iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 13 **Issue:** VIII **Month of publication:** August 2025

DOI: https://doi.org/10.22214/ijraset.2025.73919

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 13 Issue VIII Aug 2025- Available at www.ijraset.com

The Impact of Technology on Enhancing Efficiency and Innovation in Shipping and Logistics with Sun World Logistics

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Abstract: ***The shipping and logistics industry is undergoing a transformative shift driven by rapid advancements in technology. Innovations such as artificial intelligence (AI), the Internet of Things block chain, automation, and big data analytics are significantly enhancing operational efficiency and fostering innovation across the supply chain. These technologies enable real-time tracking, predictive maintenance, route optimization, and improved inventory management, thereby reducing costs, minimizing delays, and improving customer satisfaction. Additionally, digital platforms and automated systems are streamlining processes from warehousing to last-mile delivery, while also promoting sustainability through better resource utilization. This paper explores the key technological trends revolutionizing the logistics sector and evaluates their impact on productivity, agility, and long-term competitiveness. Block chain technology offers secure, tamper-proof digital records, fostering trust and reducing fraud in international trade. Automation and robotics are revolutionizing warehousing and port operations, minimizing human error, and increasing throughput. Furthermore, cloud computing and digital platforms are driving the integration of logistics networks, enhancing collaboration among stakeholders. By highlighting real-world applications and case studies, it underscores the critical role of technology in shaping the future of global shipping and logistics.***

I. INTRODUCTION

The shipping and logistics industry plays a crucial role in global trade and commerce, facilitating the movement of goods across regions and nations. However, the traditional methods of managing these operations offen faced challenges such as inefficiency, delays, and high operational costs. In recent years, the advent of advanced technologies has significantly transformed the way logistics and shipping companies operate, enhancing their efficiency and driving innovation within the sector.

This project aims to explore the profound impact that technology has had on shipping and logistics operations. Technologies such as automation, artificial intelligence. The Internet of Things block chain and data analytics have enabled businesses to streamline operations, improve real-time tracking, optimize supply chains, and reduce costs. The integration of these technological advancements not only boosts operational efficiency but also fosters innovation, creating new opportunities for companies to enhance customer satisfaction, improve the key technologies shaping the shipping and logistics landscape, this project will delve into safety, and maintain a competitive edge.By examining their benefits, challenges, and the future potential of tech-driven logistics. Furthermore, showcasing the tangible advantages of adopting these technologies for long-term sustainability and growth.

The shipping and logistics sector is the backbone of global trade, handling the transportation of goods from one part of the world to another. With the rise of e-commerce, globalization, and an ever-growing demand for faster, more reliable delivery, the pressure on logistics companies to meet these needs has never been higher. Traditionally, logistics operations were largely manual, reliant on paper-based processes, limited communication channels, and fragmented systems, which often led to inefficiencies, delays, and high operation. The technological advancements, showing how leading companies in the shipping and logistics sector have leveraged these tools to stay ahead in a highly competitive market. Ultimately, this exploration aims to showcase the vital role technology plays in creating a more efficient, sustainable, and innovative future for logistics and shipping operations worldwide.

A. Statement Of The Problem

The industry faces numerous challenges, including rising operational costs, inefficiencies in supply chain management, environmental concerns, and the need to meet ever-increasing customer demands for faster and more reliable delivery. The shipping and logistics industry is a critical component of international trade and economic growth, responsible for the movement of goods

across vast distances. However in this context, the integration of advanced technologies has emerged as a potential solution to enhance efficiency, drive innovation, and address these challenges .This study seeks to explore the impact of technology on enhancing efficiency and innovation in shipping and logistics, with a focus on Sun World Logistics. It aims to identify the key technological advancements that can address existing challenges, assess their potential benefits, and provide actionable insights for the company to leverage these innovations effectively. By doing so, the research will contribute to a deeper understanding of how technology can drive sustainable growth and competitiveness in the shipping and logistics industry.

B. Scope Of The Study

This study focuses on examining the impact of technology on enhancing efficiency and fostering innovation in the shipping and logistics industry. It explores various technological advancements such as artificial intelligence. The Internet of Things automation, cloud computing, and big data analytics, assessing their role in optimizing logistics operations, improving supply chain management, and reducing costs The study will cover key aspects of shipping and logistics, including transportation management, warehousing, inventory control, freight tracking, and last-mile delivery. It will analyze how digital transformation influences operational efficiency, decision-making processes, and customer satisfaction. Additionally, the study will investigate the challenges associated with technology adoption, such as high implementation costs, data security concerns, regulatory constraints, and resistance to change within organizations.

C. Objective

1) To examine the role of technology in enhancing efficiency and innovation in the shipping and logistics industry.
2) To analyze the specific technological solutions implemented by Sun World Logistics to improve operational efficiency and customer service.
3) To assess the impact of these technological innovations on the overall performance and competitiveness of Sun World Logistics.
4) To identify potential areas for further technological integration and improvement within the company.

II. RESEARCH METHODOLOGY

Research methodology is a structured approach that facilitates the scientific resolution of a research problem. It encompasses various methods, techniques, and procedures to systematically analyze the research question. This study adopts a descriptive study and seeks to assess “The Impact of Technology on Enhancing Efficiency and Innovation in Shipping and Logistics.”

A. Sample Size

The size of the sample is limited to 250 respondents.

B. Research Design

Research design is a quantitative and qualitative research design, employing both primary and secondary data sources. An approach is used to assess the relationship between technological advancements and their impact on efficiency and innovation within the shipping and logistics industry. Here to meet the objectives random sampling technique is used.

C. Tools and Techniques Used

1) Simple percentage Analysis
2) Rank method
3) Chi square analysis
4) ANOVA
5) Correlation
6) Regression

D. Limitations Of The Study

1) The study is done within the Sun world Logistics, so it may not be applicable for other organizations.
2) The study is conducted on the basis of the responses collected from the respondents through structured questionnaire

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III. REVIEW OF LITERATURE

1) Almaazmiet (2024) delves into the examination of the influence of digital transformation on product innovation. The paper undertakes a critical review of extant research, elucidating how digitalization influences the process of developing new products.
2) A Bresciani et al. (2023) extends the exploration of this topic by investigating digital transformation as a catalyst for innovation, encompassing not only products but also processes and business models. The authors emphasize the diverse ways in which digital technologies can play a contributory role in fostering innovation within companies.
3) Chen & Kim (2022) delves deeper into the ramifications of digital transformation on innovation performance, with a specific focus on the mediating role of innovation factors. This study underscores how the integration of digital innovation can enhance the overall productivity and competitiveness of organizations.
4) D.Aagaard (2021) concentrate on the Internet of Things (IoT) within the framework of digital transformation and business model innovation, utilizing the case study of a traditional Brazilian wholesaler. Their analysis illustrates the transformative potential of IoT in fundamentally reimagining conventional business approaches.
5) Maier (2020) investigate how innovative leaders influence the future by presenting three visions of digital transformation in construction. The paper underscores how leaders can leverage digital technologies to actualize innovative ideas and strategies within the construction industry.
6) Ujwary-Gil, (2019) extends this thematic exploration by examining business innovation and key success factors within the context of digital transformation and periods of instability. The authors underscore the imperative for companies to adapt to a swiftly changing environment.

IV. SIMPLE PERCENTAGE

Table No 1 Age Group

S. No	Age	No. of Respondents	Percentage (%)
1	18-25	57	22.8%
2	26-35	62	24.8%
3	36-45	68	27.2%
4	46-55	63	25.2%
Total		250	100

Source: Primary Data

- Interpretation: The table shows that the 22.8% of the respondents from the age group of 18 to 25 years, 24.8% of the respondents from the age group of 26-35 years, 27.2% of the respondents from the age group of 36 to 45 years and 25.2% of the respondents from the age group of 46-55 years.

- Inference: Majority 27.2% of the respondents from the age group of 36 to 45 years.

Chart 1
AGE GROUP

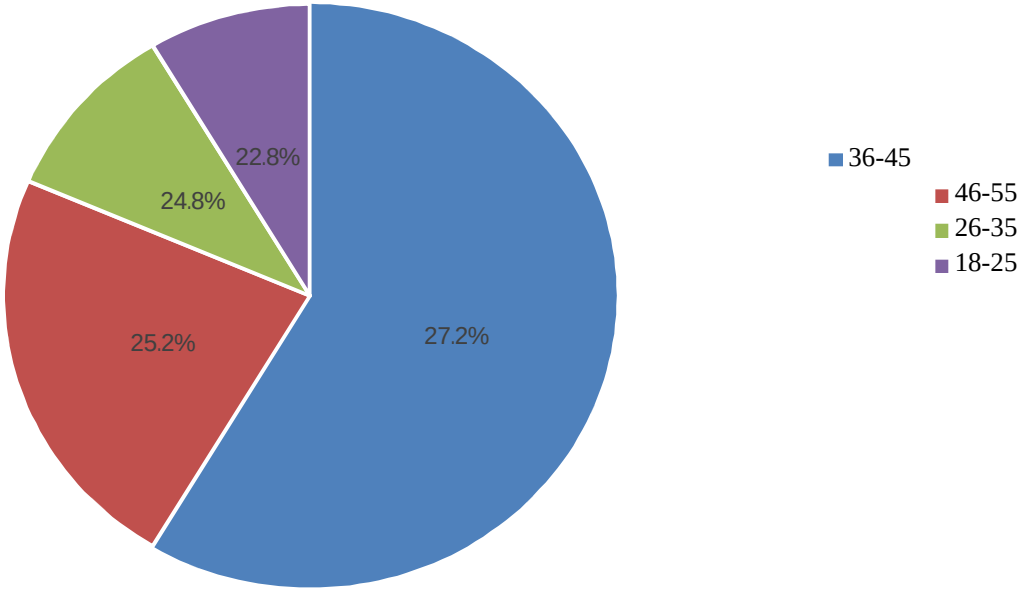


Table No 2 Gender

S. No	Gender	Number of Respondents	Percentage (%)
1	Male	126	50.4%
2	Female	124	49.6%
Total		250	100

Source: Primary Data

- Interpretation: The table shows that 50.4% of the respondents were male and 49.6% of the respondents were female.
- Inference: Majority 50.4% of the respondents were male.

Chart 2
Gender

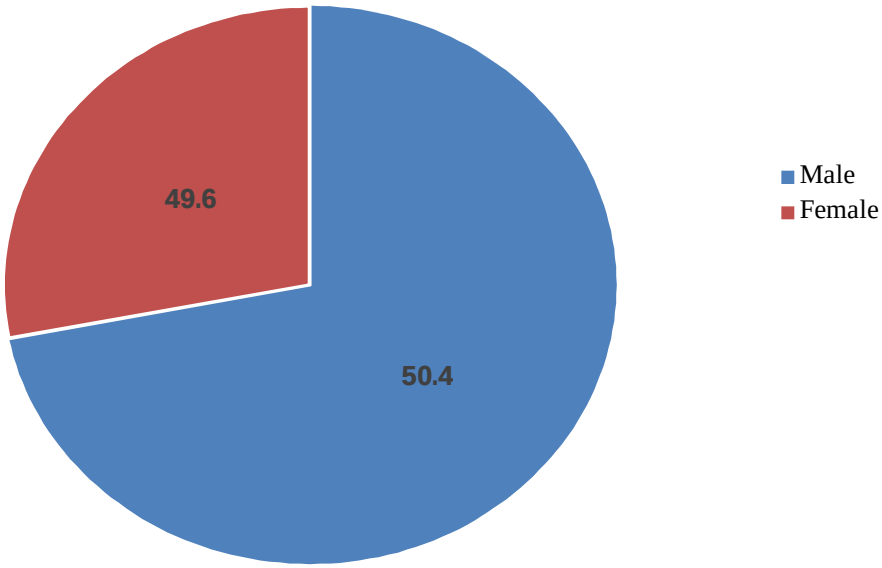


Table no 3
Educational qualification

S. No	Educational qualification	No. of Respondents	Percentage (%)
1	Higher Secondary	50	20%
2	Graduate	71	28.4%
3	Diploma	61	24.4%
4	Professional	68	27.2%
Total		250	100

Source: Primary Data

- Interpretation: The table shows that 20% of the respondent's education qualification is higher secondary, 28.4% of the respondent's education qualification is graduation, 24.4% of the respondent's education qualification is diploma and 27.2% of the respondent's education qualification is professional degree.
- Inference: Majority 28.4% of the respondent's education qualification is graduation.

Chart 3 Educational Qualification

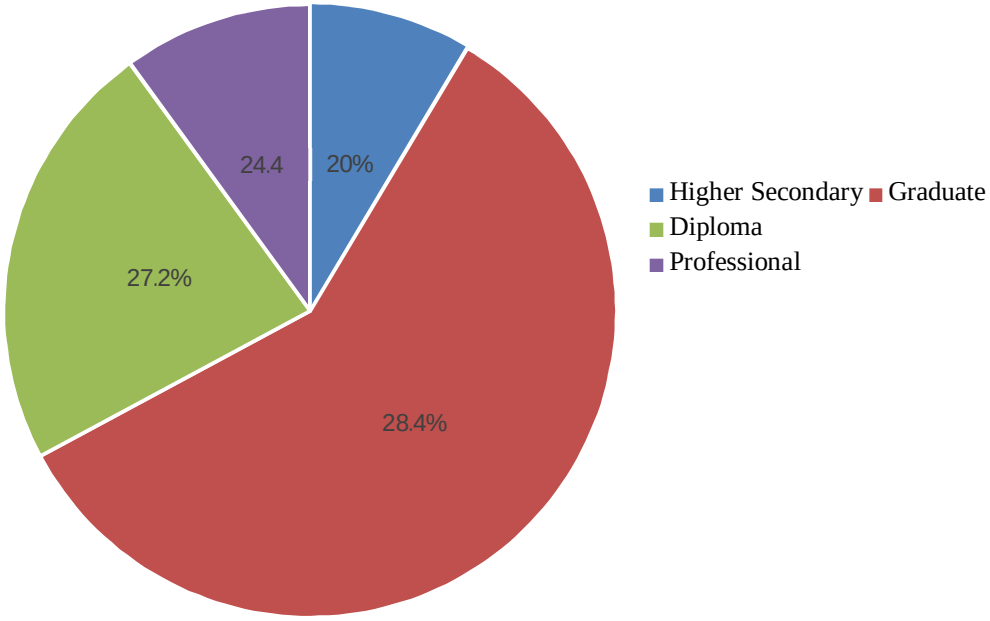


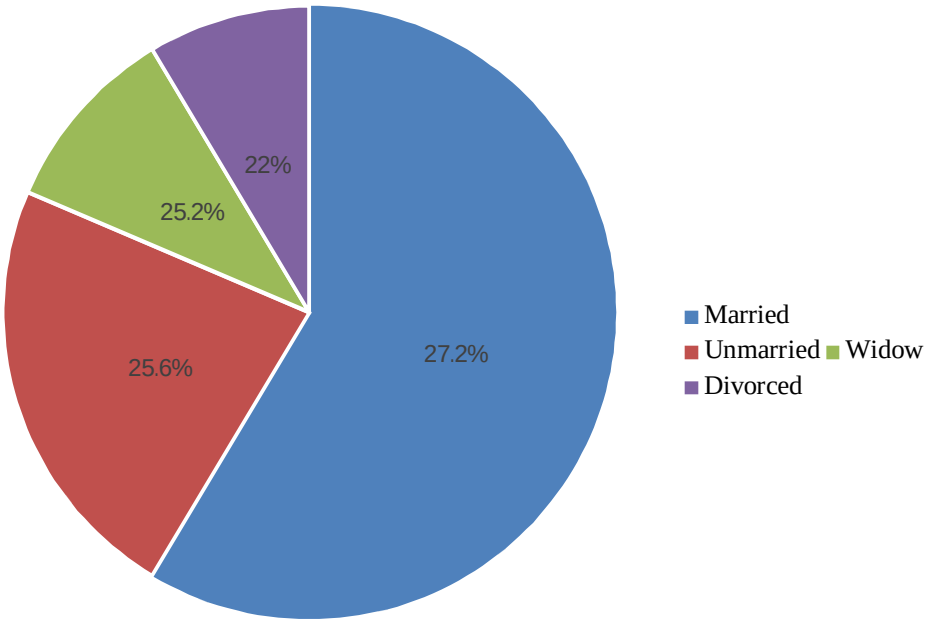
Table No 4 Marital Status

S. No	Marital status	No. of Respondents	Percentage (%)
1	Married	68	27.2%
2	Unmarried	64	25.6%
3	Widow	63	25.2%
4	Divorced	55	22%
Total		250	100

Source: Primary Data

- Interpretation: The table shows that 27.2% of the respondents were married, 25.6% of the respondents were unmarried, 25.2% of the respondents were widow and 22% of the respondents were divorced.
- Inference: Majority 27.2% of the respondents were married.

Chart 4
Marital Status



A. ANOVA

Analysis of Variance (ANOVA) is a statistical formula used to compare variances across the means (or average) of different groups. A range of scenarios use it to determine if there is any difference between the means of different groups.

TABLE 8
Anova Between Age And Benefits Of Using Technology

H_0 = There is no statistical difference between age and benefits of using technology.
H1 = There is statistical difference between age and benefits of using technology.

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	10.151	3	3.384	2.741	.044
Within Groups	303.673	246	1.234		
Total	313.824	249			

Interpretation: In the above table, with the degree of freedom 3 and f-value 0.44, sig. = 0.044 which is greater than 0.05, so we conclude that there is no significant difference between age and benefits of using technology.

B. Chi- Square Test

A chi- square test, also written as x^2 test is any test statistical hypothesis test where the sampling distribution of the test statistic is squared distribution when the null hypothesis is true, without other qualification, chi- square test is often used as short for Pearson's chi-square test.

TABLE 9

Comparison Between Educational Qualification And Technical Intergration

H_0 = There is no association between educational qualification and challenges in technology integration.

H1 = There is association between educational qualification and challenges in technology integration.

		Challenges in Tech Integration				Total
		High costs	Resistance to change	Lack of skilled personne l	Integration with existing system	
Educational Qualification	Higher Secondary	13	16	10	11	50
	Graduate	17	14	18	22	71
	Diploma	14	14	21	12	61
	Professional	19	19	14	16	68
Total		63	63	63	61	250

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7.603[a]	9	.575
Likelihood Ratio	7.404	9	.595
N of Valid Cases	250		
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 12.20.			

- Interpretation: In the above table, with the degrees of freedom 9, sig. value (.575) which is greater than significant value (0.05), so we conclude that there is no association between educational qualification and technical integration.

C. Correlation

Correlation is a statistical measure that expresses the extent to which two variables are linearly related (meaning them together a constant rate). It's a common tool for describing simple relationships without making a statement about cause and effect.

Table 10

Comparison Between Data Innovation And Satisfaction In Tech Integration

H0 = There is no correlation between role of data in Innovation & Satisfaction with Tech Integration.

H1 = There is no correlation between role of data in Innovation & Satisfaction with Tech Integration.

		Role of Data in Innovation	Satisfaction with Tech Integration
Role of Data in Innovation	Pearson Correlation	1	.022
	Sig. (2-tailed)		.726
	N	250	250
Satisfaction with Tech Integration	Pearson Correlation	.022	1
	Sig. (2-tailed)	.726	
	N	250	250

- Interpretation: In the above table, with the degrees of freedom 9, sig.value (.726) which is greater than significant value (0.05), so we conclude that there is no significant difference between role of data in Innovation & Satisfaction with Tech Integration.

D. Regression

Regression is a statistical method used to model a relationship between a dependent variable and one or more independent variables. It helps in predicting outcomes and identifying trends in data. It is widely used in fields like finance and economics for data analysis and forecasting.

Table 10
Regression Between Educational Qualifications And Monthly Income Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.043[a]	.002	-.006	1.155
a. Predictors: (Constant), Educational Qualification, Monthly Income				

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	.603	2	.302	.226	.798[b]
	Residual	329.641	247	1.335		
	Total	330.244	249			
a. Dependent Variable: Role of Data in Innovation						
b. Predictors: (Constant), Educational Qualification, Monthly Income						

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.486	.239		10.411	.000
	Monthly Income	.049	.078	.039	.619	.536
	Educational Qualification	-.019	.067	-.018	-.284	.777
a. Dependent Variable: Role of Data in Innovation						

- Interpretation: Both P-value are much greater than 0.05 so we fail to reject Ho indicating the Educational Qualification and Monthly Income.

E. Rank Analysis

Rank analysis is a statistical method used to compare and evaluate data by ranking values instead of using their absolute numbers. It helps in reducing the impact of outliers and it is widely used in fields like economics, psychology and decision-making process

Table 11
Contribution of the company's competitiveness

Factors	I	II	III	IV	V	VI	VII	VIII	IX	X	Total	Rank
Improved Delivery Speed Due to Technology	26 260	23 207	30 240	26 182	26 156	26 130	25 100	24 75	20 40	24 24	1411	III
Enhanced Customer Experience Through Digital Tools	26 260	19 171	23 184	38 266	28 168	21 105	36 144	19 57	24 48	16 16	1419	I

Cost Reduction from Process Automation	26 260	26 234	23 184	27 189	37 222	19 95	19 76	22 66	25 50	26 26	1402	V
Increased Market Share Due to Innovation	34 340	27 243	27 216	13 91	21 126	24 120	25 100	24 72	22 44	33 33	1385	VI
Better Decision-Making with Data Analytics	31 310	29 261	31 248	14 98	21 126	19 95	31 124	26 78	21 42	27 27	1409	IV
Faster Problem Resolution with AI Chatbots	16 160	28 252	23 184	26 182	24 144	26 130	23 92	21 63	31 62	32 32	1301	X
Augmented Reality for Training and Maintenance	17 170	27 243	22 176	23 166	23 138	36 180	26 104	28 84	27 54	21 21	1331	VIII
Omnichannel Integration for Seamless Shopping	19 190	25 225	28 224	20 140	24 144	27 135	21 84	32 96	27 54	27 27	1319	IX
Cybersecurity Advancements for Data Protection	24 240	27 243	24 192	38 266	22 132	22 110	21 84	25 75	24 48	23 23	1413	II
Real-Time Inventory Visibility	31 310	19 171	19 152	25 175	24 144	30 150	23 92	29 87	29 58	21 21	1360	VII

- Interpretation: From the above analysis of the performance appraisal system the highest ranked factor is Improved Delivery Speed Due to Technology, Enhanced Customer Experience Through Digital Tools, Cost Reduction from Process Automation, Increased Market Share Due to Innovation, Better Decision-Making with Data Analytics, Faster Problem Resolution with AI Chatbots, Augmented Reality (AR) for Training and Maintenance, Omnichannel Integration for Seamless Shopping, and Cybersecurity Advancements for Data Protection Real-Time Inventory Visibility.

Overall, the results highlight competitiveness that is Enhanced Customer Experience Through Digital Tools, Cybersecurity Advancements for Data Protection, Cybersecurity Advancements for Data Protection.

Table 12
Technological based on the company's performance

Factors	I	II	III	IV	V	VI	VII	VIII	IX	X	Total	Rank
Robotic Process Automation	21 210	24 216	25 200	32 224	27 162	29 145	29 116	25 75	25 50	13 13	1411	III
Automated Storage and Retrieval Systems	25 250	24 216	21 168	26 182	30 180	23 115	24 96	27 81	18 36	32 32	1356	VIII

Drones for Inventory Management	25 250	26 234	22 176	21 147	25 150	32 160	21 84	27 81	27 54	24 24	1360	VII
Digital Twins for Warehouse Simulation	29 290	18 162	30 240	22 154	20 120	26 130	21 84	21 63	33 66	30 30	1339	IX
Predictive Analytics for Demand Forecasting	24 240	28 252	26 208	22 154	22 132	29 145	27 108	21 63	22 44	29 29	1375	V
Voice-Picking Technology	26 260	26 234	34 272	20 140	23 138	20 100	25 100	26 78	28 56	22 22	1400	IV
Automated Guided Vehicles	31 310	26 234	25 200	29 203	25 150	18 90	23 92	30 90	20 40	23 23	1432	I
Smart Shelving and Bin Systems	25 250	33 274	23 184	20 140	19 114	27 135	22 88	21 63	35 70	25 25	1366	VI
Energy Efficient Warehousing	23 230	25 255	10 80	26 182	29 174	22 110	26 104	33 99	24 48	32 32	1284	X
Integration of Cloud-Based Logistics Platforms	21 210	20 180	34 272	32 224	30 180	24 120	32 128	19 57	18 36	20 20	1427	II

- Interpretation: From the above analysis of the performance appraisal system the highest ranked factor is Robotic Process Automation, Automated Storage and Retrieval Systems, Drones for Inventory Management, Digital Twins for Warehouse Simulation, in the Predictive Analytics for Demand Forecasting, Voice-Picking Technology, Automated Guided Vehicles (AGVs), Smart Shelving and Bin Systems, Energy-Efficient Warehousing, and Integration of Cloud-Based Logistics Platforms.

Overall, the results highlight performance that **is** Automated Guided Vehicles (AGVs), Integration of Cloud-Based Logistics Platforms and Robotic Process Automation.

V. FINDINGS, SUGGESTIONS AND CONCLUSION

A. Findings

Simple Percentage Analysis

1) Majority 27.2% of the respondents from the age group of 36-45.
2) Majority 50.4% of the respondents were male.
3) Majority 28.4% of the respondents education qualification is graduation.
4) Majority 27.2% of the respondents were married.
5) Majority 34.4% of the respondents were Area of Residency.
6) Majority 39.6% of the respondents working years is 1 to 5 years.
7) Majority 39.6% of the respondents for Monthly Income.

B. Suggestions

1) Analyze how technological advancements impact operational efficiency in shipping and logistics.
2) Implement automation and AI-driven systems to optimize logistics processes and reduce delays.
3) Leverage data analytics to enhance decision-making and improve supply chain visibility.

4) Invest in IoT-enabled tracking systems for real-time shipment monitoring and improved security.
5) Encourage employees to adopt digital tools through continuous training and upskilling programs.
6) Align technological innovations with organizational goals to enhance overall productivity.
7) Regularly assess the impact of technology on logistics operations and implement necessary improvements.
8) Develop a secure and transparent block chain-based system to enhance trust and efficiency in logistics transactions.
9) Customize digital solutions to meet the specific needs of different logistics functions.
10) Monitor and evaluate the effectiveness of new technologies before and after implementation to measure efficiency gains.

C. Conclusions

The study concludes that technology plays a critical role in improving efficiency and driving innovation in shipping and logistics. The integration of advanced technologies such as automation, artificial intelligence, block chain, and IoT enhances operational effectiveness, reduces costs, and increases transparency. By adopting these innovations, companies can streamline supply chain processes, improve customer satisfaction, and maintain a competitive advantage. Continuous investment in digital transformation is essential for long-term sustainability and growth in the logistics industry.

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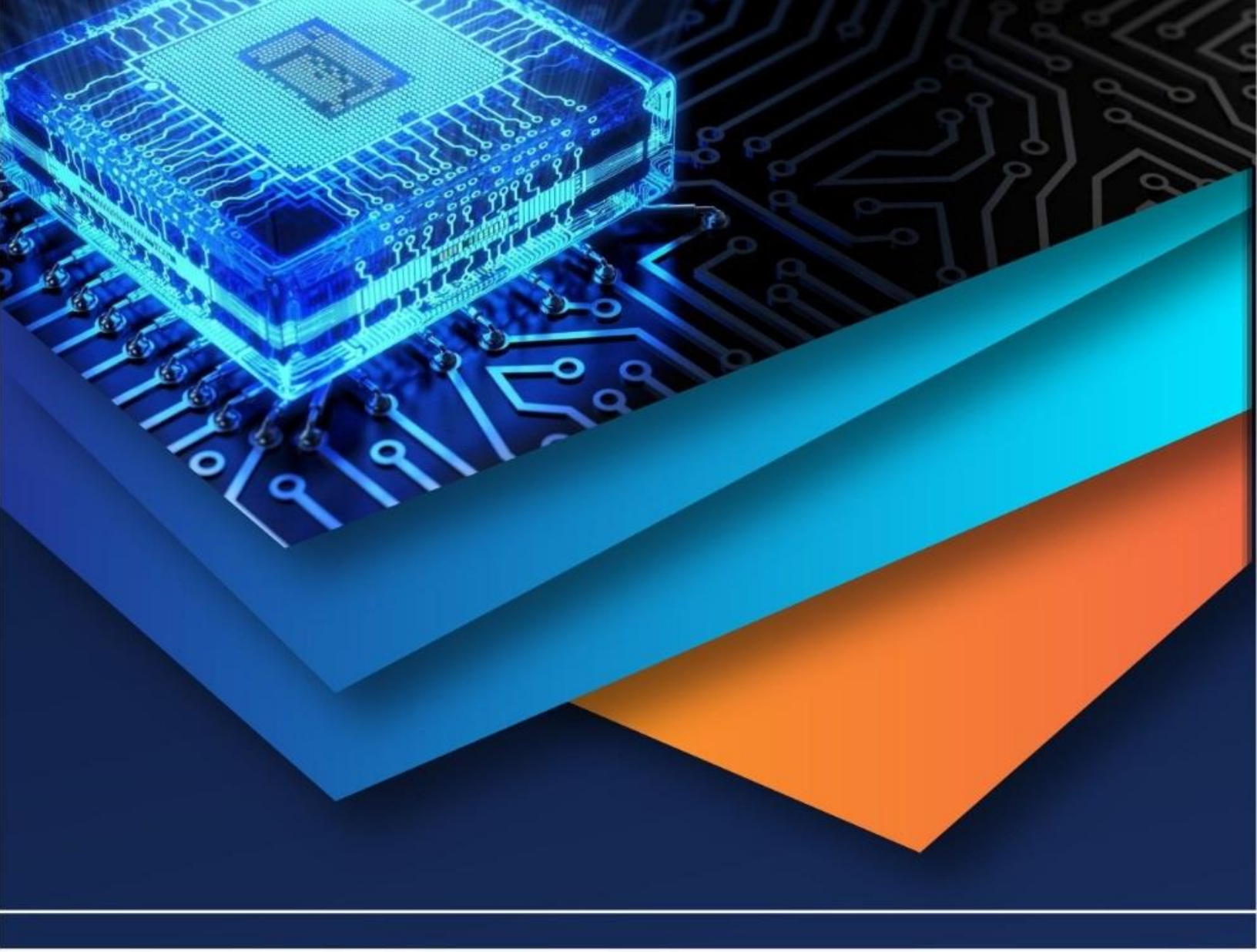

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