As a result, any implementation attempt is fragmented and does not follow common standards. Therefore, this research intends to identify the important success variables affecting the effective usage of medical equipment in Sri Lankan hospitals as a first step toward the development of a framework for medical equipment management systems for Sri Lankan hospitals. The deficiencies in the Sri Lankan healthcare sector may be determined using this research, which will help to implement national medical equipment management systems.

The objective of this research is to recognize the key factors affecting the effective usage of medical equipment in Sri Lankan hospitals. Subsequently, assess the challenges and barriers that could hinder the effective usage of medical equipment in Sri Lankan hospitals. Finally, offers recommendations for how to effectively use medical equipment in Sri Lanka.

## II. METHODOLOGY

A cohesive and logical analysis of the elements influencing the effectiveness of medical equipment utilized in Sri Lankan hospitals is essentially elaborated in the research design of this study. The population is determined by human resource profile 2016, Ministry of Health. With the inputs of 54575 as the population size, a 95% confidence level, and 5 margins of error, the Krecjie and Morgan formula (1970) is used to determine the sample size. It was calculated as 382 and there were 384 responses to the questionnaire. The sample corresponds to the employees who are currently working with medical equipment in the health industry. The sampling method used for this study is convenience sampling since it enables them to evaluate the samples conveniently and produces more samples. The Colombo East Base Hospital served as the site of most of the data collection.

### A. Literature Survey

The literature survey was conducted to identify the factors affecting the effective usage of medical equipment.

### B. Designing Questionnaire

The questionnaire was designed based on the factors identified in the literature survey.

### C. Data Collection

The data were collected by distributing the questionnaire to the target sample population. The primary audience for this study will be the hospital employees, so a Google form with a survey-based online questionnaire will be created and delivered to them as the first step in gathering data.

### D. Data Entry and Cleaning

The data were entered into a spreadsheet using 5 – point Likert scale and removed any errors or inconsistencies.

### E. Descriptive Statistic

Descriptive statistics such as mean and standard deviation were calculated per question.

### F. Reliability Analysis

The Internal consistency of the questions were checked by applying the Pearson correlation, Cronbach's alpha, and Cohen's kappa.

The following hypothesis was constructed after factor analysis.

H1: The accessibility of sufficient financial resources has a positive influence on the effective usage of medical equipment in Sri Lankan government hospitals.

H2: Proper maintenance positively influences the effective usage of medical equipment in Sri Lankan government hospitals.

H3: Personnel training and education have a positive impact on the effective usage of medical equipment in Sri Lankan government hospitals.

H4: The supportive policy and regulatory framework has a positive influence on the effective usage of medical equipment in Sri Lankan government hospitals.

## III. RESULTS AND DISCUSSION

Descriptive statistics **Error! Reference source not found.** including the mean and standard deviation were computed to determine the variability, distribution, and central tendency of the variables as well as outliers. The mean of the data was greater than 4, implying the central tendency of data is at 4 (Agree) on the 5-point Likert scale.

Table 01: Descriptive Statistics of the factors

Descriptive Statistics			
Variable	Mean	Std. Deviation	N
IV1 - Policies and Regulatory Compliance	4.260	.909	384
IV2 - Training and education	4.523	.728	384
IV3 - Maintenance	4.143	.934	384
IV4 - Financial Resources	4.530	.621	384
DV - Effective Usage of Medical Equipment	4.313	.458	384

Cronbach's alpha coefficient for the scale's 25 variables is 0.713 as shown in **Error! Reference source not found.**, which shows that the scale is reliable and suitable for factor analysis.

Table 02: Reliability test for Full Dataset using Cronbach's Alpha.

Reliability Statistics	
Cronbach's Alpha	N of Items
.713	26

Among the collection of observed variables in the questionnaire, factor analysis was used to isolate the critical elements that influence the efficient use of medical equipment in Sri Lankan hospitals. Using the factor analysis method, variables with similar statistics were integrated into a single component. Therefore, key factors that influence the efficient use of medical equipment can be isolated. These key factors are essential in determining major aspects that should be prioritized in the implementation of medical equipment management systems which could ultimately increase Sri Lanka Hospital's productivity and efficiency and patient care.

Cohen's kappa coefficient 25 variables are 0.71 as shown in 3, which shows that the inter-rater reliability is appropriate.

Table 03: Reliability test for Dataset using Cohen's kappa

Symmetric Measures					
		Value	Asymptotic Standard Error <sup>a</sup>	Approximate T <sup>b</sup>	Approximate Significance
Measure of Agreement	Kappa	.71	.123	3.480	.000
N of Valid Cases		25			
a. Not assuming the null hypothesis.					
b. Using the asymptotic standard error assuming the null hypothesis.					

The results of Table 4 explain how well the regression model fits the data. The R-value of .926 depicts that there is a positive correlation between independent variables and the Effective Usage of Medical Equipment. In addition, this model explains the 85.7 percent variation in the Effective Usage of Medical Equipment in Sri Lankan government hospitals.

Table 04: Regression analysis summary for independent and dependent variables.

Model Summary <sup>b</sup>				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.926 <sup>a</sup>	.858	.857	.173
a. Predictors: (Constant), IV4 - Financial Resources, IV2 - Training and education, IV1 - Policies and Regulatory compliance, IV3 - Maintenance				
b. Dependent Variable: DV - Effective Usage of Medical Equipment				

Table 05: ANOVA results

ANOVA <sup>a</sup>					
Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	68.859	4	17.215	572.98	.000 <sup>b</sup>
Residual	11.387	379	.030		
Total	80.246	383			
a. Dependent Variable: DV - Effective Usage of Medical Equipment					
b. Predictors: (Constant), IV4 - Financial Resources, IV2 - Training and education, IV1 - Policies and Regulatory compliance, IV3 - Maintenance					

Table 05 examines the variance between the variables. The value of F is statistically significant at a level of 5%, therefore there is a linear relationship between variables. The p-value for the regression is 0.000, which suggests that the model is significant (p < 0.05). Therefore, the chosen model fits the data well.

Table 06: Regression coefficients were obtained for the independent variables

Coefficients <sup>a</sup>					
Model	Unstand. Coefficients		Stand. Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.578	.110		5.261	.000
IV1 - Policies and Regulatory Compliance	.212	.010	.421	21.682	.000
IV2 - Training and education	.035	.012	.055	2.859	.004
IV3 - Maintenance	.421	.010	.859	43.536	.000
IV4 - Financial Resources	.206	.015	.279	14.162	.000

Therefore, the linear regression equation for this model is as follows.

Effective use of medical equipment in Sri Lankan government hospitals

=

$$0.578 + 0.212 * \text{Policies and Regulatory compliance} + 0.035 * \text{Training and education} + 0.421 * \text{Maintenance} + 0.206 * \text{Financial Resources}$$

The beta values for Unstandardized Coefficients demonstrate the factor Maintenance have greater weightage in the Effective use of medical equipment in Sri Lankan government hospitals, whereas the significance for the independent variables Policies and Regulatory Compliance, Training and Education, Maintenance, and Financial Resources are 0.000, 0.000, 0.004, and 0.000 respectively as shown in Error! Reference source not found examines the variance between the variables. The value of F is statistically significant at a level of 5%, therefore there is a linear relationship between variables. The p-value for the regression is 0.000, which suggests that the model is significant ( $p < 0.05$ ). Therefore, the chosen model fits the data well. Therefore, the null hypothesis corresponding to the independent variables H10, H20, H30, and H40 can be rejected because all the values of p satisfy  $p < 0.05$ .

#### IV. CONCLUSION

The main aim of this empirical study was to determine the key factors that influence how well medical equipment is

used in Sri Lankan government hospitals. The main research objectives can be considered as having been successfully achieved based on the results. The data was acquired from a structured questionnaire comprising 26 variables which were eventually divided into 5 primary elements using factor analysis. The demographic information was initially examined using Microsoft Excel. Some of the attributes of the sample population were determined from the findings, and it was found that nurses made up the majority (52%) of those who responded because are highly involved with the operations of medical equipment. The five key factors identified in this research are Policies and Regulatory Compliance, Training and Education, Maintenance, and Financial Resources.

The results demonstrate that there is a positive influence from Policies and Regulatory Compliance, Training and Education, Maintenance, and Financial Resources to the effective usage of medical equipment in Sri Lankan government hospitals. Furthermore, the factor maintenance has a greater influence on the effective use of medical equipment in Sri Lankan government hospitals than the other three factors. This study provided a systematic analysis of the variables that affect infers the implementation of the medical equipment management system for Sri Lankan hospitals.

#### REFERENCES

- Acevedo, F.J., Fuentes, J.E. and Enderle, J.D. (2005) 'Design of computerized maintenance management system for the Chilean Naval Hospital Biomedical Engineering Department', *Annual International Conference of the IEEE Engineering in Medicine and Biology - Proceedings*, 7 VOLS, pp. 174–177. Available at: <https://doi.org/10.1109/IEMBS.2005.1616370>.
- Dasanayaka, S. (2001) 'Performance of Health Care Equipments in the Public Sector Hospitals in the Eye of Good Governance, A Case Study Based on the Sri Lankan Public Sector Hospitals', (January 1986), pp. 1–25. Available at: [http://www.napsipag.org/PDF/SARATH\\_DASANAYKA.pdf](http://www.napsipag.org/PDF/SARATH_DASANAYKA.pdf).
- Dasanayaka, S.W.S.B. and Sardana, G.D. (2011) 'Management of healthcare equipment in Sri Lankan public sector hospitals', *International Journal of Biomedical Engineering and Technology*, 5(4), pp. 317–342. Available at: <https://doi.org/10.1504/IJBET.2011.039924>.
- Hillebrecht, M. et al. (2022) 'Maintenance versus replacement of medical equipment: a cost-minimization analysis among district hospitals in Nepal', *BMC Health Services Research*, 22(1), pp. 1–9. Available at: <https://doi.org/10.1186/S12913-022-08392-6/FIGURES/1>.
- Jayawardena, D.B.A.S. (2017) 'Hospital Equipment Management in District Base Hospitals in Kalutara District in Sri Lanka', <http://www.sciencepublishinggroup.com>, 2(1), p. 18. Available at: <https://doi.org/10.11648/J.BSL.20170201.14>.

Koggalage, P.D. and De Alwis, S. (2019) 'A Project to Improve Management of Biomedical Equipment in Selected Units of District General Hospital, Gampaha, Sri Lanka', *International Journal of Research Foundation of Hospital and Healthcare Administration* [Preprint]. Available at: <https://doi.org/10.5005/jp-journals-10035-1109>.

Salim, S.A.H. *et al.* (2019) 'Dellabada Batawalage Ayanthi Saranga Jayawardena. Hospital Equipment Management in District Base Hospitals in Kalutara District in Sri Lanka', *MATEC Web of Conferences*, 14(1), pp. 317–342. Available at: [https://doi.org/10.1007/978-3-540-36841-0\\_924](https://doi.org/10.1007/978-3-540-36841-0_924).

Salim, S.H., Mazlan, S.A. and Salim, S.A. (2019) 'A Conceptual Framework to determine Medical Equipment Maintenance in Hospital Using RCM Method', *MATEC Web of Conferences*, 266, p. 02011. Available at: <https://doi.org/10.1051/MATECCONF/201926602011>.

Sritart, H. *et al.* (2023) 'Design and Evaluation of Web-Based Information Systems for the Medical Laboratory', *International Journal of Online and Biomedical Engineering (iJOE)*, 19(03), pp. 48–60. Available at: <https://doi.org/10.3991/IJOE.V19I03.36505>.

Zamzam, A.H. *et al.* (2021) 'A Systematic Review of Medical Equipment Reliability Assessment in Improving the Quality of Healthcare Services', *Frontiers in public health*, 9. Available at: <https://doi.org/10.3389/FPUBH.2021.753951>.

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#### AUTHOR BIOGRAPHY



I, Sanuththara Ranasinghe, am dedicated and passionate professional in the field of biomedical engineering. With a strong academic foundation, I hold a Bachelor of Science (BSc) degree in Biomedical Engineering and is currently pursuing Master of Science (MSc) in Biomedical Engineering. My internship provided me with invaluable insights into the intricacies of healthcare equipment utilization and the challenges faced by hospitals in Sri

Lanka. The main aim of my work is to contribute to the enhancement of healthcare services and the optimization of medical equipment usage, ultimately improving patient care in his home country and beyond.

# The Impact of Logistics Function on the Performance of an Organization

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**Abstract** - As an island, which seeks to thrive from area of logistics, the development of the logistics industry is significant since it acts as a vigorous supportive arm for the economy. Furthermore, the logistics functions in the industry are a paramount factor that assists to maintain a stable performances within the organizations and long-term reduce the price of the end product with efficient logistics practices. With the challenges faced by the supply chains in the whole world there has been ups and downs in the logistics industry, researchers have identified that there is contemporary requirement of assessing dimensions of logistics functions in order to find the impact on organizational performances. Moreover, the researcher has identified four functions of logistics which effect the organizational performance as warehousing, inventory management, transportation and order processing. In order to achieve the objectives of this study, the researcher have conducted multiple regression analysis by collecting the data from employees at MAS holdings Borupana. Finally, thematic analysis was done on the collected data to prove or double assure the responses received from the managers. As research findings, researchers exposed a strong positive correlation between the dimensions as warehousing as the most significant dimension of organizational performance at MAS holdings borupana. Furthermore, researchers can look in to the all companies within Sri Lanka and find the impact of logistics functions on overall performances of the company. practitioners should more concern about the revealed factors of this study to find out the impact of logistics functions on organizational performance.

**Keywords** - Warehousing, Inventory Management, and Organizational Performance

## I. INTRODUCTION

Despite its evident significance, logistics has not always gotten enough consideration. Historically, organisations focused only on the production of goods and paid little thought to the accompanying transportation of materials. Managers acknowledged that transport and storage were necessary, but considered them as unimportant technical difficulties; they were merely seen as unavoidable business expenses (waters,2003). Logistics is a set of operations that assures the availability of the appropriate items in the appropriate amount to the appropriate clients at the

appropriate time. Frequently, logistics is undervalued or underappreciated. In many organisations, logistics is considered as a cost centre, not a strategic asset (Mentzer et al., 2004). Such an argument is reinforced by Fugate et al. (2008) study examining the importance of logistics inside businesses. According to one of the authors' respondents, "many conventional logistics operations are regarded non-value added and tactical" in his organisation (p. 17)(Sink et al., 1996). This mentality may have detrimental repercussions on the logistics department and the business as a whole. Thankfully, there are businesses who appreciate the importance of logistics and consider it as a source of competitive advantage (Fawcett et al., 1993). To guarantee that logistics is fully exploited and generates the maximum value for the organisation, the function and its capabilities must be understood and utilised (Williams et al., 2009). In other words, logistics must be "sold" or brought to the forefront of the business (Zacharia and Mentzer, 2004). The objective should be to make people in the company aware of the value generated by logistics (Zacharia and Mentzer, 2007). If logistics is deemed significant, workers from other company divisions will have a higher understanding and regard for logistics' capacity to aid them in their daily work (Ralston et al., 2013)(Sohail et al., 2006). The majority of companies do not comprehend how the logistics function can impact their overall performance. Typically, companies focus on their marketing, finance, human resource, and other functions, but pay less attention to their logistics function, despite the fact that logistics can contribute significantly to the company's performance. Through this study, we are assisting in the understanding of how organisations that pay the utmost attention to logistics function and enhance the performance of the logistics of the company have achieved outstanding outcomes across the board (Jagersma, 2011).

## II. METHODOLOGY AND EXPERIMENTAL DESIGN

This research was done on the Borupana branch of MAS Holdings. The purpose of the study was to assess the impact of the logistics function on the business. MAS holding was chosen for this research because it focuses on fashion and lifestyle, is one of Asia's largest manufacturers of intimate apparel, sportswear, performance wear, and swimwear, provides IT solutions to the global apparel and footwear industry, and owns Sri Lanka's first international

lingerie brand, Amanté. The MAS holding textile manufacturing company obtains cotton as its primary raw material from various regions of the globe and sells its product mix to both domestic and international markets. In this way, logistics plays a significant role in the daily operations and overall performance of the organisation. Logistics management is a broad concept. Companies undervalue organizational logistics operations, according to the problem statement in chapter 1, but this has an indirect impact on the organization's performance as a whole. It establishes the market performance growth of the complete firm. The conceptual framework has four dimensions: order processing, inventory management, transportation, and warehousing to meet the study's objectives. The theoretical underpinning of this study's conceptual framework is the conceptual model put out by Narunart & Panjakajornsak (2019) in the literature review. Yang & Peterson, Yang & Parasuraman, Chen & Dubinsky, Parasuraman & Grewal, and 2003 (2004).

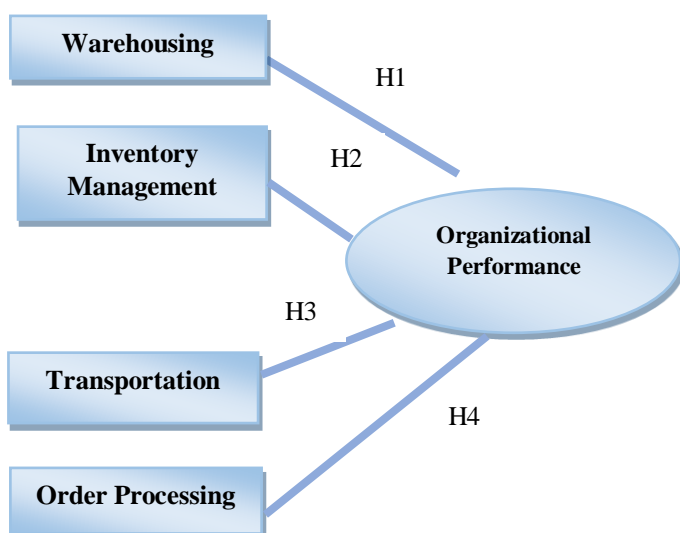


Figure 1: Conceptual Framework

Source: Developed by the Authors (2022) based on Narunart and Panjakajornsak (2019)

In order to confirm the validity and dependability of the 50 surveys, the researchers performed survey validation interviews with three industry experts. Using their feedback, they restructured the questionnaire using more complete and dependable items. Data was gathered, entered into Microsoft Excel, and exported to IBM SPSS (Version 22). The sample characteristics were explained using MS Excel-based bar charts, column charts, and pie charts. The data were analysed using statistical analysis methods including mean and frequencies using MS Excel and IBM SPSS (Version 22). Cronbach's Alpha is used to do a reliability test for the questionnaire survey. This approach was used by Chen and Dubinsky (2003) as well to guarantee the accuracy of the data collection. KMO and Bartlett's Test were used to assess the suitability of the

sample. In light of this, the quantitative technique was used in this study's data analysis. The link between each variable and organizational performance has been determined using linear regression analysis to meet the research objectives. The most important factors influencing organizational performance have been found through study using linear regression. The main program for carrying out the data analysis was IBM Statistical Package for the Social Sciences (SPSS) version 22. An interview was conducted as part of the qualitative data collecting process for the next particular goal, which was accomplished utilizing a thematic approach. Three business professionals gathered the qualitative information to ascertain their opinions and perceptions on the influence of logistics operations on an organization's performance. In order to meet the goals of their study, which was to assess organizational performances, Khadka & Maharjan (2017) used the same quantitative data collection method.

### III. RESULTS

Prior to starting data analysis, it is required to determine the characteristics of the sample that will be utilized for data collecting and analysis. The logistics division of MAS Holdings Borupana, where the personnel are skilled in warehousing, inventory management, order processing, and transportation, was the setting for the stratified random sampling approach, which was used to select a sample of 50 employees. Employees at all levels of the organization, from strategic to operational, collected the data. Three interviews were also conducted: two with top-level managers and one with middle-level managers. 56% of the chosen personnel are operationally involved, which is the in high percentage of the workforce. Secondly, only 4% of employees work at the strategic level, whereas 40% of people are involved in management.

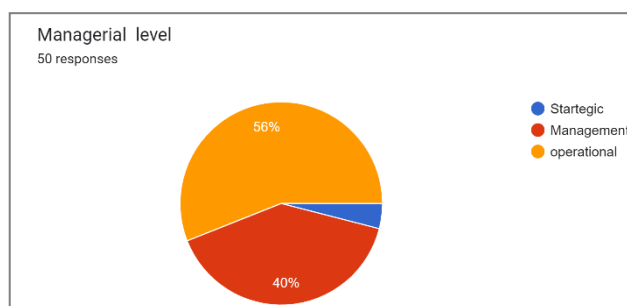


Figure 2: Managerial Levels of Employee  
Source: Survey Data (2022)

#### A. Section/ Department/ Unit

The respondents to the survey, specializes in jobs as in the sample operate according to logistics functions as warehousing, inventory management, transportation, and order processing in the company.

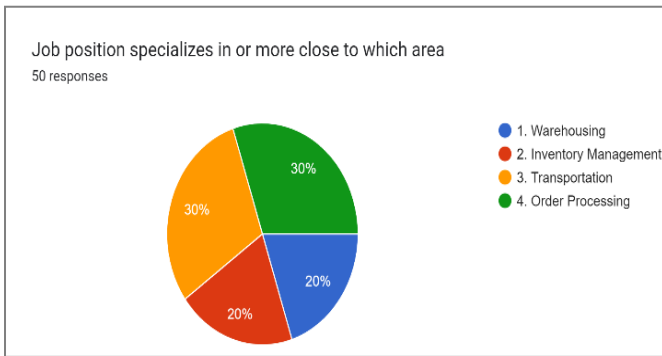


Figure 3: Specialization of Job Position  
Source: Survey Data (2022)

Figure 3 displays the job specializations of warehousing, inventory management, transportation, and order processing. Transport and order processing are shown to make up the majority as 30% for each, followed by warehousing and inventory management at 20% each

*B. Descriptive Statistics*

In the Table 1 the descriptive statistics of the 5 independent and dependent variables are shown in the minimum column the responses to each question related to each variable and the responses in minimum range is 2 for warehousing and inventory management whereas for the other 3 it starts with 3 which is neutral in the liquored scale and the maximum answers has been strongly agree for all questions of the variables and mean and standard deviation is as shown,(Ralston et al., 2013)

*C. Normal P-P Plot of Dependent Variable*

To check for linearity figure 4, the typical P-P plot from the obtained data set should be shown. If the dependent variable (output variable) has a smooth normal

Descriptive Statistics					
	N	Min	Max	Mean	Std. Deviation
<b>WH</b>	50	2	5	3.94	0.544
<b>IM</b>	50	2	5	3.97	0.579
<b>TM</b>	50	3	5	4.01	0.536
<b>OP</b>	50	3	5	4.05	0.465
<b>Per</b>	50	3	5	4.11	0.615

distribution, the plot will be normally distributed.

Table 1: Standard Residual Statistics

Source: Survey Data (2022)

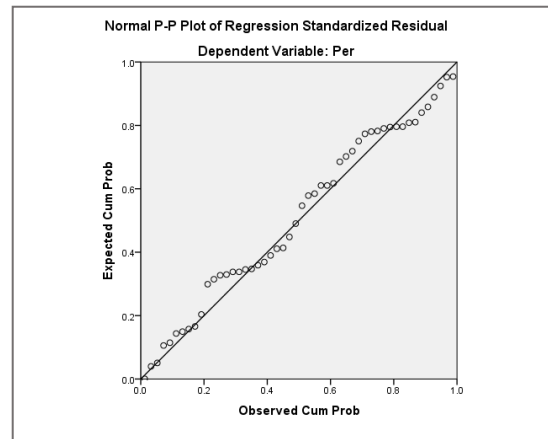


Figure 4: Normal P-P Plot of Regression of Dependent Variable  
Source: Survey Data (2022)

Figure 4 shows that the data is linearly related to organizational effectiveness throughout. The criterion has been met because the data is close to the line. The dependent variable, organizational performance, has a smooth normal distribution. From this figure we can get an idea that the questions related to each other that is the dependent questions and independent questions has a good relationship as the dots and aligned with the graph,(Paula et al., 2020).

*D. Multiple Regression Analysis*

To meet the research objective impact of Warehousing, Transportation, Inventory management and Order processing logistics functions effects organizational performance. The researchers ran a multiple regression analysis. In order to determine the most important factor that effects the organization performances, IBM SPSS (version 22) was used. The influence or effect between the dependent variable (outcome variable) and independent variable can be determined by the researchers by performing a multiple regression analysis (s). It assists in identifying which dimensions are most crucial, which ones might be neglected, and how those dimensions relate to one another. The unstandardized coefficients reflect the degree of correlation between the dependent variable and that particular independent variable while all other independent variables are held constant. The interpretation can be made based on whether the B value is positive or negative. To acquire a substantial unique contribution for forecasting the output variable, the significant value must also be smaller than 0.05. (Dependent variable).



2) *Relationship between organizational performances and inventory management*

The relationship between organizational performance and inventory management is above 0.05 therefore it is unsatisfactory and as inventory management doesn't have a significant value, the independent variable doesn't have an impact on the organizational performance.

Table 2: Output of the Multi-Regression Analysis

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1(Constant)	-0.117	0.864		-0.135	0.893
WH	0.431	0.156	0.381	2.768	0.008
IM	0.344	0.227	0.196	1.516	0.137
TM	0.433	0.157	0.377	2.75	0.009
OP	-0.157	0.227	-0.091	-0.693	0.492

Source: Survey Data (2022)

The coefficients for warehousing and transportation that were statistically significant are shown in Table 2 since their significance levels are less than 0.05 (P<0.05). Further analysis revealed that order processing and inventory management were not statistically significant because their P values were higher than 0.05 (P > 0.05). As a result, it can be said that order processing and inventory management (dependent variables) do not significantly contribute to the prediction of organizational performance (output variable). With statistical significance, the study determined that Warehousing and Transportation favourably influence or affect organizational performances (output variable) by taking into account the aforementioned table 2. using multi regression analysis determine the logistics functions' most significant dimension influence on organizational performance. Because warehousing has the highest unstandardized coefficients B value in table 2, the researchers have determined that it is the most important dimension. While the specific goal of this study, the impact of logistical activities such as warehousing, inventory management, transportation, and order processing on organizational performances, was accomplished through the use of multiple regression analysis.

1) *Relationship between organizational performances and warehousing*

The relationship between organizational performance and warehousing is below 0.05, therefore it is satisfactory, and warehousing is a significant independent variable that has a positive impact on the organizational performance.

3) *Relationship between organizational performances and transportation*

The relationship between organizational performance and transportation is below 0.05 therefore it is satisfactory, and warehousing is a significant independent variable that has a positive impact on the organizational performance.

4) *Relationship between organizational performances and order processing*

The regression between organizational performance and inventory management is above 0.05 therefore it is unsatisfactory and as order processing doesn't have a significant value, the independent variable doesn't have an impact on the organizational performance.

IV. DISCUSSION

According to the impact of logistical functions on organizational performance, the author of this study found four elements, A corporation must go beyond basic logistics operations to highly skilled logistics functioning since supply chain management and logistics have grown to be a competitive sector.

In light of this, the current study focuses on the variables that affect organizational performance and examines the relationships between logistics operations and organizational performance. Chen & Dubinsky (2003), Narunart & Panjakajornsak (2019), and Yang & Peterson (2004). warehousing, inventory management, transportation, and order processing were among its four dimensions. Results were interpreted in accordance with the research objective and each of those objectives' results was addressed. The researchers did multiple regression analysis to examine the four dimensions that affect organizational performances. Four factors and organizational performance are correlated by multi-regression analysis. The exact alignment of two dimensions with their corresponding relative dimensions has been proven. In contrast, the two dimensions' alignment with the respective variables was not complete. The researchers' goal for the study has been accomplished using multiple regression analysis. The researchers used

multi regression analysis to determine that warehousing is the most important factor affecting organizational performance in the MAS holdings.

#### *4.1 Interpretation of Research Findings of warehousing and how it effects the organizational performances*

Improvements in warehouse functionality have increased along with the emergence of businesses like Industry 4.0. (Atieh et al., 2016).

Each of the independent variables listed above has undergone a linear regression analysis. The independent computation of each variable results in a linear connection with organizational performances. Each variable needs to be smaller than 0.05 in order for there to be a positive association. The value of the warehousing variable is 0.008, as displayed in Table 2 The previous sentence validates the value. For distribution centre management to remain effective, warehouse activities should be more adaptable with their resources (Autry et al., 2005) and procedures. The results demonstrate that warehousing has a positive impact on organizational performance.

As proven by the quantitative analysis that there is an impact by the warehousing function on the performance of the MAS holding company. This can be verified with the answers given by the managers in their interviews, as per the statistics warehousing function has the most impact on the organizational performance. This is true as they are outsourcing their warehousing and when outsourcing the best can done as specialist in that field is undertaking the warehousing part and the MAS holdings can focus on the core business activities and then in return the organizational performances increase.

#### *4.2 Interpretation of Research Findings of Inventory management and how it effects the organizational performances*

A linear regression analysis has been performed on each of the independent variables indicated above. Each variable in table 2 is computed independently to produce a linear association with organizational performances. For there to be a positive relationship, each variable must be less than 0.05. The inventory management variable's value, as shown in Table 2 is 0.137. The value is not validated by the previous phrase. The findings show that inventory management has a negative impact on organizational performance.

Inventory management has a negative impact on organizational performance, with the slightly unfavourable responses from the inventory department and the unequal distribution of responders from each variable.

#### *4.3 Interpretation of Research Findings of transportation and how it effects the organizational performances*

The above all independent variables are analysed under linear regression analysis method. According to that in table 2, each variable is calculated separately, to get the linear relationship with the organizational performances. To certify a positive relationship each variable should be in less than 0.05. in table 4.9, for transportation variable the value interprets as 0.009. the value is confirmed from the above statement. Therefore, the results define transportation effect in a positive impact to organizational performances.

Finally, all above information that grant a positive relationship for organizational performances by transportation variable as information exchange should improve logistics performance because it's necessary for transportation (Kim and Lee, 2010; Wong et al., 2015; Raweevan and Ferrell, 2018; Viet et al.,2018).

#### *4.4 Interpretation of Research Findings of order processing and how it effects the organizational performances*

All of the independent variables listed above have been analyzed using linear regression. To obtain a linear relationship with organizational performances, each variable in table 2 is calculated independently. Each variable should be in less than 0.05 to confirm a positive link. Table 2 shows that the value for the order processing variable is 0.492 as indicated. From the sentence above, the value is not validated. Thus, the results define the order processing does not have an effect on organizational performance.

Whether the chart flows in linear, according to received values confirm that order processing has not a direct impact on organizational performances as the values aren't fulfil mentioned requirements. Finally, all above information that grant a negligible relationship for organizational performances by order processing variable.

## V. CONCLUSION

According to above data analysis and charts, the warehouse and transportation aspects have a positive impact on the organizational performances to continue operating, as can be seen from the aforementioned data. When addressed questions from the transportation and warehousing industries, the staff responded more effectively. And the other two hypothesis which is inventory management and order processing, the outcomes are frequently overwhelmingly unfavourable from the viewpoint of workers. Such a conclusion can be reached because every inquiry made is insightful responses. Although the transportation and order processing sectors employ the majority of the workforce, the order processing sector received the fewest positive comments. Even though the warehousing receives little assistance, the positive answers there are greatly valued. Thus, now can definitely say that the functions of transportation and warehousing have a direct positive impact on a company's ability to

survive. Therefore, we can come to a conclusion that the warehousing and transportation has an impact on the organizational performances and inventory management and order processing doesn't have an impact on the organizational performances on the MAS holdings Borupona, and to dig deep in to this aspect more the sample amount can be increased and the equal number of individuals can be taken from each 4 independent variables to get an fair result.

#### REFERENCES

- Arya, P., Srivastava, M. K., & Jaiswal, M. P. (2020). Modelling environmental and economic sustainability of logistics. *Asia-Pacific Journal of Business Administration*, 12(1), 73–94. <https://doi.org/10.1108/APJBA-11-2018-0204>
- Chan, J. W. K. (2005). Competitive strategies and manufacturing logistics: An empirical study of Hong Kong manufacturers. *International Journal of Physical Distribution and Logistics Management*, 35(1), 20–43. <https://doi.org/10.1108/09600030510577412>
- Chan, K. C. (1993). Intelligent Corporate Strategy: Beyond World-class Manufacturing. *Industrial Management & Data Systems*, 93(2), 1–64. <https://doi.org/10.1108/02635579310032824>
- Consultant, M., & Delhi, N. (n.d.). *UNIT 2 LOGISTICS MANAGEMENT: CONCEPTUAL FRAMEWORK , SCOPE , AND IMPORTANCE* \*. 28–37.
- Dadzie, K., Dadzie, C., Johnston, W. J., Winston, E., & Wang, H. (2022). The integration of logistics and marketing practice into baseline supply chain practices in the emerging markets. *Journal of Business and Industrial Marketing*, January. <https://doi.org/10.1108/JBIM-01-2022-0002>
- Editor, T. G., & Fojt, M. (1996). *Strategic logistics management*. 9(5).
- Gattorna, J., Day, A., & Hargreaves, J. (1991). Effective Logistics Management. *Logistics Information Management*, 4(2), 2–86. <https://doi.org/10.1108/09576059110143603>
- Hagon, T. (1994). *Putting the Logistics Manager in the Driving Seat*. June, 53–57.
- Hançerlioğulları, G., Şen, A., & Aktunç, E. A. (2016). Demand uncertainty and inventory turnover performance: An empirical analysis of the US retail industry. *International Journal of Physical Distribution and Logistics Management*, 46(6–7), 681–708. <https://doi.org/10.1108/IJPDLM-12-2014-0303>
- Hellström, D., & Nilsson, F. (2011). Logistics-driven packaging innovation: A case study at IKEA. *International Journal of Retail & Distribution Management*, 39(9), 638–657. <https://doi.org/10.1108/09590551111159323>
- Jagersma, P. K. (2011). Competitive information logistics. *Business Strategy Series*, 12(3), 136–145. <https://doi.org/10.1108/17515631111130103>

Kembro, J., & Norrman, A. (2022). *The transformation from manual to smart warehousing: an exploratory study with Swedish retailers*. 33(5), 107–135. <https://doi.org/10.1108/IJLM-11-2021-0525>

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