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STUDY ON LOGISTIC AND SUPPLY CHAIN WORKFLOW USING RFID AND BAR CODE DATABASE

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Abstract
This research aims to analyse the challenges and opportunities of implementing radio frequency identification (RFID) and barcode technologies in developing countries, evaluate their effectiveness in managing product recalls and returns, and develop a methodology for evaluating their return on investment (ROI). Through a comprehensive review of the literature and empirical analysis, this research will identify the obstacles faced by developing nations in adopting RFID and barcode technologies. It also proposes solutions to overcome them. The research will also assess how well these technologies handle product recalls and returns and develop a framework for evaluating the ROI of RFID and barcode technologies. The findings, suggestions and conclusion are drawn explicitly which are explained in detail.

Keywords: RFID, Barcode, Logistics, ROI, Supply chain management.

Introduction

Any organization needs logistics and supply chain management because they are essential to the timely and effective delivery of products and services. The adoption of radio-frequency identification (RFID) and barcode technologies has had a particularly substantial influence on logistics and supply chain management. Real-time tracking of items and inventory levels is made possible by RFID and barcode technology, which boosts the effectiveness of logistics and supply chain activities. This study aims to examine the difficulties and opportunities of implementing RFID and barcode technology in developing nations, assess how well they manage product recalls and returns, and create a framework for calculating the return on investment of RFID and barcode technology in these countries.

The pros and cons of using RFID and barcode technologies in underdeveloped nations are examined:

The lack of infrastructure and resources is one of the major obstacles to the adoption of RFID and barcode technologies in poor nations. Due to their limited resources, developing nations may not place the highest focus on investing in technology. Installing RFID and barcode technology may be expensive, so impoverished nations may not have the financial resources to do so. The use of RFID and barcode technologies may also be hampered by problems with power supply, internet connectivity, and availability of technical skills.

On the other hand, using RFID and barcode technologies in developing nations opens up many options. For instance, RFID and barcode technologies may enhance the visibility and traceability of the supply chain, which can improve inventory management and save waste. Moreover, supply chain collaboration and integration may be enhanced with the use of RFID and barcode technologies, which can result in decreased costs and better efficiency.

Assessing the use of RFID and barcode technology in the control of product returns and recalls:

Recalls and returns of products present a substantial difficulty for businesses and can negatively affect a company's brand reputation and financial success. Real-time product tracking made possible by RFID and bar code technologies can help organizations better handle product recalls and refunds.

An economical and effective method of data collection and management in the logistics and supply chain sector is provided by RFID and barcode technology. Whereas bar code technology employs a pattern of lines and spaces that may be scanned by a bar code reader to convey product information, RFID technology uses radio waves to connect with a reader to identify and track assets. Reduced mistakes, improved inventory management, greater supply chain visibility, and higher efficiency are just a few benefits of using RFID and bar code technology in logistics and supply chain operations.

Despite the many advantages of RFID and bar code technology, these technologies are still not widely used in poor nations due to many issues, such as a lack of infrastructure, a lack of funding, and a lack of technical ability. Thus, the goal of this study is to examine the difficulties and opportunities associated with integrating RFID and bar code technologies in developing nations.

Evaluating the efficiency of RFID and barcode technologies in handling product recalls and returns is another goal of this study. Recalls and returns of products may be expensive and time-consuming for businesses, resulting in lost sales and reputational harm. Faster and more precise product identification and tracking may be accomplished by businesses with the use of RFID and bar code technologies, resulting in streamlined recall procedures.

Lastly, this study attempts to create a methodology for evaluating the ROI of RFID and bar code technologies in supply chain and logistics operations.

Objectives of the study

1. To analyse the challenges and opportunities of implementing RFID and bar code technology in developing countries.
2. To evaluate the effectiveness of RFID and bar code technology in managing product recalls and returns.

Statement of the problem

This study examines how RFID and bar code technologies are used in logistics and supply chain processes, particularly in developing nations. The objectives include identifying the opportunities and challenges associated with the use of this technology, assessing how well it handles product recalls and returns, and developing a framework for evaluating the return on investment (ROI) of RFID and bar code technology in logistics and supply chain operations. The research will first look at the potential problems associated with using RFID and bar code technologies in developing nations to solve these issues. The usefulness of RFID and bar code technologies in handling product recalls and returns will also be examined. The project will also create a methodology for evaluating the return on investment (ROI) of RFID and bar code technologies in supply chain and logistics operations. The conclusions will aid businesses in making wise choices on whether to invest in RFID and bar code technologies.

SCOPE OF THE STUDY

This study's objectives include establishing a technique for calculating the return on investment (ROI) of RFID and bar code technology in logistics and supply chain operations, as well as looking into the benefits and drawbacks of adopting these technologies in developing countries.

The study will be focused on developing countries, which typically have unique challenges integrating RFID and barcode technology. These challenges include a lack of resources, infrastructure, and the necessary expertise and abilities. These concerns will be looked at in the research along with opportunities for the efficient use of technology in developing countries.

The investigation will also look at how well RFID and barcode systems handle product recalls and returns. This will include looking at how technology may help in identifying and monitoring defective products more quickly and efficiently, reducing the risk of brand damage, and saving money. The study will look at customer happiness and the efficiency of supply chain operations.

A methodology for assessing the ROI of RFID and bar code technology in supply chain and logistics operations will also be developed as part of the project. The framework will consider several factors, including

the cost of adoption, the benefits of the technology, and the impact on company performance. The study will examine the technology's return on investment.

The study will use a variety of quantitative and qualitative research methods, including surveys, interviews, and case studies, to collect data from companies that have included RFID and barcode technologies in their logistics and supply chain operations. The study will also review other studies on the topic to provide a comprehensive picture of the challenges and opportunities of integrating RFID and barcode technology in developing countries.

The study has a lot of limitations. Due to its sole focus on developing countries, it could not be generalizable to developed ones. The study may also be limited by how easily accessible and reliable the data acquired from businesses is. Finally, the research might not be able to capture the whole range of benefits since supply chain procedures are so complex and diverse.

NEEDS OF THE STUDY

This study aims to assess the prospects and difficulties of deploying RFID and bar code technologies in developing nations. It also seeks to assess how well RFID and bar code technology manage product returns and recalls. The research also intends to create a methodology for evaluating the return on investment (ROI) of RFID and bar code technologies in supply chain and logistics operations. This framework will take into account elements like the cost of implementation, the cost of operation, and the advantages obtained from the technology, and will assist organizations in determining the ROI of RFID and bar code technology.

THEORETICAL BACKGROUND

RFID TAG

RFID (radio frequency identification) is a form of wireless communication in which electromagnetic or electrostatic coupling in the radio frequency section of the electromagnetic spectrum is used to uniquely identify an object, animal, or human.

TAG

A tag is a piece of information that provides a description of the material or data to which it is applied. Non-hierarchical keywords known as tags are used for files, digital photos, movies, and other content such as Internet bookmarks. A tag itself carries no meaning or information.

RFID standards

Although there are many rules and requirements for RFID technology, the principal standards bodies are

- International Organization for Standardization (ISO)
- Electronics Product Code Global Incorporated (EPCglobal)
- International Electrotechnical Commission (IEC)

Next-generation RFID uses

RFID technologies are being utilized more often to facilitate the adoption of the Internet of things. The technology allows for the wireless transmission of sensor data, including temperature, movement, and position, using smart sensors and/or GPS technology.

DATABASE

A database is a structured collection of data arranged to make it easy to store, retrieve, and manipulate data. When data is arranged into tables, rows, and columns and stored in a database, it might be compared to a digital file system.

Large volumes of data, including customer information, proctologist algos, financial records, and more, are frequently stored and managed via databases, which are frequently utilized in computer programs and websites. Several contemporary technologies, like e-commerce, social media, and search engines, depend on them.

WORKFLOW

A workflow is a series of actions taken to accomplish a certain objective. It displays the stages in a process and the sequence in which they are carried out. Several various industries, including business, manufacturing, healthcare, and information technology, frequently employ workflows.

A typical workflow consists of numerous processes, including information collecting, data analysis, job completion, and decision-making. Workflows can be either branching or linear, where multiple pathways are chosen based on the results of earlier phases, where each step is performed sequentially.

LOGISTICS

The process of organizing, carrying out, and managing the transportation of products and services from one location to another is referred to as logistics. Making sure that goods are delivered at the proper location, at the proper time, and in the proper condition, entails the coordination of several activities including transportation, storage, packing, and distribution. To ensure the effectiveness of operations and cut costs, logistics is crucial in both commercial and military situations. Using cutting-edge technology, effective procedures, and qualified staff are all necessary for effective logistics management to maximize the flow of products and services across the supply chain.

SUPPLY CHAIN

A supply chain is a system of businesses, individuals, events, information, and assets used to transfer goods from a supplier to a customer. The manufacturing, sourcing, procurement, transportation, storage, and delivery of products and services are all included in the supply chain. To fulfil orders and meet demand, a complicated system with several layers of suppliers, manufacturers, distributors, retailers, and customers may be in place.

INVENTORY

Inventory is the term used to describe the items and supplies that a business has on hand to support its manufacturing or distribution operations. It contains unfinished items that are ready to be sold or delivered to clients, as well as raw materials and things that are still being produced. To guarantee that the correct items are available in the right amounts at the right time while reducing costs and preventing stockouts or overstocks, inventory management entails the planning, tracking, and control of inventory levels.
As it helps to balance the expenses of maintaining inventory against the advantages of having it accessible for sale, effective inventory management is essential to a business's profitability. Businesses can utilize various methods and tools, including forecasting, safety stock, just-in-time (JIT) inventory systems, and inventory optimization software, to increase their operational effectiveness, financial performance, and customer service while optimizing their inventory levels. By ensuring that supplies are accessible when required, effective inventory management may also assist in decreasing waste, enhancing cash flow, and raising customer satisfaction.

WAREHOUSES

A warehouse is a sizable commercial structure that is used to store materials and merchandise. Manufacturers, distributors, and retailers frequently utilize warehouses to hold goods before sending them to consumers. They may be owned and run by the businesses that employ them, or by outside logistics organizations that provide warehouse and delivery services.

Products of all sizes, from little ones like electronics or books to big, clunky ones like furniture or machinery, can be stored in warehouses. To maximize space utilization and facilitate product access and find, they may be fitted with specialized storage systems, such as pallet racking, shelving, or automated storage and retrieval systems.

BARCODE

The manufacturer is determined from the first six digits of the barcode. The next five numbers correspond to the item's number. The last character, sometimes referred to as a check digit, aids the scanner in determining if the barcode was correctly read.

USES OF BARCODE

Barcodes make it considerably quicker and simpler to check out products at a store and keep track of inventory in a warehouse by encoding product information into bars and alphanumeric letters. Bar codes' main commercial advantages are accuracy, inventory control, and cost savings in addition to simplicity and speed.

CHALLENGES OF BARCODE

Failed or incorrect readings can be brought on by misorientation, blockage from debris, mist, protrusions, and breakage. They must be viewed at line of sight, often at a distance of less than one metre. Scanners are expensive and fragile, which presents issues for people like New Zealand sheep ranchers.

STANDARDS OF BARCODE

A typical barcode, sometimes referred to as a linear barcode or a 1D (one-dimensional) barcode, is made up of parallel lines of various lengths of bars and gaps that each represent a different set of numbers or characters. This kind of barcode is frequently used in retail, logistics, and other industries for monitoring and identifying items.

The Universal Product Code (UPC), which consists of a 12-digit number encoded in a barcode, is the most well-known standard barcode symbology. The standard barcodes Code 39, Code 128, EAN-13, and Interleaved 2 of 5 are among the several that are often used.

A barcode reader or scanner is used to scan a standard barcode and turn the pattern of bars and spaces into a digital code that a computer can understand.

FUTURES OF BARCODE

2D (two-dimensional) barcodes are the next generation of barcodes, which can store much more data than standard 1D barcodes. They use a matrix of square or circular dots instead of bars and spaces and can encode text, images, and even small amounts of binary data.

Popular 2D barcode symbology's include QR codes, Data Matrix codes, and Aztec codes. These types of barcodes are commonly used in mobile marketing, product tracking, and document management. They can be scanned by mobile devices without the need for a separate barcode scanner and can be customized with colours, logos, and other visual elements.

2D barcodes represent a significant improvement over standard barcodes in terms of data capacity, versatility, and accessibility, and are likely to become increasingly prevalent in a wide range of industries and applications.

LITERATURE REVIEW

Flanagan, J. and McGovern, C. (2023) This study intends to look at the use of radio frequency identification (RFID) and perspectives on RFID in two of the top global logistics businesses and four supply network organisations. To comprehend the causes of operations improvement and related competitive advantage, an operations strategy was applied. However, it is difficult to assess the advantages of RFID for logistics processes due to the complexity of the operations strategy. By carefully putting the ideas of operations strategy into practice, we may assess how RFID is used in logistics processes.

Venkesh Agarwal,Sonali Ankolikar(2023) A seamless network of tasks and parties engaged in any business makes up the supply chain. It guarantees the efficient movement of commodities, services, and products. Supply chains have grown increasingly complicated in the contemporary global environment, and using technology has several advantages. For the identification, tracking, and supervision of the various items and assets across the supply chain, reliable technology is required. RFID sensors are one such new technology for this. RFID is a well-known wireless technology that can identify, track, and communicate by gathering, storing, and transferring data. Tags and readers are the two major elements of RFID systems, and each one serves a vital and distinct purpose. Tags serve as the reader's virtual memory, storing information. Readers access the information

Md. Abdul Kafi, Adam Bin Mohd Saifudin, Nizamuddin bin Zainuddin (2022)

Since the 1970s, supply chain management (SCM) science has recognised the barcode as its primary instrument. Recently, the emphasis on cost savings through the use of radio frequency identification (RFID) technology has increased across a wide range of businesses. The technical aspects of RFID and its effects on supply chains are discussed in this study. The document also emphasises the benefits of inventory management and control, which help businesses comprehend how RFID offers all-encompassing services with a budget-friendly strategy. So, future research in this field can use this study as a resource.

Konrad LEWCZUK, Teresa SIEDLECKA-WÓJCIKOWSKA, Aleksandra ZABIELSKA (2022) The article outlines the organisational and technological presumptions for the introduction of RFID in specific supply chain components, particularly in warehouses, transhipment, and terminal facilities. It has been suggested to quantify RFID technology. Based on this, the framework of a mathematical model was presented to assess certain RFID solution performance metrics in logistics facilities.

Casella, Giorgiaa et.al (2022) Compared to more conventional methods of automatic identification, such as barcodes or human data entry, radio frequency identification technology has several potential advantages. The technology accelerates the speed of identification, material, and information flow and plays a significant part in many logistical processes since it doesn't require human interaction, doesn't require human involvement, and updates information in real time.

Raza, S.A. (2022) The top 100 cited articles are then subjected to a multivariate analysis, and k-means clustering is used to select the best groupings and uncover research topics. The key topics are then identified by factor analysis. Findings Using BA methods, exploratory analysis is conducted to offer insights into elements like prominent authors, producing nations, most-cited articles, and common keywords. Understanding the groupings (communities) of research ideas was made more accessible by utilising co-citation network analysis and keyword co-occurrence analysis to visualise bibliographical data. We used k-means clustering and component analysis techniques to expand on these discoveries. Potential study ideas are also revealed by historiographical direct citation analysis. We note that the Internet of Things and blockchain will likely be advantageous for supply chain RFID applications.

Raza, S.A. (2022) Purpose The conclusions of this paper provide useful direction for future research in this field by shedding light on the main study areas of RFID in the supply chain. By doing an SLR of recent research works in the domain of RFID applications in supply chains, this study helps to close the gap. SLR enhanced with BA has not yet been applied to research supply chain RFID application
advances. Design/methodology/approach We use a systematic literature review (SLR) to examine 556 publications published between 2001 and the present. Tools for modern bibliometric analysis (BA) are used. An exploratory analysis is done first, showing important factors such as influential authors, sources, and areas. The conceptual framework is then understood using a co-citation work analysis.
the body of literature, then a dynamic co-citation network to show the field's development. The top 100 cited articles are then subjected to a multivariate analysis, and k-means clustering is used to select the best groupings and uncover research topics. The key topics are then identified by factor analysis. Findings Using BA methods, exploratory analysis is conducted to offer insights into elements like prominent authors, producing nations, most-cited articles, and common keywords. Understanding the groupings (communities) of research ideas was made more accessible by utilising co-citation network analysis and keyword co-occurrence analysis to visualise bibliographical data. We used k-means clustering and component analysis techniques to expand on these discoveries. Potential study ideas are also revealed by historiographical direct citation analysis. As we can see, RFID uses

Pawel Rymarczyk, et., al. (2021) The article's goal is to create a system that uses RFID technology to optimise supply chain logistics procedures. Design/Methodology/Approach: The problem was solved using machine learning techniques such as RUS, decision trees, random forests, and gradient boosting. Both specialised software and an RFID reader were created. Findings: The research's findings demonstrate that the techniques employed a project application based on RFID technology increase the company's logistical process efficiency. Relevant Applications: The supply chains of manufacturing and logistics firms can make use of the techniques and systems described in the article. Originality/Value: The new aspect of the system's design that uses RFID technology to optimise return logistics is the right selection and use of machine learning techniques.

Riste Temjanovski1and Zlatko (2020) Modern digital technology has a lot of potential for enhancing the visibility of goods and service flows in the logistics industry. For practically every organisation, managing and finding significant assets is surely a major task. Business operations are time-related, thus whether a profit or loss is made depends on how quickly specific tasks are completed. Missed deadlines and client obligations,

lost labour, and expensive delays or downtime can all result from time spent looking for essential equipment. Today, RFID asset management is a well-known method for locating and monitoring priceless items. Data is sent from an RFID tag to a reader via electromagnetic fields in an RFID asset tracking system.

Wei Wanhua (2020) Introduces the ideas of logistics distribution and RFID technology. It designed and researched a logistics distribution system with its overall plan, hardware, and software based on its characteristics. The system can recognise and track data throughout the whole acquisition and supply chain. It can offer precise information on product distribution to suppliers, manufacturers, retailers, and customers. It may significantly cut down on labour costs, streamline the logistics distribution process, and increase distribution efficiency.

Suvendu Naskar, Preetam Basu, Anup K. Sen (2020) The Internet of Things (IoT) envisions an ecosystem in which intelligent, networked items may interact with one another, perceive environmental changes, analyse data, and actively participate in decision-making. Manufacturing and logistics companies are primarily concerned with improving the performance of their supply chains. By enabling the first step towards an IoT-enabled future, Radio Frequency Identification (RFID) is assisting businesses in creating automated and linked smart environments. This chapter makes an effort to comprehend the material that has already been written about using RFID to deploy the Internet of Things in supply chain management. We divide up the existing literature into two categories: supply chain processes and research methods. We discover that there is currently little analytical and conceptual effort put towards conceptualising the usefulness of RFID in the Internet of Things.

Temjanovski, R. (2020) The visibility of products and service flows in the logistical sector may be improved with the use of current digital technologies. RFID asset management, which transmits data from an RFID tag to a reader via electromagnetic fields, is a well-known method for identifying and managing priceless assets. The term "radio frequency identification," or RFID, refers to a technique in which readers use radio waves to read digital data encoded in RFID tags or smart labels. Leading distribution businesses already make use of technology like radio frequency identification (RFID) and global positioning systems (GPS). Every firm must make use of the advantages provided by technological advancements in communications between gadgets, commodities, and vehicles that have considerably improved the quality of services.

Lam, C.Y., & Ip, A.W. (2019) The integrated supply chain management model provided in this research uses data from GPS and RFID to determine where items are located. Grouping, routing, and scheduling logistics tasks are automated and optimized by the model. There are suggested optimization strategies for routes and timetables that reduce resource usage and trip time. Instantaneous and dynamic information on the logistics jobs' current processing and location state is provided by data from RFID readers and GPS devices. So that centralized logistics planners may make any required adjustments, the optimum routes and timetables are then dynamically updated and shown. Hence, the suggested method integrates discrete and continuous data to support logistics routings and scheduling and improve supply chain management. Hence, the model may address the practical

Smith-Ditizio, A.A., & Smith, A.D. (2019) To manage supplier relationships and/or work together with suppliers to accomplish shared goals of operational efficiency and profitability, companies can employ RFID and barcode technologies. In a lean environment, managing more reliable and adaptive supply chains is vital and requires the use of RFID and other IT-intensive technology. As demonstrated in a case study of NE Ohio regionally headquartered firms' involvement of positive outcomes from the strategic use of automatic identification and tracking technologies, the areas that needed improvement were successfully implemented applications as well as technological advancements and development.

A.Lanko 1*, N. Vatin1 and A. Kaklauskas2 (2018) Nearly all spheres of human activity now rely on supply chain management. Implementing one also has significant economic advantages for building businesses. The essay examines the viability of using blockchain in the logistics of building materials by utilising RFID technology. An illustration of an introduction to the production and distribution of ready-mixed concrete is provided. The key benefits, drawbacks, views, and challenges associated with implementing blockchain

technology in the construction sector are outlined. Particular focus is placed on how these technologies might be applied.

Research methodology

This research examines the quality of workflow using RFID and bar code database. this study aims to understand how workflow using RFID and bar code database, as well as the hurdles they confront on their entrepreneurial path. This sample size is 146 and the data collected from the people who consume produced which has barcode and RFID. The research data collection is being conducted in states namely Karnataka and Tamil Nadu The structured questionnaire technique was used to collect the data. The scale used in the questionnaire is Likert's five-point scale (strongly agree, agree, neutral, disagree, and strongly disagree). The questionnaire has 16 questions in total which was analysed and relevant findings, suggestions and conclusion are drawn. The chi square method was used to analyse the data and determine whether the hypotheses are accepted or rejected. The detailed findings were analysed.

Data analysis and Interpretation

The data analysis and interpretation Chi-square test and percentage analysis method is adopted and the details are as follows

Formula for Chi-Square Test is given below:

$$\chi^2 = \sum (O_i - E_i)^2/E_i$$

Were,

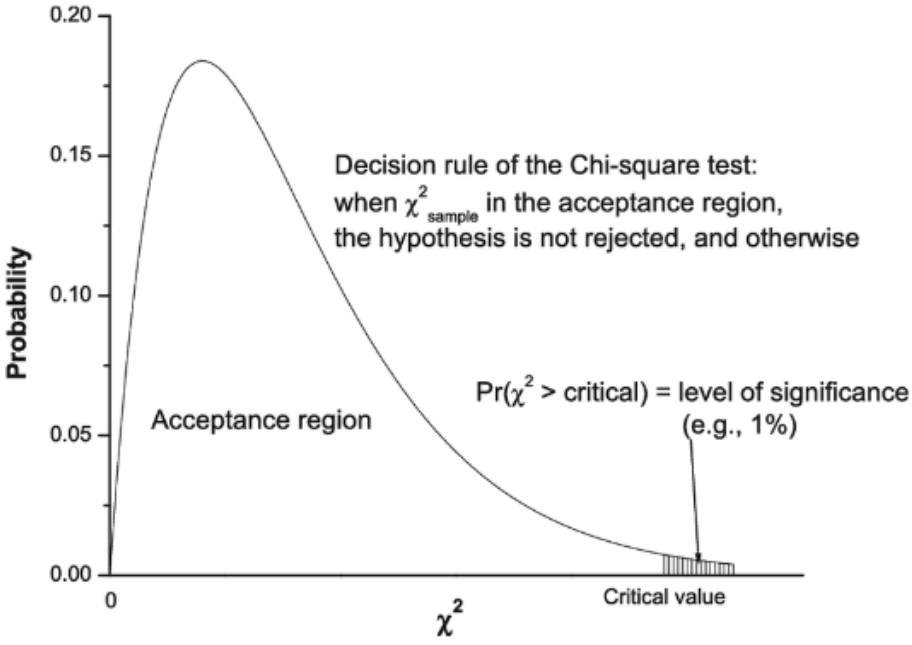
C= Degrees of freedom

O= Observed Value

E = Expected Value

The number of variables that can change in a computation is represented by the degrees of freedom in a statistical calculation. It is possible to determine the degrees of freedom to make sure chi-square tests are statistically reliable. Typically, these tests are used to compare the observed data to the data that would be expected if a particular hypothesis were true. The values acquired are known as the observed values. The frequencies predicted by the null hypothesis are the anticipated values. (5% level of significance is taken into account.)

Diagram of chi-square



Data collected from the population

Objective 1	Objective 2
580	556
596	568
572	538
564	562
554	562
562	570
556	564
548	550

Hypothesis statement

H0: There is no relation between challenges & implementation of it functions and effectiveness in the RFID and Barcode technologies.

H1: There is a relation between challenges & implementation of it functions and effectiveness in the RFID and Barcode technologies.

In hypothesis testing there are two mutually exclusive hypotheses, H0-Null Hypothesis; H1- Alternative Hypothesis. P denotes the probability; hence for the calculation of p-values, the Chi- Square test comes into the picture. The different p-values indicate different types of hypothesis interpretations.

1. P<=0.05 (Hypothesis interpretations are rejected)
2. P>=0.05 (Hypothesis interpretations are accepted) We have chosen significance level as = 0.05.

CHI-SQUARE TEST		
Objective 1	**Objective 2**	**Total**
580	556	1136
596	568	1164
572	538	1110
564	562	1126
554	562	1116
562	570	1132
556	564	1120
548	550	1098
4532	4470	9002

Calculation of $(Oi-Ei)^2/Ei$

Values are calculated based on the data collected. Here the Oi value will be the observed value of challenges and time management of women entrepreneur.

Ei value calculation:

Ei= (Row Total* Column Total)/ Grand Total

CALCULATION OF CHI-SQUARE VALUE				
Oi	**Ei**	**Oi-Ei**	**$(Oi-Ei)^2$**	**$(Oi-Ei)^2/Ei$**
580	571.91202	-8.08798	65.41543	0.1143802
556	564.08798	8.08798	65.41543	0.1159667
596	586.008443	-9.99156	99.83122	0.170358
568	577.991557	9.991557	99.83122	0.1727209
572	558.822484	-13.1775	173.6469	0.3107372
538	551.177516	13.17752	173.6469	0.3150472
564	566.877583	2.877583	8.280483	0.0146072
562	559.122417	-2.87758	8.280483	0.0148098
554	561.843146	7.843146	61.51494	0.1094877
562	554.156854	-7.84315	61.51494	0.1110064
562	569.898245	7.898245	62.38227	0.1094621
570	562.101755	-7.89824	62.38227	0.1109804
556	563.856921	7.856921	61.7312	0.1094803
564	556.143079	-7.85692	61.7312	0.1109988
548	552.78116	4.78116	22.85949	0.0413536
550	545.21884	-4.78116	22.85949	0.0419272
Total				**1.9733236**

Ei value for 580= (1136*4532)/9002=571.912
Ei value for 556= (1136*4470)/9002=564.087

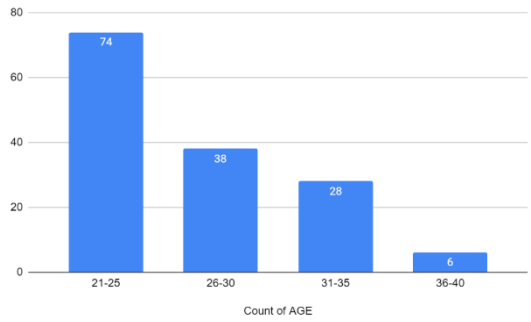
$$\chi^2 = \sum_i \frac{(O_i - E_i)^2}{E_i}$$

X^2=1.97332
Degree of freedom
(r-1) (c-1) =7
From the chi-square distribution table value, for an alpha level of 0.05 and seven degrees of freedom, the critical statistic is 14.07.
H0 is accepted. (14.07 > 1.97332)
As per the study conducted with help of data collection, there is no relation between challenges & implementation of its functions and effectiveness in the RFID and Barcode technologies.

Age	Count
21-25	74
26-30	38
31-35	26
36-40	6

AGE

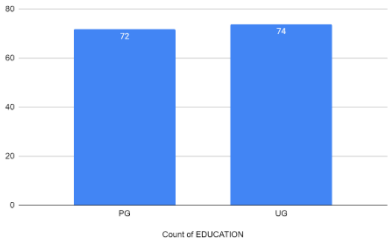
Above 40	0
Total	146



INTERPRETATION: As per the data collected the maximum population lies under the age category of 21-25

QULIFICATION

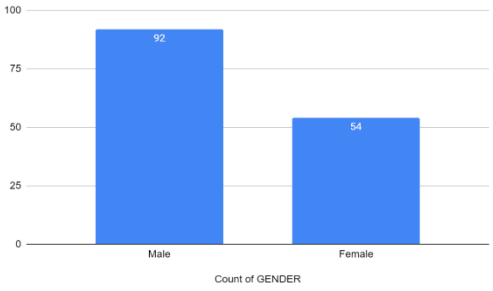
Qualification	count
UG	74
PG	72
Total	146



INTERPRETATION: As per the data collected the maximum population lies under the education category UG

Gender

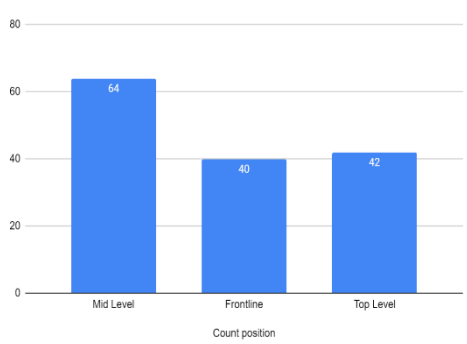
Gender	Count
Male	92
Female	54
Total	146



INTERPRETATION: As per the data collected the maximum population lies under the gender category male

DESIGNIATION

Designation	Count
Mid-Level	64
frontline	40
Top level	42
Total	146



INTERPRETATION: As per the data collected the maximum population lies under the position category mid-level

Recommendation

The fields of logistics and supply chain management have seen an increase in the usage of Radio Frequency Identification (RFID) and barcode technologies. By enabling businesses to track and manage inventory more, these technologies have the potential to increase the efficiency of supply chain operations greatly. There are a variety of possibilities and obstacles involved with applying these technologies in various situations, and underdeveloped nations are still rather slow to adopt RFID and barcode technology.

The primary goal of the proposed study is to examine the potential and problems associated with integrating RFID and barcode technologies in underdeveloped nations. When it comes to deploying new technologies, developing nations confront various difficulties, such as poor infrastructure, a shortage of qualified workers, and low levels of consumer and commercial technology acceptance. Thus, it's crucial to comprehend the particular difficulties these nations have deploying RFID and bar code technologies and to develop solutions.

The planned research's second goal is to assess how well RFID and barcode technologies handle product returns and recalls. For many businesses, managing product returns and recalls is a substantial problem that can be expensive and time-consuming. By enabling businesses to identify impacted items, follow their movement through the supply chain, and take necessary action to remove them from the market, RFID and bar code technology have the potential to expedite the recall and return process rapidly and precisely. Thus, it's crucial to assess how well these technologies manage recalls and returns and to determine the best methods for applying them in this situation.

Creating a methodology for evaluating the Return on Investment (ROI) of RFID and bar code technologies in logistics and supply chain operations is the third goal of the proposed research. Although barcode and RFID technology have the potential to cut costs and increase supply chain efficiency, there may be a large investment needed to put them into use. Thus, it's crucial to create a framework for evaluating the ROI of these technologies and to pinpoint the crucial elements that influence both their efficiency and ROI.

In conclusion, the proposed study intends to explore some of the major potential and problems related to the use of RFID and barcode technologies in developing nations. This study will offer useful insights into the potential advantages of RFID and barcode technology for logistics and supply chain operations in developing nations by examining how well these technologies manage product recalls and returns and providing a methodology for evaluating their ROI.

CONCLUSION

The logistics and supply chain sector are essential to the world economy because it makes sure that goods are delivered to clients effectively and efficiently. Technology developments are essential for simplifying operations and enhancing efficiency as the sector continues to develop. The usage of RFID and barcode databases is one such technology that has completely transformed the logistics and supply chain sector.

The goal of this study is to examine the potential and problems associated with using RFID and barcode technologies in underdeveloped nations. Inefficient customs processes, poor transportation, and limited infrastructure are just a few of the particular difficulties that developing nations frequently encounter while operating their logistics and supply chains. These obstacles make it difficult to put new technologies into practice, and as a result, developing nations may fall behind in their supply chain and logistics management. The purpose of this study is to identify obstacles to the use of RFID and barcode technologies in developing nations and to offer solutions.

This study examines the challenges and evaluates how RFID and barcode technology to handle product recalls and refunds. Being able to manage product recalls and returns is crucial in the logistics and supply chain industry. With the use of RFID and bar code technologies, firms may identify product flaws more quickly and accurately, reducing the risk of customer injury. The precision of inventory management may be improved by using RFID and bar code technology, and the likelihood of overstocking or understocking merchandise may be decreased.

This research looks at the challenges as well as how successfully RFID and barcode technology handle returns and product recalls. It's essential to be able to manage product recalls and returns in the logistics and supply chain industry. To reduce the risk of customer injury, firms may act swiftly by using RFID and bar code technologies to boost the speed and accuracy of product defect identification. Moreover, using RFID and bar code technology may improve inventory management precision and reduce the likelihood of overstocking or understocking merchandise.

In conclusion, it is essential to understand the potential and constraints of applying this technology in developing nations by understanding the workflow of logistics and supply chains employing RFID and barcode databases. The study of RFID and barcode technology's performance in handling product recalls and returns can also shed light on the advantages of using this technology. Lastly, to make wise judgments about technology investments, a methodology for evaluating the return on investment (ROI) of RFID and bar code technologies in logistics and supply chain operations must be developed. The results of this study can help organizations, decision-makers, and researchers improve the productivity and effectiveness of the logistics and supply chain sector.

REFERENCE

1. A.Lanko 1*, N. Vatin1 and A. Kaklauskas2 (2018) Application of RFID combined with blockchain technology in logistics of construction materials MATEC Web of Conferences 170, 03032
2. Casella, Giorgiaa | Filippelli, Serenab | Bigliardi, Barbara | Bottani, Eleonor (2022)Radiofrequency identification technology in logistics, A review of the literature International Journal of RF Technologies, vol. 12, no. 2, pp. 69-86, 2022, DOI: 10.3233/RFT-220321.
3. Flanagan, J. and McGovern, C. (2023), "A qualitative study of improving the operations strategy of logistics using radio frequency identification", Journal of Global Operations and Strategic Sourcing, Vol. 16 No. 1, pp. 47-68. https://doi.org/10.1108/JGOSS-04-2021-0030
4. Konrad Lewczuk, Teresa Siedlecka-Wójcikowska, Aleksandra Zabielska (2022) Selected Aspects Of Modelling Rfid Systems In Supply Chains Warsaw University of Technology (Politechnika Warszawska), DOI: 10.2478/jok-2022-0016
5. Lam, C.Y., & Ip, A.W. (2019). An Integrated Logistics Routing and Scheduling Network Model with RFID-GPS Data for Supply Chain Management. Wireless Personal Communications, 105, 803-817.
6. Md. Abdul Kafi, Adam Bin Mohd Saifudin, Nizamuddin bin Zainuddin (2022) 2022 International Conference on Intelligent Technology, System and Service for Internet of Everything (ITSS-IoE) DOI: 10.1109/ITSS-IoE56359.2022.9990933
7. Pawel Rymarczyk, Arkadiusz Malek, Ryszard Nowak, Jacek Dziwulski (2021) Optimization of Logistics Processes of the Supply Chain Using RFID Technology European Research Studies Journal, Volume XXIV, Special Issue 2, 637-647, 2021 DOI: 10.35808/ersj/2292

8. Published under licence by IOP Publishing Ltd Journal of Physics: Conference Series, Volume 1544, 2020 5th International Conference on Intelligent Computing and Signal Processing (ICSP) 2020 20-22 March 2020, Suzhou, China Citation Wei Wanhua 2020 J. Phys.: Conf. Ser. 1544 012193 DOI 10.1088/1742-6596/1544/1/012193
9. Raza, S.A. (2022), "A systematic literature review of RFID in supply chain management", Journal of Enterprise Information Management, Vol. 35 No. 2, pp. 617-649. https://doi.org/10.1108/JEIM-08-2020-03228277-8301.
10. Riste Temjanovski1and Zlatko (2020) How IT can add value to the logistic sector: Bar code systems and RFID (radio frequency identification) in logistics services Bezovski11Faculty of Economics, “Goce Delcev” University, Stip, Republic of North Macedonia2Faculty of Economics, “Goce Delcev” University, Stip, Republic of North Macedonia
11. Smith-Ditizio, A.A., & Smith, A.D. (2019). Using RFID and Barcode Technologies to Improve Operations Efficiency Within the Supply Chain. Advanced Methodologies and Technologies in Business Operations and Management.
12. Suvendu Naskar, Preetam Basu, Anup K. Sen (2020) A Literature Review of the Emerging Field of IoT Using RFID and Its Applications in Supply Chain Management DOI:10.4018/978-1-5225-2104-4.ch001
13. Temjanovski, R. (2020). How IT can add value to the logistics sector: Bar code systems and RFID (radio frequency identification) in logistics services. Journal of Economics.
14. Venkesh Agarwal, Sonali Ankolikar(2023) Deployment of RFID sensors in supply chain management – a review 2023 13th International Conference on Cloud Computing, Data Science & Engineering (Confluence) https://doi.org/10.21595/jmai.2022.22565
15. Wei Wanhua1(2020) Design and Research of Logistics Distribution System Based on RFID