European International University, EIU-Paris

Doctoral Thesis

Title:

STRATEGIES TO ENHANCE OPERATIONAL EFFICIENCY OF MICRO, SMALL AND MEDIUM ENTERPRISES (MSME) IN GENERIC PHARMA INDUSTRY ACROSS SOUTH INDIA

Submitted by:

GIRISH KAPUR

EIU2020568

In Partial Fulfillment of the Requirements for the Degree of

Doctor of Management (D. Man) in Operations Management

Supervisor:

Dr. Sudeep Chinnabathini,Ph.D

Date:

2nd September,2024

CANDIDATE'S DECLARATION

I hereby declare that the work in this thesis entitled, "***Strategies to Enhance Operational Efficiency of Micro, Small and Medium Enterprises (MSME) in Generic Pharma Industry Across South India***" has been undertaken and completed by me for the award of the degree of Doctor of Management (D.Man) with European International University, under the guidance of Dr. Sudeep Chinnabathini, Ph.D , Associate Professor and Principal, Megha and Omega Group of Institutions,Hyderabad,

I also declare that this thesis is an original work and has not been submitted for any degree or diploma in any other university or institution. Further, I declare that the texts, figures, tables, and any other material taken from other sources have been acknowledged, referred, and cited to the best of my knowledge and understanding.

Signature :

Name : Girish Kapur

Student ID : EIU2020568

(Research Scholar, European International University)

Date : 2nd September, 2024

Place : Hyderabad

CERTIFICATE OF ORIGINALITY

This is to certify that the thesis titled, "***Strategies to Enhance Operational Efficiency of Micro, Small and Medium Enterprises (MSME) in Generic Pharma Industry Across South India***" is a bonafide research work conducted by Mr. Girish Kapur in partial fulfillment of the requirements for the award of the Doctor of Management (D.Man) degree from the European International University (EIU-Paris). This research was carried out under my supervision and guidance.

The thesis represents an original work undertaken in accordance with the academic regulations of the European International University (EIU-Paris).The content of this thesis reflects the independent research efforts of the candidate. This thesis has not been submitted for the award of any degree, diploma, or other qualification at any other university.

Signature of Supervisor

Dr. Sudeep Chinnabathini, Ph.D
Associate Professor and Principal,
Megha and Omega Group of Institutions,
Habsiguda, Hyderabad,
Telangana-500007, INDIA

Date : 02.09.2024
Place : Hyderabad

UNIVERSITY APPROVAL

This dissertation titled, "***Strategies to Enhance Operational Efficiency of Micro, Small and Medium Enterprises (MSME) in Generic Pharma Industry Across South India***," has been examined and approved by the European International University (EIU-Paris) for the award of the Doctor of Management (D. Man) degree.

Signature: _____

Name : Ky. Col. Prof. Dr. Edward Roy Krishnan

Position : Founder & Director General

European International University, Paris, France

Date: 8 October 2024

University Seal:

STRATEGIES TO ENHANCE OPERATIONAL EFFICIENCY OF MICRO, SMALL AND MEDIUM ENTERPRISES (MSME) IN GENERIC PHARMA INDUSTRY ACROSS SOUTH INDIA

Acknowledgement

First and foremost, from the bottom of my heart, I express my deep gratitude and sincere thanks to my supervisor, Dr. Sudeep Chinnabathini, Ph.D., for keeping me motivated and helping me navigate this journey from start to finish with a positive mindset. He will always remain a guiding light and a role model to look up to. His unwavering commitment and wholehearted support made this research possible.

Mr. Ananth Arumugam deserves major applause for partnering with the university and acting as a key interface to clarify doubts throughout the entire duration of the doctoral program. His ability to manage multiple stakeholders in a timely and seamless manner was invaluable.

I would like to thank all the participating companies for their candid responses to the survey.

I dealt with the loss of my beloved father while I was halfway through the research, but "GOD" helped me to be resilient and move ahead with the thought, "Keep going, do not lose hope." I thank the "Almighty" for always imparting inner strength during tough times.

Family gives an individual more strength than anyone else, and I want to thank my spouse Pooja and my son Gauransh for bearing with my whims and fancies while I was engaged in the research along with my job duties for over three years. They have been my solid pillars of support and strength. I have promised to make up for the countless weekends over the last several months where I could not spend time with them..

Table of Contents

Chapter I. Introduction…… 5

1.1 Background of the Study……...8

1.2 Research Objectives, Research Question and Hypothesis……. 13

Chapter II. Literature Review……...14

Chapter III. Research Design…….....26

3.1 Description of Participants of the Study…….....27

3.2 Data Collection -Tools and Materials and Treatment ……..…….. 28

3.3 Data Treatment..…….……..30

3.4 Limitations of the study……...31

3.5 Tabular Description of Research Design…….32

Chapter IV. Data Analysis & Presentation of Results & Findings…….34

4.1 Data Analysis, Report and Results …….35

4.2 Overall Findings-Hypothesis…..…….....94

Chapter V. Conclusion, Implications, and Recommendations for Improvement and Future Research……..95

5.1 People……..……..……..96

5.2 Process……..…...97

5.3 Technology……..98

5.4 Infrastructure……..….98

5.5 Funding ……...99

5.6 Overall recommendations for improvement and Conclusion…….…….....99

5.7 Recommendation for further studies…… 101

VI. References……102

VII. Appendices…… .120

7.1 List of Figures, Tables and Charts……... 121

7.2 Main Study questionnaire……..122

7.3 Pilot Study(Brief Report)……...129

7.4 Table for Sample Size Selection……134

Abstract of dissertation entitled

Strategies to enhance Operational Efficiency of Micro, Small and Medium Enterprises (MSME) in generic pharma industry across South India

Submitted by

Girish Kapur

for the degree of Doctor of Management (D. Man.)

European International University (EIU),Paris,Year-2024

The Micro, Small and Medium Enterprises (MSME) sector has emerged as a strong and dynamic segment of the Indian economy. The objective of this study was to evaluate factors like People, Process, Technology, Infrastructure and Funding which impact the Operational Efficiency of MSMEs.In addition, the research focused on exploring and evaluating the enabling environment for recommendation of appropriate strategies to enhance the operational efficiency of MSMEs in the generic pharma industry. The scope of this study spanned across five states of South India-Andhra Pradesh, Telangana, Karnataka, Tamil Nadu and Kerala which had different success levels in pharmaceutical manufacturing. The results of the research have pointed towards greater emphasis in building qualified and trained workforce, urgent need of technology adoption by means of moving from manual to online systems, overhaul of inventory management, product testing, storage and distribution and MSME tax policy restructuring along with seamless approval for funding.

Keywords:*MSME,Operational Efficiency, People, Process, Technology, Infrastructure and Funding*

Total Word Count : 25,013

CHAPTER I.
INTRODUCTION

INTRODUCTION

The Micro, Small and Medium Enterprises (MSME) sector has emerged as a strong and dynamic segment of the Indian economy. MSMEs play an important role in providing more employment opportunities at lower cost than large enterprises and supports the growth of the country's economy as a crucial pivot.

Micro, Small and Medium Enterprises

The Micro, Small and Medium Enterprises Development (MSMED) Act 2006(Chapter 7) forms the basis for micro, small and facility investment and machinery investments by manufacturers and equipment investments by service sectors. In February 2018,the Ministry of Finance agreed to change the classification system for micro, small and medium-sized enterprises from "plant and machinery/equipment investment" to "annual changes". The purpose of the changes is to facilitate the ease of doing business and to write rules that will enable the category to grow. A micro enterprise refers to a manufacturing firm where the investment in plant and machinery or equipment does not exceed one crore rupees, and turnover does not exceed five crore rupees. A small enterprise is one with an investment not exceeding ten crore rupees and turnover not exceeding fifty crore rupees. A medium enterprise is defined by an investment in plant and machinery or equipment within fifty crore rupees and a turnover within two hundred and fifty crore rupees.

Contribution of MSMEs to Indian Economy

As per the 73rd round of National Sample Survey (NSS) 2015-16, there were 63.388 million unincorporated non-agricultural MSMEs in the country. These activities (business start-ups 19,665,000 companies, non-closed electronic products and transmission business 3,000 businesses, commercial businesses 23,035,000 businesses, other business services 206,850 businesses) fall under the Factories Act 2m (ii 8 and 2m) (a) Section 2m(i), excluding activities under (b) the Companies Act, 1956, and (c) construction activities under Part F of the National Industrial Classification (NIC), 2008. Small and medium enterprises were registered for employing over 110.989 million people. The contribution of small and medium enterprises to India's gross value added (GVA) and global gross domestic product was 31.83% and 28.90%, respectively, in 2016-17. The MSME sector has the potential to support economic growth across the country and can be an important partner in the growth process.

Job creation/employment in the MSME sector included various projects and programs of the Government of India. Many large organizations have launched initiatives to create career

opportunities in their industries. The Ministry of Micro, Small, and Medium Enterprises collaborates with relevant ministries, state governments, and other departments to create a positive environment by promoting the growth of highways and the development of industries such as cottage, rural, and coconut industries within the MSME sector. They provide support to existing businesses and create new ones.

Table 1: Estimated Employment in MSME Sector (Broad Activity Category Wise)

Broad Activity Category	**Employment (in lakh)**			**Share (%)**
	Rural	**Urban**	**Total**	
Manufacturing	186.56	173.86	360.41	32
Trade	160.64	226.54	387.18	35
Other Services	150.53	211.69	362.22	33
Electricity*	0.06	0.02	0.07	0
Total	**497.78**	**612.10**	**1109.89**	**100**

*Non-captive electricity generation and transmission

Source:-Annual Report (2018-19) of the Ministry of Micro, Small and Medium Enterprises.

Pharmaceutical Industry

The Indian pharmaceutical industry is booming, with over 16,000 licenses, largely supported by India's patent law, which recognizes only process patents. Although India has developed a strong base and infrastructure for pharmaceutical manufacturing, as evidenced by the growth in API and formulation, the country is not very keen on spending on research and development (R&D). India's R&D spending is still less than 3% of the economy.

The Indian pharmaceutical industry has been growing at a healthy rate of 16.7% annually over the last decade. India can meet more than 70% of its pharmaceutical supply and 95% of its planning needs. Business in India operates in a competitive environment, which has attracted high foreign investment. Many multinational companies (MNCs) have manufacturing facilities in India, benefiting from low labor costs and a large domestic market. The Planning Commission expects the economy to grow at 12% annually.

The country's pharmaceutical exports have increased rapidly, from Rs. 2256.6 crores in 1994-95 to Rs. 3177.7 crores in 1995-96, and to Rs. 4090.3 crores in 1996-97, registering an impressive annual growth rate of 34.4%, reaching around 8 billion USD currently. More than 500 manufacturing facilities in India are USFDA approved, which is considered the strictest in the industry. Many companies have also upgraded their facilities to meet internationally recognized standards such as GMP requirements and ISO 9002 certifications.

1.1 BACKGROUND OF THE STUDY

The five southern states of Andhra Pradesh (AP), Telangana, Karnataka, Tamil Nadu, and Kerala in India have achieved varying levels of success in pharma manufacturing despite their proximity. Karnataka is a major player in biologics, and the small state of Telangana has an outsized manufacturing industry, while Kerala and Tamil Nadu lag behind. Karnataka has one of the fastest-growing pharmaceutical sectors in India, with approximately 40% of the state's pharma production exported overseas. The state's success, particularly in Bangalore, is largely driven by its biologics production. Telangana, though geographically small, has a significant pharma industry with ties to US and European companies. In contrast, Kerala, a much larger state, has a poorly represented pharma industry, partly due to its left-wing government failing to attract businesses. Tamil Nadu has a solid pharma industry but is not as attractive to international and innovative pharma companies as Karnataka.

The pharmaceutical manufacturing industries in the southern Indian states of AP, Telangana, Karnataka, Tamil Nadu, and Kerala have significant merger and acquisition (M&A) potential, given that most pharma facilities belong to companies with a single site in the region. Well-known pharma companies operate in Karnataka, supported by several R&D centers, pharma industrial zones, and exclusive pharma Special Economic Zones (SEZ) to incentivize international investment. An SEZ is an area with specific tax and trade laws to encourage the establishment of certain industries. In March 2020, the country announced a mega pharma park in Raichur, Karnataka, along with five others across India.

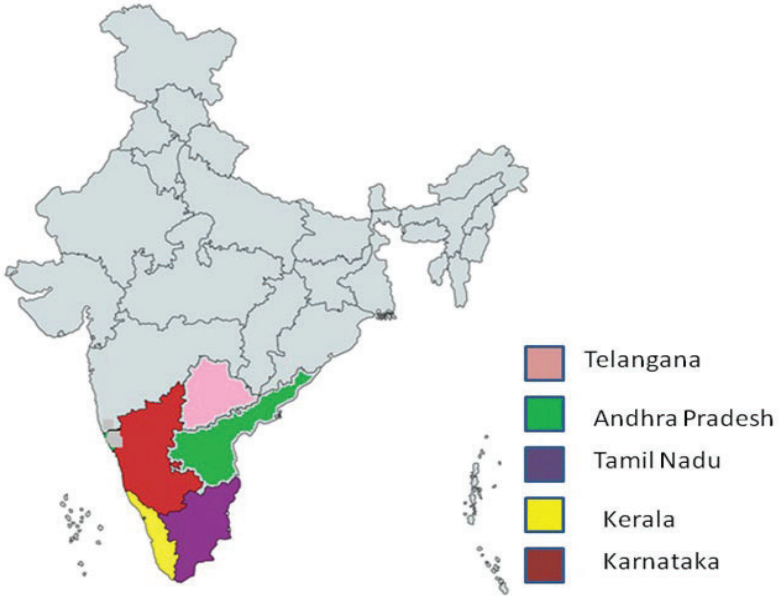
A large proportion of biotech and international pharma companies in India are located in or around Bangalore in Karnataka, known as the "Silicon Valley of India." Most sites in the five southern states offer small molecule manufacture; however, API biologics (protein and peptide) manufacture for the US and EU is also available at five facilities in Karnataka (clustered around Bangalore) and one facility in Telangana. Companies such as Biocon Ltd

(Karnataka), Cipla Ltd (Telangana), Syngene International Ltd (Karnataka), Stelis Biopharma Pvt Ltd (Karnataka), and Kemwell Biopharma Pvt Ltd (Karnataka) are involved in biologic API manufacture. All these companies are Indian-owned, except for Kemwell Biopharma, which was acquired by Recipharm AB (Stockholm, Sweden) in 2016. Karnataka's emerging pharma powerhouse includes international pharma companies such as Mylan NV (Hertfordshire, UK) and Adcock Ingram Holdings Ltd (Gauteng, South Africa) operating excess capacity contract sites.

Comparing states' pharma manufacturing activity in India

Karnataka houses the largest number of FDA- and/or European Medicines Agency (EMA)-approved manufacturing facilities, followed by Tamil Nadu and Telangana. Andhra Pradesh and Kerala have fewer approved locations. Sangrose Laboratories Pvt Ltd in Kerala is the only FDA-approved facility in the state. Telangana, though small, has a more developed pharmaceutical industry compared to the larger southern states due to its close ties with US and European companies. In comparison, Kerala is larger but lacks a strong pharmaceutical industry due to poor marketing by the state government. These five states have fewer facilities than Andhra Pradesh and Telangana (E/MOR, September 2019), which together have a total of 248 FDA and/or EMA-approved facilities.

Figure 1: Map of Telangana, Andhra Pradesh, Karnataka, Tamil Nadu and Kerala.



Credit: Global Data Contract Service Provider Database (Date accessed: 10 September 2020).

Major pharmaceutical companies such as Sun Pharmaceutical Industries Ltd (Telangana, India) and Mylan NV have manufacturing facilities in Tamil Nadu.

Figure 2:FDA- and/or EMA-Approved Pharma Manufacturing Facilities in Karnataka, Tamil Nadu, Andhra Pradesh, Telangana and Kerala, India.

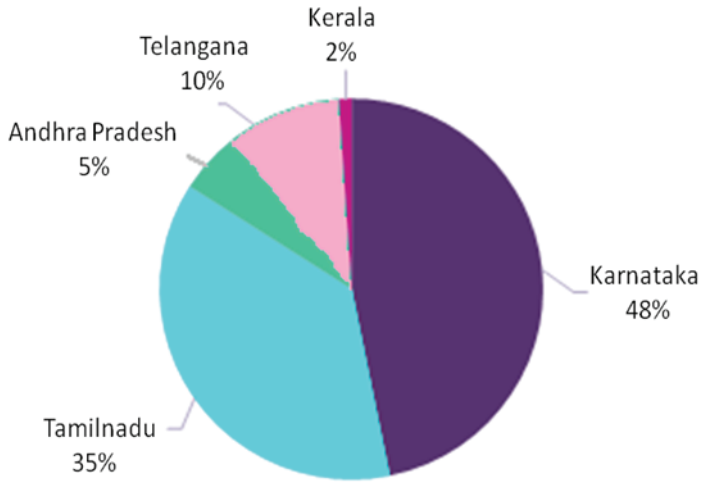
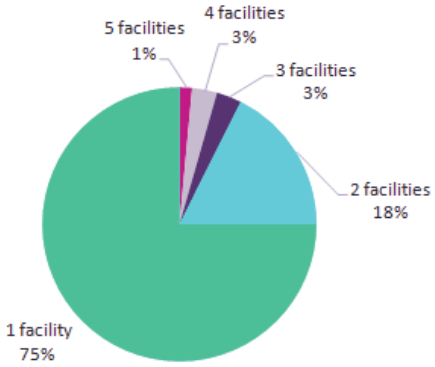


Image source: Global Data Contract Service Provider Database (accessed September 10, 2020).

Figure 3: FDA- and/or EMA-Approved Pharmaceutical Facilities per Company in AP, Telangana, Karnataka, Tamil Nadu and Kerala.



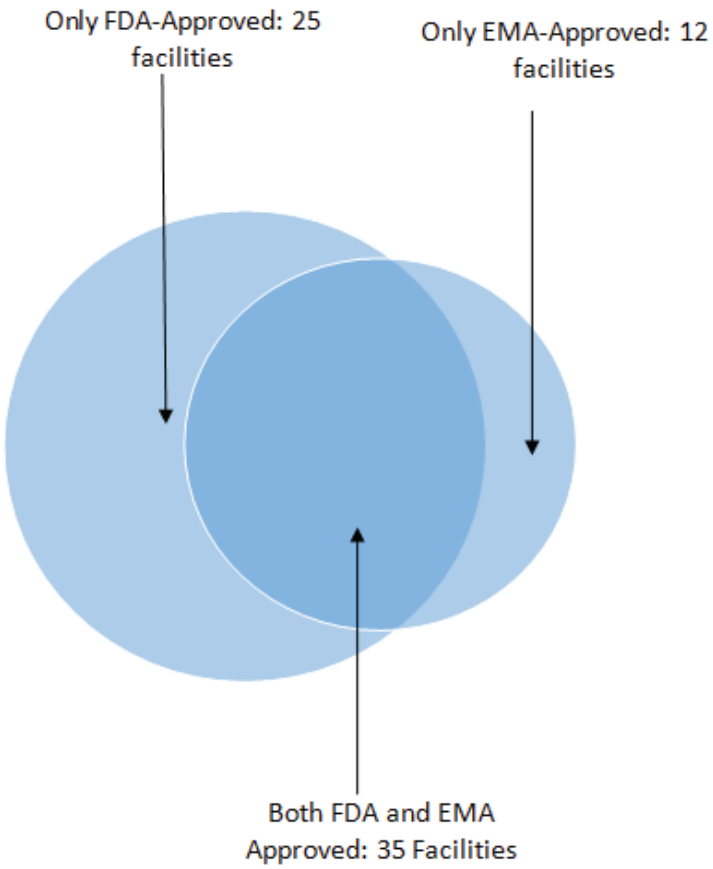
Credit: Global Data Contract Service Provider Database (Date accessed: 10 September 2020).

Most of the locations in these five southern states (75%) belonged to companies with regional locations, indicating significant merger and acquisition (M&A) potential in the Indian market. Three companies had four or more locations: Micro Labs Ltd (Karnataka, India), Solara Active Pharma Sciences Ltd (Telangana, India), and Mylan Corporation. Two of the Contract Manufacturing Organizations (CMOs) were based in India. These three companies have nine factories in Karnataka, three factories in Tamil Nadu, and one factory in Telangana.

South India supplies to US and EU

As shown in Figure 4, most of the manufacturing facilities in the five southern states were FDA and EMA approved (35 centers). The number of FDA-only approved sites was more than double the number of EMA-only approved sites, demonstrating the region's success in sales to the USA and the EU. However, there were many drug sites without FDA or EMA approval in Tamil Nadu (39 districts), Karnataka (37 districts), Telangana (10 districts), and Kerala (5 districts). This discrepancy can protect landowners and commercial contracts from the influence of specific businesses, such as by increasing conservation rights.

Figure 4: Overlap of EMA- and FDA-Approved Facilities in Karnataka, Tamil Nadu, Telangana, and Kerala.



Credit: Global Data Contract Service Provider Database (Date accessed: 10 September 2020).

Pharmaceutical companies and the biotech industry are increasingly turning to knowledge management (KM) to help them succeed. Knowledge management can improve productivity in the face of an increasingly complex R&D process (the main department of a pharma company), facilitate the sharing of data and information between different parts of an organization, and enable the sharing of expertise with partnering companies in cases of

licensing deals, acquisitions, and mergers. Knowledge management is not just about technology but also about implementing new business processes.

Pharmaceutical companies have often used various technologies and processes to capture and transfer the knowledge of R&D and manufacturing professionals. In general, a good knowledge management system includes effective online collaboration and communication tools that facilitate the sharing of ideas, information, and knowledge among colleagues. The backbone of sharing research and other R&D information is the company's global knowledge management system.

Although only a handful of new drugs enter the market each year, pharmaceutical companies must carefully monitor all their research and supporting data, repeating successes and learning from previous projects (and even failures). Clinical trials involve thousands of patients across the country. Information management systems can detect unexpected results and direct them to appropriate personnel for review, helping to save time and ensure that important information is not overlooked. The centralized information management function serves as a convenient repository that allows timely and accurate information delivery to customers.

MSMEs form an integral part of the pharma supply chain, with over 24,000 registered MSME units within the Indian pharma sector. With a sizeable contribution of 35-40% and a turnover of around INR 5,000 crore, the Indian pharma industry is highly dependent on MSME units for manufacturing and niche marketing. However, factors like the non-availability of raw materials at the right time, high input costs, lower capacity utilization, supply chain disruptions, rising API (active pharmaceutical ingredient) prices in India, high freight costs, and working capital constraints (fixed expenditure, increase in receivable days, etc.) impact their operational efficiency. A key challenge for the Indian pharma sector is the need to re-examine the supply chain to improve operational performance parameters, in addition to low manufacturing costs and aggressive competition. Most Indian companies have successfully figured out how to manufacture generic drugs but have paid little or no attention to operational efficiency.

Operational efficiencies of a firm play a crucial role in determining the survival and growth of a firm, especially when the industry is undergoing dynamic structural transformation due to external changes. In June 2020, the Ministry of Micro, Small, and Medium Enterprises (MSME) classified MSMEs into three categories. A micro enterprise refers to a manufacturing firm where the investment in plant and machinery or equipment does not exceed one crore rupees and turnover does not exceed five crore rupees. A small enterprise indicates an

enterprise with an investment not exceeding ten crore rupees and turnover not exceeding fifty crore rupees. In a medium enterprise, the investment in plant and machinery or equipment is within fifty crore rupees and turnover is well within two hundred and fifty crore rupees.

This research focused on exploring and evaluating the enabling environment to recommend appropriate strategies to enhance the operational efficiency of MSMEs in the generic pharma industry across South India.

1.2 RESEARCH OBJECTIVES

1. To analyze the role of factors - People, Process, Technology, Infrastructure and Funding ecosystem, that influence operational efficiency of MSMEs
2. To identify strategies that help in enhancing the operational efficiency of MSMEs
3. To suggest a model that provides recommendations for the Indian generic pharma to enhance operational efficiency of MSMEs

RESEARCH QUESTIONS

RQ1-What were the critical areas under the Primary and Secondary factors affecting Operational efficiency of MSME?

RQ2 -What were the strategies that help in enhancing Operational efficiency in MSMEs?

RQ3-What is the kind of model can be suggested that helps in enhancing the Operational Efficiency in MSMES?

RESEARCH HYPOTHESIS

H01: The relationship between people and process significantly impacts the operational efficiency in MSME

H02: Infrastructure is a significant factor in enhancing operational efficiency in MSME

H03: Technology is a significant factor in enhancing operational efficiency in MSME

H04:There is a significant relationship between Technology and Funding to enhance Operational efficiency in MSME

The factors have been further categorized as Primary include People, Process, Technology and Secondary include Infrastructure and Funding Systems.

CHAPTER II.

LITERATURE REVIEW

LITERATURE REVIEW

According to the Indian Economic Survey 2021 and a report by Soni, S. in the Financial Express in November 2021 titled "MSMEs in Pharma," the domestic pharma market was likely to grow threefold this decade from $42 billion in 2021 to $65 billion by 2024 and further to around $120-130 billion by 2030. Pharma exports stood at $24.44 billion in FY21, up by more than 18% from $20.58 billion in FY20, according to the Pharmaceuticals Export Promotion Council of India. According to IBEF, India was the 12th largest exporter of medical goods in the world, with the sector comprising 6.6% of India's total merchandise exports. Despite the encouraging projections, revenue growth for the Micro, Small and Medium Enterprises (MSME) sector in FY22 might dip despite the Covid vaccine opportunity. Operating profitability is predicted to decline due to the rise in prices of APIs imported from China, among other reasons. For instance, the price of paracetamol API jumped from around Rs 500 per kg to nearly Rs 1,000 per kg in the past few weeks. Industry estimates indicate that prices of medications such as guaiphenesin have jumped from around Rs 550 per kg to over Rs 800 per kg, while metformin increased from around Rs 250 to over Rs 380 per kg. The report mentioned that profitability would be hit as raw material costs had gone up phenomenally along with packaging material costs, freight costs, marketing costs, etc. Prices for medicines are regulated and cannot be increased like those in other industries.

Research Gap: The report highlighted MSMEs as the most impacted ones but did not suggest concrete measures to help MSMEs by funding units affected during COVID. There was no mention of government schemes like Production Linked Incentives (PLI) and benefits which might have helped the MSMEs. This research incorporated funding as one of the factors to maintain business continuity and increase operational efficiency.

A study on the efficiency of the Indian manufacturing industry by Yadav and Suthar (2016) showed the role of labor and capital productivity in the export earnings of India's small-scale industries from 1975-76 to 2009-10. They found that the SSI (Small Scale Industries) sector was crucial for sustainable growth, increased productivity, employment creation, exports, and sustainable investment. They tried to link employment and capital production with employment, production, and exports. They found that after economic reforms, India's direct exports accounted for approximately 35% of India's total exports. Research showed that capital and modern technology contribute significantly to the SSI sector's productivity and export growth, and labor concentration had a greater impact on export earnings. The study

highlighted important factors that can improve employee performance, such as a good working environment, better salary levels, employee training, nutrition plans for employees, and health. There was also a good distribution of money through technological changes and innovations.

Research Gap: While the study was generic and focused on the broader manufacturing sector, it did not cover any of the pharma small-scale units which manufacture for domestic market distribution. This proposed research addressed this gap and is exclusively focused on the pharma domain of Micro and Small Medium Enterprises.

Shukla and Misra (2013) stated in their study that Value Engineering (VE) had become an essential concept in the majority of public and private sector industries. Most Indian companies had shown interest in adopting, and some have successfully adopted, value engineering concepts. In Indian industries, there has been a lack of understanding of value engineering concepts and their implementation among industrial practitioners. This study discussed different critical issues pertaining to cross-functional teams and developed flow charts and FAST diagrams (Functional Analysis System Technique) for Value Analysis & Value Engineering (VAVE) suitable for the automobile industry. The study recommended the following for the successful implementation of value analysis & value engineering in the automobile sector: most of the value engineering concepts were extremely sound and had very good application prospects in the automobile industry, but there was a lack of knowledge pertaining to their successful implementation, which could be addressed through proper guidance and education. It was essential to utilize value engineering concepts and implement them with a broader mindset. The success of any cost reduction concept required better coordination with all segments (other parties) of the value system that played an influential role in project and component-level costing. Almost all VE teams were composed of multidisciplinary specialists, so the success of the VE team depended on a very well-qualified team leader with excellent coordinating ability. People with prior experience in implementing VE programs should be assigned such responsibilities.

Research Gap: Their study focused on the manufacturing industry but not specifically on pharmaceutical sector MSMEs. The study highlighted that Value Engineering(VE) could be an important factor in improving efficiency. In this research, the focus was exclusively on shopfloor-level aspects, as the maturity of Indian pharma MSMEs is not at the same level as that of big manufacturing companies. More advanced concepts like VE could be handled once the basics were addressed, which had been studied for pharma MSMEs in this research.

Various authors cited above have studied the conversion of goods into services as output, marketing, finance, and measured them to define operational efficiency. Factors studied in the manufacturing sector across multiple domains include ways to reduce human error, improve equipment performance, and increase capital infusion .

While factors affecting operational efficiency have been studied, the emphasis has been on the broader manufacturing sector and not specifically on the pharmaceutical domain. The basic shopfloor aspects (laboratory environment in a pharmaceutical setup) have not been studied in pharmaceutical Micro, Small, and Medium Enterprises (MSMEs). This gap is addressed in this research, which focuses on pharmaceutical MSMEs with attention to day-to-day unit operations by studying factors like People (Labor), Process (Equipment functioning, Human Error reduction), and Technology (Manual vs. Automated) that impact operational efficiency at the ground level.

According to Chita, Jain, and Metri (2020) in the study titled “Funding Landscape and Gap Analysis for Pharmaceutical MSMEs," the contribution of the MSME sector is nearly 40 percent of the pharma sector's production, amounting to a turnover of nearly ₹35,000 crore. They play an important role in promoting inclusive growth at the grassroots level by contributing 45 percent to the nation’s manufacturing output and 36 percent of total exports. Despite the vital role played in the economy's growth, many MSME sector firms face challenges such as funding crunch, high-interest rates, falling export demand, falling bottom-lines, lack of government incentives for loss-making units, and stringent regulatory barriers. The biggest problem is the perennial shortage of funds. According to the 4th All India Census of MSME in 2011, only about 5 percent of these enterprises obtained finance from financial institutions, 2 percent from others, leaving the rest 93 percent to fend for themselves.

Research Gap : While this report highlighted the funding crunch, it did not discuss measures for MSME funding exhaustively except for liberal financing by banks. The study categorized financing as a major bottleneck but did not suggest exhaustively how the crunch of finance leads to several other challenges such as training people with current practices in the pharmaceutical industry, developing new infrastructure, adopting new technologies, and attracting a good talent pool. The gap in the study was the lack of focus on other factors such as People, Infrastructure, and Processes within an MSME, which was an integral part of this research subject.

Pujar (2014) analyzed MSMEs and their role in job creation in India through secondary data obtained from various public sources. He studied the definition, policies, and issues of MSMEs in India, identifying variables such as the number of MSME units, jobs, investment, production, and exports. The study highlighted the problems faced by small businesses, including finance and credit, infrastructure problems, machinery and equipment, operational problems, technology, and lack of skilled personnel. The main objective was to analyze the role of the MSME sector in generating employment in India. Findings indicated that the Indian economy could look forward to a prosperous future in MSME sectors. Micro-enterprises, in particular, play a basic role in employment generation and fostering entrepreneurship at the grassroots level. These sectors should be given a pre-eminent role and must be extensively supported. These enterprises are labor-intensive, require less capital, and help eradicate socio-economic problems such as unemployment, underemployment, poverty, and regional imbalances. Proper infrastructure and other support from the government are necessary for their promotion and development.

Research Gap: The study highlighted the problems and provided recommendations for MSMEs, specifically to improve infrastructure and handholding by government agencies but does not talk in particular about the pharmaceutical MSMEs. In this research, infrastructure is being studied as one of the key factors impacting MSMEs, with a focus on pharmaceutical MSMEs. Other factors studied include People, Process, Technology, and Funding.

Yadav (2014)[68] in her research conducted a field survey and in-depth interviews with the owners of 60 employers of small-scale engineering industries of Gujarat. She evaluated the responses to uncover the technological flexibility of these industries. She indicated that the technological up-gradation will enhance the performance of the company and increase the competitiveness of SSIs. The study derived employment elasticity of output to find out the employment generation capacity of this sector. It was found that MSME sector has been able to create employment opportunity within the sector but it fails to absorb the semi-skilled and unskilled migrated labour forces from agriculture and other sector in all eight states of North East India. The study suggested that the government should take measures to create environment which is conducive to smooth operation of the MSME units in NEI so that it will create employment opportunity among youth population of this region.

Research Gap : While the study talked about creating employment in the current study but does not mention about hiring the right talent for a highly regulated industry. This research focussed on how we can further train hired manpower for skills, technology and improve the

infrastructure with a focus on pharma MSMEs and how it will eventually lead to trained manpower, less downtime for machinery and improvement in overall performance which eventually is going to benefit the patients in India and in other countries as well when these MSMEs move to the next level by securing the regulatory approvals from foreign authorities (USFDA,MHRA,EMA etc.)for drugs manufactured in their facilities .

In the study conducted by Ali and Firoz (June 2014) titled "MSMEs in India: Problems, Solutions, and Prospects in the Present Scenario," the authors summarized various MSME problems in India, such as lack of credit from banks, competition from multinational companies, poor infrastructure, unavailability of raw materials, lack of advanced technology, lack of training and skill development programs, and complex labor laws. Authors have mentioned in brief about the potential which MSME sector offers .

Research Gap : While the authors talked in detail about the problem areas and challenges there was a gap with respect to detailed recommendations/model on the suggestions pertaining to infrastructure , availability of trained personnel ,slow or poor adoption of new technologies .This research aims to address the above gaps by considering five major factors to be studied namely, People,Process,Infrastructure,Technology and Funding beyond the only focus on funding aspects in the above studies .All the problem areas mentioned in different research papers can be categorized under these broad factors. This research explored and took a deep dive into each one of these factors through structured questionnaire and suggested recommendations to improve the overall efficiencies of MSME .

Das and Barman (2013) surveyed 21 microenterprises in three villages of Hajo, Kamrup (rural) district, South India. The industries studied included brass metal, bakery, rice and Ghani, steel fabrication, weaving, silk rearing, and tailoring. The research showed that sectors such as steel and grill manufacturing, brass metal, and bakery were in good shape in terms of investment, workforce, and technology. The main problems of entrepreneurs in these small businesses were lack of work and funds. Micro and small enterprises provide employment opportunities with relatively small capital investment and act as a subsidiary source of employment.

Research Gap: The paper highlighted the development of facilities essential for industrial growth, such as power supply, raw material, marketing, capital, labor, technical know-how, etc., remains a major obstacle in the block. Institutional support for manpower training and infrastructure facilities should be a government priority and suggests further studies as a gap

and similar problems plague pharmaceutical MSMEs, covered in this research by categorizing them under factors like People, Process, Technology, Infrastructure, and Funding.

Sitaram and Hoque (2016) attempted to uncover the internal and external factors affecting the performance of SMEs in South Africa. They collected cross-sectional data from 74 SME owner-managers to examine relevant factors. The study found that technological innovation significantly impacts SME performance, while competition has a positive relationship with SME performance. The study also highlighted challenges such as technological capabilities, external competition, and globalization for SMEs in South Africa. It emphasized that addressing these factors would increase SME performance, customer base, and profits.

Research Gap: The studies cited above explored the MSME sector generally in India and other countries (e.g., Nigeria, Kenya, South Africa, Malaysia), with few including pharmaceutical MSMEs. They assessed leadership, top management, team structures, business management, external environment, customer orientation, assets, financial leverage, operating cash flow, profitability, business strategies, and sales revenue, linking them to company performance. However, there is a gap in the thorough assessment of shop floor needs and dynamics, the actual operations carried out, and their link to performance.The study focused more on external factors, whereas this research focused on in-house capabilities and factors for improvement to understand problems at the ground level. The pharmaceutical industry being a regulated industry, the shopfloor-level problems have been studied. Addressing these problems can help MSMEs set their house in order before aspiring for regulatory approvals in advanced markets like the US and EU. This study focuses on personnel qualifications, ease of day-to-day operations, management support, regular upskilling, and operational uptime in pharmaceutical MSMEs, influencing performance and operational efficiency. The factors (People, Process, Technology, Infrastructure, Funding) were studied to recommend changes at the ground level, integrating them to improve overall performance.

Kannan and Sudalai Muthu (2014)[61] determined in their study the importance of MSMEs in the Indian economy. They also examined the challenges faced by MSMEs and the steps taken by the government to improve the performance of MSMEs in India. The study collected secondary data from various government agencies. They found a positive relationship between the total output of MSMEs and the global output of the economy and population. MSMEs contribute to India's global productivity and export performance. Some of the key challenges faced by the MSMEs in India were found to be access to capital, access to marketing activities,

shortage of infrastructure, lack of training and education. They suggested improving the funding of banks to the MSMEs.

Research Gap : In the study by Kanna and Muthu, the gap is lack of data particularly for the pharmaceutical MSMEs which is covered in this research with a focus on each one of these factors through structured questionnaire and suggested recommendations to improve the overall efficiencies of MSME in pharmaceutical sector.

Gaur et al. (2011)[90] studied the relationship between business orientation and the creation of SMEs in India.Of the 327 companies the researchers surveyed, 315 SMEs operating around Pune and Mumbai in the Indian state of Maharashtra responded fully.They collected data from CEOs or senior employees of SMEs in these areas. Scholars divided marketing orientation into customer orientation, competitive orientation, and joint venture orientation. They incorporated environmental factors into dimensions such as competition, job noise, and job instability to achieve their research goals. They sought sustainable resources, customer focus and mutually beneficial operations. Labor competition did not affect the performance of manufacturing SMEs.Additionally, the benefits that SMEs derived from business practices were dependent on the accessibility of company resources. Access to more resources would enable SMEs to perform better.

Research Gap: The study had a gap in terms of more focus on job related factors like job instability, attrition and how it impacts the business continuity but no focus on shopfloor aspects . This research focussed on how we can utilize skilled manpower, technology and improve the infrastructure with a focus on pharma MSMEs.It will eventually lead to trained manpower, less downtime for machinery and improvement in overall performance .The stringent regulatory procedures in pharmaceutical industry can be adhered to if the basics are correct and in place which has bee studied in this research.

Kadian and Chahal (2015)[60] assessed the Importance of MSMEs by analyzing secondary data available from sources such as Ministry of Micro, Small and Medium Enterprises Annual Report, Reserve Bank of India (RBI) and Confederation of Indian Industry (CII).Business in the Indian government's "Make in India" initiative was also analyzed. They reported that the contribution of MSMEs to manufacturing and total exports was 45% and 40% respectively. They found that handicrafts played an important role in the growth of the Indian economy. The study revealed concerns about the gap between demand for money and availability of money.

Research Gap: The study had a gap as it established a relationship between funding and its availability but did not dwell on other factors such as personnel, technology, infrastructure, government schemes among other aspects. In this research, factors studied include People, Process, Technology, and Funding and the findings related to concerns and their redressal mechanism in pharmaceutical MSMEs.

Sharma and Bhagwat (2006)[115] surveyed 210 SMEs in Western India through surveys and personal interviews. Although computer usage continued to increase in small and medium-sized businesses, they had shown that the information technology of small and medium-sized businesses were inadequate. This study showed that SMEs frequently use information systems for financial transactions, sales management or materials planning. They also found that SMEs were less interested in information technology in management and decision support and were less likely to use supply chain management or business management software.

Research Gap: The study highlighted the unwillingness to adopt information technology but did not recommend why SMEs are not interested in adopting technology and how it can be done .In this research, Technology has been taken as one of the key factors evaluated in detail for its link to the operational efficiency in pharmaceutical MSMEs.

Govindappa and Geetha (2011)[92] conducted a survey with 30 randomly selected entrepreneurs from factories in Davangere district of Karnataka.They reported that certain demographic patterns exist, such as women not participating in the labor market, entrepreneurs were under the age of 40 and belonged mostly to nuclear families.Factors influencing the growth of MSMEs included family background and environment, knowledge and understanding through experience and participation in training programs such as the Enhanced Development Program (EDP).They mentioned some of the challenges faced by entrepreneurs in the operation of production facilities were procurement of raw materials, marketing, power or energy, labor, finance, services and management.

Research Gap: The study primarily focussed on problems faced by entrepreneurs running MSMEs and also highlighted aspects of skewed gender ratio in overall workforce in only one district of a state. The gap of not studying impact of having robust systems and processes which are required as a basic need for functioning of a pharmaceutical company has been

addressed in this research by exploring factors which directly impact the operational efficiency of pharmaceutical MSMEs.

According to Adam, Jr. and Ebert, 2007 ,Operational efficiency is a company's measure of value. Operations involve converting inputs into goods or services, thus increasing the output value relative to the sum of the input values. Value added is often used as a necessary metric to measure the power, capacity, and ability of MSMEs to transform inputs into outputs. It is the difference between the output value and the average input value. These factors can be successful with the relationship and support of the company's various departments (e.g., purchasing, quality, production, engineering, marketing, and finance) (Shukla and Misra, 2013).The operations in production involve producing physical goods or services. Output is common in many organizations. Manufacturing organizations produce physical products (materials) through a transformation process. The main elements of work are inputs, transfer processes, outputs, and feedback Inputs include land, labor, and capital (in the form of buildings, equipment, and commodities). After the product is produced, the actual product is compared with the required level to understand the variation of the output and check if any adjustments are needed. Changes or modifications to products due to unexpected variations in the external environment or internal forces (human error, equipment failure) are carried out.
Factors which have been studied in this research were ways to reduce Human error reduction, performance of equipment's and capital infusion.

Research Gap: While factors affecting Operational Efficiency had been studied, the emphasis has been on broader manufacturing sector and not specifically in pharmaceutical domain. The basic shopfloor aspects (laboratory environment in pharmaceutical set up)had not been studied in Micro, Small and Medium Enterprises(MSMEs).This gap was dealt with in this research study as the focus was on pharmaceutical MSMEs with attention to day to day unit operations by studying factors like People, (Labor),Process(Equipment functioning, Human Error reduction) and Technology (Manual vs Automated) which impact the Operational Efficiency at ground level.

Satpati et al. (2017)[23] tried to focus on the growth, development and participation of MSMEs in India and highlighted the different policies of the Indian government towards developing MSMEs. The nature of the research was explained and secondary data was analysed to discuss the findings. They collected information from the Ministry of Micro, Small and Medium Enterprises; Indian Economic Statistics Manual, Reserve Bank of India; Newspapers,

magazines and white papers of MSMEs from 2001-02 to 2010-12. They said that MSMEs contribute to the growth of the Indian economy. They analysed the performance of MSME units, employment, investment and overall profit. The study covered important topics such as its contribution to India's GDP, comparison of the MSME sector with other industries, bank loans and different programs of the government for MSMEs in India. The study also highlighted the Make in India Project, a government initiative to improve the performance of MSMEs.

Research Gap: The study had a gap in data on pharma MSMEs' shopfloor environment, which was the focus in five states of South India, a major hub for pharmaceutical activity over the last decade. The author had indicated the advantages of using international opportunities and pointed to the revision of government policy, infrastructure, and exports, linking them to the nation's GDP growth. The study had a gap in data on pharma MSMEs' shopfloor environment, which was the focus in five states of South India, a major hub for pharmaceutical activity over the last decade. This research focused on assessing and evaluating basics such as laboratory technology, personnel qualification, SOP comprehension, equipment downtime, and warehousing conditions. Factors such as People, Process, Technology, Infrastructure, and Funding were studied to recommend changes at the ground level, integrating them to improve overall performance and operational efficiency.

Summary of Research Gaps:

The studies conducted had a gap of data on pharmaceutical MSMEs shopfloor environment and thorough assessment of needs and dynamics at ground level where the actual operations were being carried out and its link to performance or Operational Efficiency.The basic aspects (laboratory environment in pharmaceutical set up) had not been studied in pharmaceutical Micro, Small and Medium Enterprises.

This research focussed on assessment and evaluation of basics like the technology being used in the laboratory, personnel or labour qualification, how SOPs were being read and understood, equipment down time and warehousing conditions. This was covered by studying factors like People,Process,Technology, Infrastructure and Funding. The broader umbrella of these factors encompassed the nuances of shopfloor, production and distribution . This study focused on personnel qualification, ease of day-to-day operations, support from management to workers for regular upskilling, training and reducing downtime in a laboratory in pharma MSMEs which influenced performance and eventually Operational Efficiency.The focus was

on pharmaceutical MSMEs with attention to day to day unit operations that impacted the Operational Efficiency at ground level.

Several journals, research papers,books,articles,news analysis were refereed as part of literature review and those have been captured under References (Chapter 6,Pg.102). The above cited research papers and reports were thoroughly studied and were found to be the most relevant to the topic of this research. The gaps were studied doing a deep dive and a structured questionnaire was developed to address those challenges in particular for the pharmaceutical MSMEs. Due to lack of space, the most relevant literature has been critically reviewed, analysed and presented in the above section .

CHAPTER III.
RESEARCH DESIGN

CHAPTER III
RESEARCH METHODOLOGY

3.1 Research Design & Description of participants of the study-

In this study, a quantitative research design was employed. Data was collected using a structured questionnaire. The responses from the questionnaire were analyzed quantitatively using statistical analysis tools like SPSS to derive inferences and understand the issues and problems faced by MSMEs.

During the initial pilot phase of the study (refer to Appendix 7.3, Pg 129), the questionnaire was administered to a sample size of thirty (n=30) MSMEs in one of the states in South India (Telangana). The responses in the pilot phase were analyzed quantitatively to further revise the questionnaire based on obtained Eigenvalues for testing the reliability and validity of the questionnaire.

In the second phase or main study, the revised questionnaire was administered to selected companies across the MSMEs in five states in South India, namely Telangana, Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu. These five states, being the major base of MSMEs, accounted for more than 25% of MSMEs in the country, hence the sample was taken from these states. The responses from the questionnaire were again analyzed quantitatively using statistical analysis tools like SPSS, and inferences were derived to study the impact of various factors on the operational efficiency of MSMEs. The target final sample size was 400 MSMEs, but data was eventually collected from 316 MSMEs.

A correlational analysis was undertaken to establish the relative importance and significance of different factors impacting the operational efficiencies of MSMEs within the pharmaceutical industry. The responses were analyzed to identify the critical factors and their impact on the operational efficiency of MSMEs. The factors studied were People, Process, Technology, Infrastructure, and the Funding Ecosystem.

While these were the broad factors under which several questions were framed, the responses provided insights on the following aspects of mind set, skillset, and toolset:

- To assess their current situation in real time
- To benchmark themselves against peers and industry standards
- To categorize the current challenges and address them by formulating the right strategies
- To identify probable solutions for the gaps in operational efficiency in the MSMEs within the pharmaceutical industry.
- Level of personnel expertise and training (Skilled Manpower)
- Awareness and willingness towards automation of processes (Digital Adoption).
- Capability and capacity for imports to regulated markets (US and EU)
- Current state of laboratory equipment, quality management systems (QMS etc.)
- Awareness and ability to access funds through government schemes (Funding environment)
- Inventory management and Warehouse practices (Supply Chain)

3.2 Data Collection Tools and Materials

For the current study, the entire survey was developed in English and later piloted among various Small and Medium Enterprises (MSMEs) to get expert input for necessary improvements before data collection for the main study. The survey was administered to respondents through Google Forms, emails, WhatsApp, and LinkedIn. The survey comprised questions on demographic data as well as study-specific data. The types of items included were double-marked questions, multiple-marked and multiple-choice questions, measurement and evaluation questions, and single-marked multiple-choice questions.

Research Sample, Sample Size and Treatment of Data

Since the study involved five states in South India, the sampling technique used was multistage sampling, similar to cluster sampling, wherein five states were selected. From each state, 80 MSMEs were targeted, resulting in a total target of 400 MSMEs (80 x 5). Data was eventually collected from 316 MSMEs.

Responses were composed using a non-probability convenience sampling method to understand the working pedagogy.

Determination of Sample Size

According to the guidance, the sample size should never be below 378. By including the possibility of outliers, the target sample size was selected as 400 to account for outliers. However, data was ultimately collected from 316 MSMEs only.

	Sample Size **Sample Table**				**Risk Based Formula**	
	95% Confidence Level		99% Confidence Level		Risk Probability	
Population Size	5% Error	1% Error	5% Error	1% Error	0.99	0.75
75	63	74	67	75	3	2
300	169	291	207	295	8	6
800	260	739	363	763	20	16
2,500	333	1984	524	2173	60	47
25,000	378	6939	646	9972	593	462
1,00,000	383	8762	662	14227	2370	1848
2,50,000	384	9248	662	15555	6185	4618
5,00,000	384	9423	663	16055	12369	9235
25,00,000	384	9423	663	16478	59216	46171

Source : "The Research Advisors" (2006) . Refer Annexure-1 for details .

The formula used for these calculations is given as below :-

$$n = \frac{X^2 * N * P * (1-P)}{(ME^2 * (N-1)) + (X^2 * P * (1-P))}$$

Where :

n = sample size

X^2 = Chi – square for the specified confidence level at 1 degree of freedom

N = Population Size

P = population proportion (.50 in this table)

ME = desired Margin of Error (expressed as a proportion)

Sampling Plan

Sampling Method	Non-Probability Convenient Sampling and Multistage Sampling
Sampling Elements	Data collected from the Micro Medium and Small Enterprises (MSME) across 5 states of South India
Sample Size	Data collected from 316 MSME's
Target Population	Pharma MSMEs

Data Analysis and Interpretation

Based on the literature review and theoretical framework, research objectives were determined, and an appropriate questionnaire was developed and administered to the companies. Responses collected from MSMEs were recorded in a physical survey and pre-coded. These responses were entered into Microsoft Excel 2013 and subsequently analyzed using IBM SPSS 21.0 software. For better analysis, the data was categorized into various types: nominal data, comparative data, temporal data, and ordinal data.

3.3 Process of Data Analysis and Treatment

The statistical tools that were applied for the analysis of data in this study :-

1. **Frequency distribution** - Used for analysing the MSMEs' profile in graphical and tabular formats.
2. **Z test (Bivariate Data Analysis Technique)** - Applied to measure the significant influence of various socio-economic profiles of MSMEs and factors representing opportunities and threats for MSMEs.
3. **Chi Square Test**- Used to check the association between nominal data of the socio-economic profile of MSMEs and scale data of factors representing opportunities and threats for MSMEs.

Software Applied For Data Analysis Process

1. Microsoft Excel 2013
2. IBM SPSS 21.0

Data analysis was displayed and represented by various Charts and Table in the subsequent chapters.

Ethical Measurement Considerations

1. The purpose of the study was communicated in advance to the MSME owners, as the study aimed to enhance the operational efficiency of MSMEs.
2. All personal and financial information of MSMEs was kept confidential.
3. The results could prove useful for those interested in deriving insights for policy-making decisions.
4. Potential errors or biases from MSMEs were minimized because the entire survey was clearly explained to them before soliciting their opinions.

2.4 Limitations of the Study

1. This study has its own limitations as all the factors relevant to bring out the various opportunities and challenges posed to MSMEs in India were not studied.
2. While all adequate efforts were made to communicate the purpose of the study some of the companies may still have not fully understood it, as not all MSMEs were ready to disclose about each aspect asked.
3. Since this research was based on previous research, it took a lot of time to collect data from MSMEs and not all response were identical.
4. The findings of this study might change in future. Only a sample of population was surveyed due to restrictions like expenditure, time-limit and tepid response from MSMEs.

3.5 Tabular Description of Research Design

	Objective	What Empirical Data do you intend to collect to fulfill this objective ? Numerical? Narrative? Explain in detail ?	How do you intend to go about collecting the indicated empirical data? Questionnaire? Interview? Observation ?Explain in detail .	Where do you intend to collect the empirical data? If your research involves population and sample , indicate both and justify why you intend to select and use a specific sample group/participants	How do you intend to analyze the empirical data you would collect? Explain in detail how you would arrive at the findings of the study
1.	To analyze the role of the following factors that influence operational efficiency of MSMEs: • People • Processes • Technology • Infrastructure • Funding	Questionnaire Administered to selected companies in the pilot study, the reliability of the questionnaire was tested, and the revised questionnaire was administered thereafter during the main study	The questionnaire was administered to selected companies during the pilot study to test its reliability. After revisions, the revised questionnaire was administered during the main study	The questionnaire was administered to selected companies during the pilot study to test its reliability. After revisions, the revised questionnaire was administered during the main study	Responses collected from MSMEs were pre-coded. All responses were entered into Microsoft Excel 2013 and then transferred to IBM SPSS 21.0 software for analysis (Step A).
.2.	To identify strategies that help enhance the operational efficiency of MSMEs	The questionnaire was administered to selected companies during the pilot study to test its reliability. After revisions, the revised questionnaire was administered during the main study	Responses to the questionnaire were collected through an offline survey during the pilot study and a mix of offline and online surveys (Google Forms, LinkedIn, WhatsApp) during the main study.	This study covered MSMEs in South India from five states viz.Telangana,Andhra Pradesh, Karnataka, Kerala and Tamil Nadu as these states accounted for more than 25% of MSMEs in the country. Target sample size 400,data was eventually collected from 316 MSMEs(Refer Page 54)	**Step A**: Responses collected from MSMEs were pre-coded. All responses were entered into Microsoft Excel 2013 and then transferred to IBM SPSS 21.0 software for analysis. **Step B**: Statistical tools used in this study included: **Frequency Distribution**: For MSMEs in graphical and tabular formats. **Z-Test (Bivariate Data Analysis Technique)**: To measure the significant influence of the socio-economic profile of MSMEs and factors representing opportunities and threats for MSMEs. **Chi-Square Test**: To check the association between nominal data of the socio-economic profile of MSMEs and scale data of factors representing opportunities and threats for MSMEs.

3.	To suggest a model that provides recommendations for the Indian generic pharma industry to enhance the operational efficiency of MSMEs	Key findings from the main study were used to capture recommendations for enhancing the operational efficiency of MSMEs.	Key findings from the main study were used to capture recommendations for enhancing the operational efficiency of MSMEs	Key findings from the main study were used to develop recommendations for enhancing the operational efficiency of MSMEs.	Key findings from the main study were used to capture recommendations for enhancing operational efficiency.

CHAPTER IV.
DATA ANALYSIS
&
PRESENTATION OF
RESULTS & FINDINGS

4.1 Analysis and Report

Strategies to Enhance Operational Efficiency of MSME in Generic Pharma Industry

Research Objectives

1. To analyse the role of the following factors that influence operational efficiency:
   - People
   - Processes
   - Technology
   - Infrastructure
   - Funding ecosystem
2. To identify strategies that help in enhancing the operational efficiency of MSMEs
3. To suggest a model that provides recommendations for the Indian generic pharma to enhance operational efficiency of MSMEs

Research Hypothesis

H01: The relationship between people and process significantly impacts the operational efficiency in MSME

H02: Infrastructure is a significant factor in enhancing operational efficiency in MSME

H03 :Technology is a significant factor in enhancing operational efficiency in MSME

H04: There is a significant relationship between Technology and Funding to enhance Operational efficiency in MSME

Research Questions

RQ1-What were the critical areas under the Primary and Secondary factors affecting Operational efficiency of MSME?

RQ2-What were the strategies that help in enhancing Operational efficiency in MSMEs?

RQ3-What kind of model can be suggested that helps in enhancing the Operational Efficiency of MSMEs?

Snap - shot of Data

S.NO	State	1.The basic educational qualification of personnel on the shop floor is:	2.Type of Induction/Training Programme undergone(Tick all that apply)	3.Training Evaluation (effectiveness check) Methodology followed by your organization	4.Have you undergone the refresher training programme?	5.Mention the frequency of the refresher training programme	6.Are you aware of the Standard Operating Procedures (SOPs) of your organisation?	7. Did the Induction/Training programme help you get awareness of the SOPs.	8.Do you think SOPs that are followed in the shop floor need improvement?	9.The mechanisms to report failure of any material to comply to the required specifications at different stages of manufacturing?	10.The tools used to Investigate and rectify those failures to avoid their recurrence?	11.The time frame to address any errors/failures at different stages in manufacturing?
1	Tamilnadu	Post graduate	Organizational Overview and Policies, Hands on training	Software	Yes	Quarterly	Yes	Yes	Yes	Online	Online	Between 30-60 days
2	Telangana	Post graduate	SOP Manuals	Software	Yes	Quarterly	Yes	Yes	Yes	Manual Forms/Systems	Manual Forms/Systems	Less than 30 days
3	Telangana	Graduate	SOP Manuals	Software	Yes	Monthly	Yes	Yes	Yes	Manual Forms/Systems	Manual Forms/Systems	Less than 30 days
4	Andhra Pradesh	Graduate	Hands on training	Software	Yes	Monthly	Yes	Yes	Yes	Online	Online	Less than 30 days
5	Andhra Pradesh	Graduate	Organizational Overview and Policies	Manual forms	No	Monthly	Yes	Yes	Yes	Manual Forms/Systems	Manual Forms/Systems, Online	Less than 30 days
6	Telangana	XIIth pass	Hands on training	Manual forms	Yes	Monthly	Yes	Yes	Yes	Manual Forms/Systems	Others	Less than 30 days
7	Karnataka	Graduate	Organizational Overview and Policies, SOP Manuals, Hands on training	Manual forms	No	Need based	No	No	No	Online, Others	Online, Others	Others
8	Karnataka	Graduate	Hands on training	Software	Yes	Quarterly	Yes	Yes	Yes	Manual Forms/Systems	Manual Forms/Systems	Less than 30 days
9	Kerala	Graduate	Organizational Overview and Policies, SOP Manuals	Software	Yes	Monthly	No	Yes	Yes	Manual Forms/Systems, Online	Manual Forms/Systems, Online	Less than 30 days
10	Telangana	XIIth pass	Hands on training	Manual forms	No	Monthly	Yes	Yes	Yes	Manual Forms/Systems, Online	Online	Less than 30 days
11	Tamilnadu	XIIth pass	Organizational Overview and Policies, SOP Manuals, Hands on training	Manual forms, Software	No	Need based	No	Yes	Yes	Manual Forms/Systems, Online	Manual Forms/Systems, Online	Less than 30 days
12	Telangana	XIIth pass	Organizational Overview and Policies, SOP Manuals, Hands on training	Manual forms	No	Need based	Yes	Yes	Yes	Online	Manual Forms/Systems	Less than 30 days
13	Tamilnadu	XIIth pass	Organizational Overview and Policies	Manual forms	Yes	Need based	Yes	Yes	Yes	Manual Forms/Systems	Online	More than 60 days
14	Andhra Pradesh	Graduate	Hands on training	Software		Need based	No	No	No	Online	Online	Between 30-60 days
15	Kerala	Graduate	Organizational Overview and Policies, SOP Manuals, Hands on training	Software	Yes	Need based	Yes	Yes	Yes	Online	Online	Between 30-60 days
16	Karnataka	Graduate	Organizational Overview and Policies	Manual forms	Yes	Monthly	Yes	Yes	Yes	Manual Forms/Systems	Manual Forms/Systems	Less than 30 days
			Organizational Overview and Policies, SOP Manuals, Hands on							Manual Forms/Systems,		

Sheet1 Sheet2 Sheet3 +

After coding

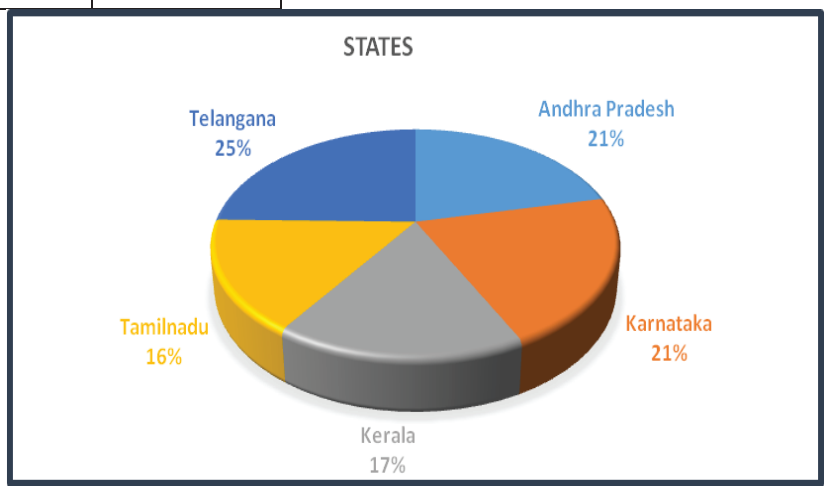
cstate	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26
4	2	3	5	2	8	2	2	2	4	5	1	5	8	2	2	1	1	2	2	1	3	2	2	1	5	
5	2	6	5	2	8	2	2	2	1	1	2	5	4	2	2	1	1	1	1	1	4	4	2	2	5	
5	1	6	5	2	1	2	2	2	1	1	2	5	4	2	2	2	1	7	3	3	1	2	2	2	1	
1	1	1	5	2	1	2	2	2	4	5	2	1	4	2	2	1	1	4	4	7	4	2	2	1	1	
1	1	2	1	1	1	2	2	2	1	2	2	5	3	2	2	1	1	3	1	3	8	4	2	3	5	
5	3	1	1	2	1	2	2	2	1	7	2	2	4	2	2	1	1	1	1	3	4	4	2	1	1	
2	1	5	1	1	6	1	1	1	5	6	4	3	3	2	2	2	2	3	1	1	4	4	2	2	1	
2	1	1	5	2	8	2	2	2	1	1	2	5	4	2	2	2	2	3	2	2	4	4	2	2	1	
3	1	4	5	2	1	1	2	2	2	2	2	5	4	2	2	2	3	4	1	4	3	3	2	2	3	
5	3	1	1	1	1	2	2	2	2	5	2	1	8	2	2	1	2	3	1	3	4	2	2	2	7	
4	3	5	2	1	6	1	2	2	2	2	2	2	4	2	2	1	1	4	1	1	5	3	2	2	2	
5	3	5	1	1	6	2	2	2	4	1	2	1	4	2	2	2	1	1	1	3	4	2	2	2	1	
4	3	2	1	2	6	2	2	2	1	5	3	4	3	2	2	2	4	3	4	8	3	3	2	2	5	
1	1	1	5	2	6	1	1	1	4	5	1	5	1	1	1	1	1	1	1	8	8	2	2	1	5	
3	1	5	5	2	6	2	2	2	4	5	1	5	1	2	2	2	2	2	3	10	3	2	2	3	1	
2	1	2	1	2	1	2	2	2	1	1	2	1	3	2	2	3	2	3	1	3	8	3	2	1	1	
1	3	5	1	1	7	1	2	2	2	1	1	1	4	2	2	2	2	1	1	3	1	4	2	2	1	
1	3	1	1	1	1	2	2	2	1	1	2	1	1	2	2	3	2	1	1	3	4	4	2	2	1	
5	3	1	1	2	8	1	2	2	1	5	2	1	4	1	2	1	1	3	2	10	3	4	2	1	1	
1	1	2	1	1	2	2	2	2	4	7	2	1	8	2	2	1	1	1	1	8	3	3	2	1	5	
1	3	5	3	2	5	2	2	2	3	3	2	1	4	2	2	2	2	3	1	3	4	4	2	2	1	
1	1	7	1	1	8	1	1	2	1	5	2	4	8	2	1	2	1	1	1	1	4	2	2	1	5	
4	3	5	3	1	5	2	2	2	3	3	4	3	7	2	2	4	4	6	1	8	4	3	2	4	1	
4	2	5	1	1	6	1	2	2	2	2	4	1	4	1	1	1	4	7	2	1	4	2	2	2	1	
5	1	5	5	1	6	1	1	1	6	7	3	4	3	2	2	1	1	1	4	1	1	2	1	3	5	
2	1	2	5	2	1	2	2	2	1	5	2	1	4	2	2	1	1	1	1	3	4	4	2	1	1	
3	2	2	5	2	1	2	2	2	2	3	2	5	8	2	2	1	1	1	1	6	3	3	2	2	7	
2	3	5	2	2	6	2	2	2	2	2	1	1	1	1	1	4	2	1	2	5	2	1	2	1	7	
2	3	5	2	2	6	2	2	2	2	2	1	1	1	1	1	4	2	1	2	5	2	1	2	1	7	
4	3	2	1	2	1	2	2	2	1	1	2	1	4	2	2	2	2	3	1	6	7	3	2	2	4	
5	3	1	5	1	6	1	2	2	2	5	2	5	4	2	2	2	1	1	3	3	3	3	2	2	5	
5	1	5	4	2	4	2	2	2	2	6	2	1	4	2	2	2	2	1	1	3	8	4	2	1	1	
4	3	5	5	2	7	1	1	2	1	5	2	1	3	2	2	2	1	1	1	8	4	3	2	2	3	
1	1	5	3	2	5	2	2	2	3	3	2	3	7	2	2	3	3	6	4	6	7	2	2	2	4	
1	3	2	5	2	6	2	2	1	6	1	2	1	1	2	2	2	1	2	1	8	1	1	2	2	5	
5	3	2	5	2	6	2	2	2	1	4	3	1	4	2	1	1	2	3	2	2	1	2	2	2	6	
2	1	5	3	2	9	2	2	2	5	3	1	4	3	2	2	1	1	7	1	9	4	1	2	1	4	
3	2	5	3	2	1	2	2	1	3	3	2	3	7	2	2	2	3	6	1	6	4	4	2	2	4	
3	1	5	3	1	5	2	2	2	3	3	2	3	7	2	1	3	3	6	1	8	7	2	2	1	4	
2	1	1	1	2	1	2	2	2	1	1	2	1	4	2	2	2	2	3	1	3	4	4	2	2	1	
5	1	3	5	2	2	2	2	2	3	3	1	1	5	2	2	1	1	1	4	7	6	4	2	1	6	
1	1	5	5	1	6	1	2	2	2	1	2	1	2	2	2	2	2	2	1	3	4	1	1	2	4	
4	3	5	3	2	1	1	2	1	4	2	1	3	4	2	2	1	2	5	2	3	4	3	2	1	1	
2	3	5	3	2	5	2	2	2	2	3	1	2	6	2	1	2	1	5	4	6	6	2	2	1	3	
1	1	1	1	1	6	2	2	2	1	1	1	1	4	2	2	1	1	1	4	1	1	2	2	2	5	

Untitled2 +

I. Question wise analysis

State Distribution

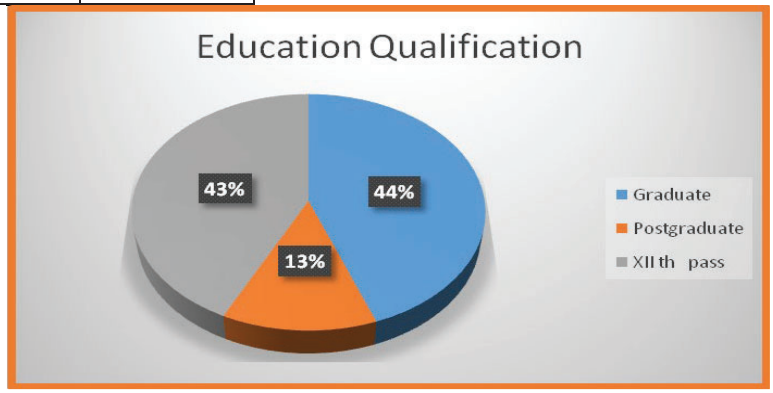
	Frequency	Percent	Valid Percent	Cumulative Percent
Andhra Pradesh	68	0.21	21	21
Karnataka	67	0.21	21	42
Kerala	53	0.17	17	59
Tamil Nadu	50	0.16	16	75
Telangana	78	0.25	25	100
Total	316			



Based on the chart above, we concluded that the highest number of responses were from the state of Telangana(i.e., 25%).

1.The basic educational qualification of personnel on the shop floor is:

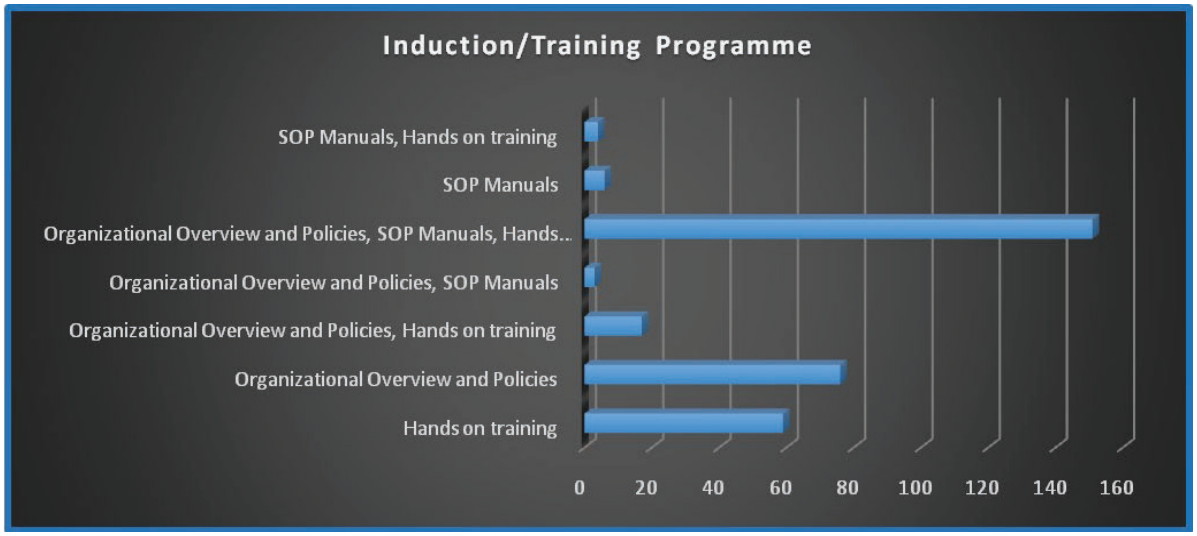
	Frequency	Percent	Valid Percent	Cumulative Percent
Graduate	140	0.44	44	44
Postgraduate	41	0.23	13	57
XIIth pass	135	0.42	43	100
Total	316			



From the above chart, we concluded that graduates have the highest response rate(i.e.,44%).

2.Type of Induction/Training Program undergone(Tick all that apply)

	Frequency	Percent	Valid Percent	Cumulative Percent
Hands-on training	59	0.19	19	19
Organizational Overview and Policies	76	0.24	24	43
Organizational Overview and Policies, Hands-on training	17	0.05	5	48
Organizational Overview and Policies, SOP Manuals	3	0.01	1	49
Organizational Overview and Policies, SOP Manuals, Hands-on training	151	0.48	48	97
SOP Manuals	6	0.02	2	99
SOP Manuals, Hands-on training	4	0.01	1	100
Total	316			

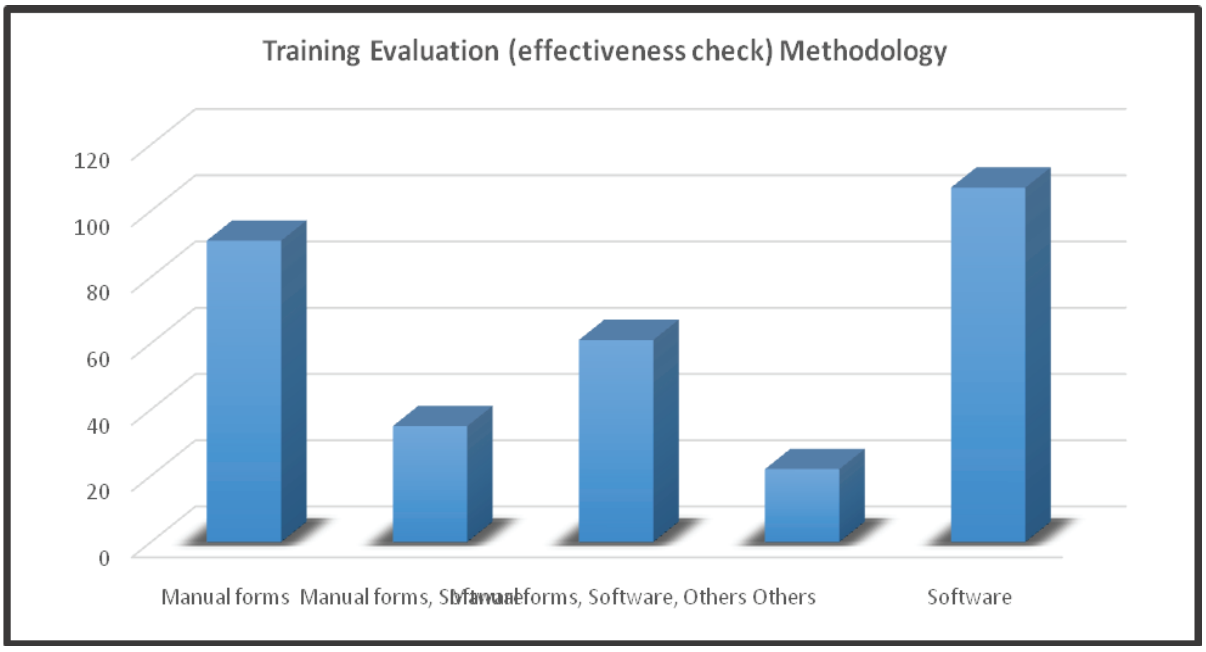


Most of the respondents underwent an organizational overview, and reviewed policies, and

SOP manuals, while some chose a combination of organizational overview and policies along with hands-on training.

3.Training Evaluation (effectiveness check) Methodology followed by your organization.

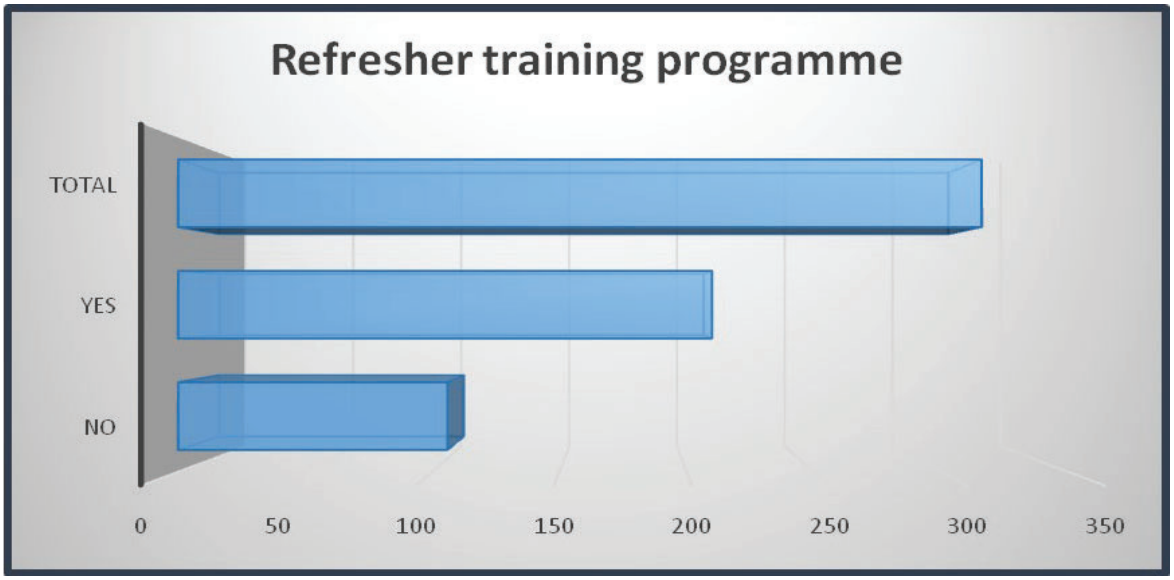
	Frequency	Percent	Valid Percent	Cumulative Percent
Manual forms	91	0.29	29	29
Manual forms, Software	35	0.11	11	40
Manual forms, Software, Others	61	0.19	19	59
Others	22	0.07	7	66
Software	107	0.34	34	100
Total	316			



The purpose of training evaluation was to assess whether the training was successful in meeting its intended objectives and whether it delivered value to both the organization and its participants. Based on the data presented in the graph, it could be concluded that the usage of software had achieved a high level of success.

1. Have you undergone the refresher training program?

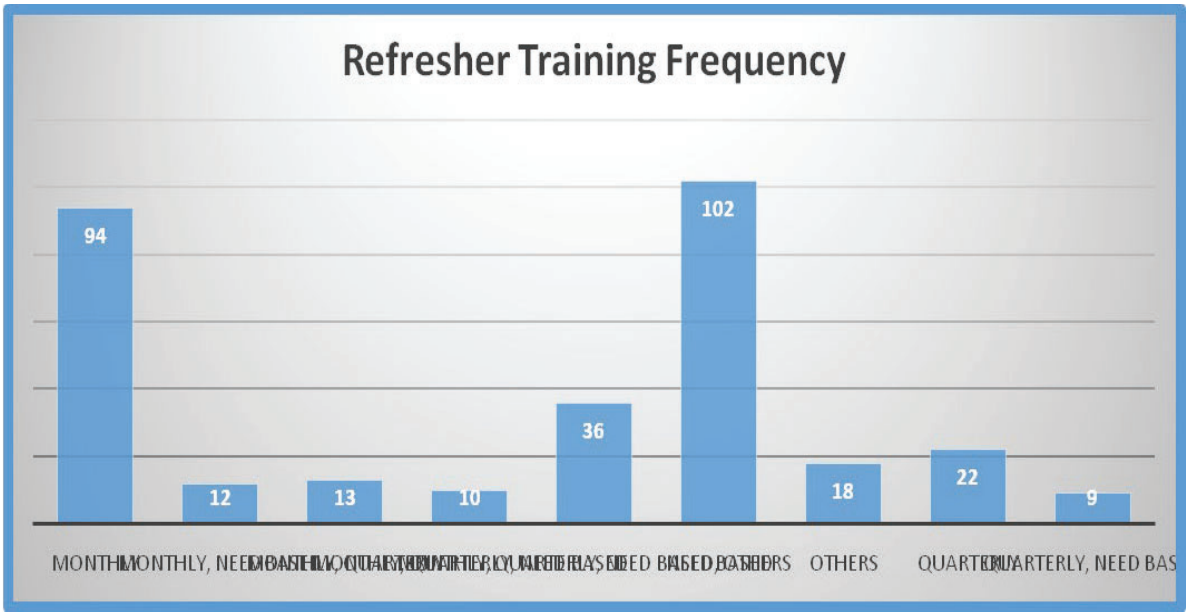
	Frequency	Percent	Valid Percent	Cumulative Percent
No	106	0.34	34	34
Yes	210	0.66	66	100
Total	316			



Based on the graph above, we concluded that the majority of respondents had participated in the refresher training program.

5Q. Mention the frequency of the refresher training program:

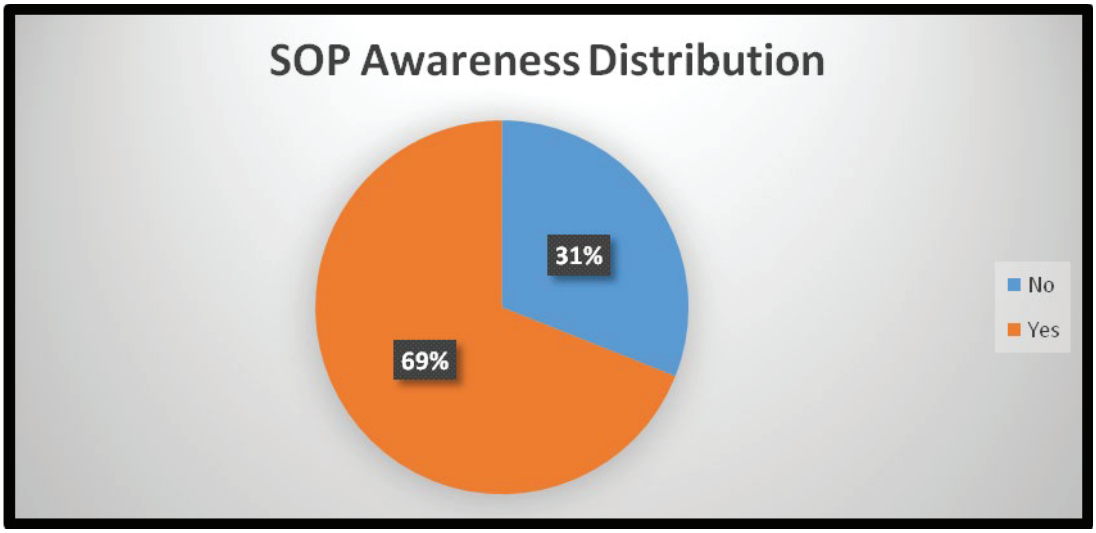
	Frequency	Percent	Valid Percent	Cumulative Percent
Monthly	94	0.30	30	30
Monthly, Need-based	12	0.04	4	34
Monthly, Quarterly	13	0.04	4	38
Monthly, Quarterly, Need-based	10	0.03	3	41
Monthly, Quarterly, Need-based, Others	36	0.11	11	52
Need-based	102	0.32	32	84
Others	18	0.06	6	90
Quarterly	22	0.07	7	97
Quarterly, Need-based	9	0.03	3	100
Total	316			



Most respondents preferred monthly or need-based refresher training, with monthly training being the top choice. Some also liked a mix of frequencies. This highlighted the need for flexible training options to meet employees' diverse preferences.

6Q. Were you aware of the Standard Operating Procedures (SOPs) of your organization?

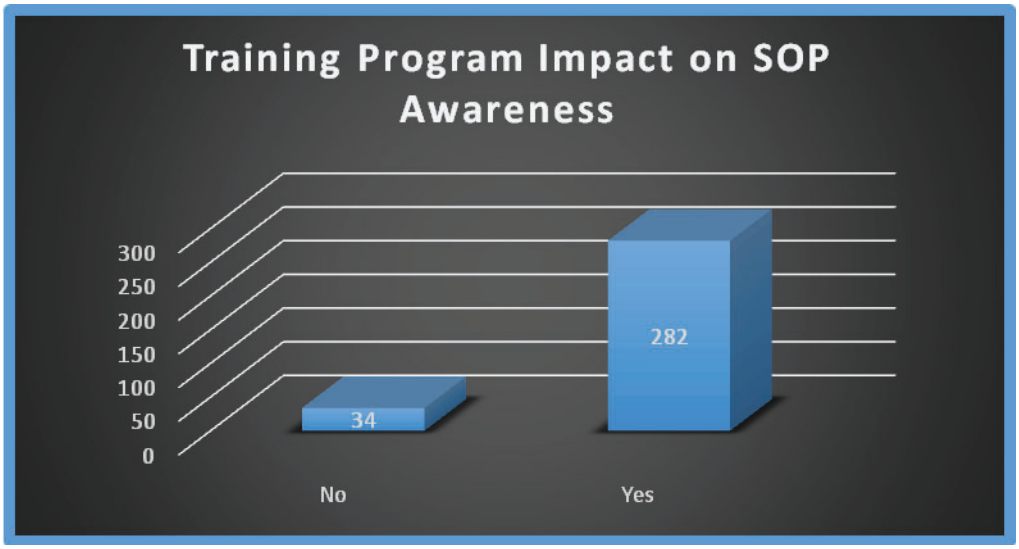
	Frequency	Percent	Valid Percent	Cumulative Percent
No	98	0.31	31	31
Yes	218	0.69	69	100
Total	316			



Most employees, around 69%, were aware of their organization's Standard Operating Procedures (SOPs), which was positive for maintaining consistency and quality. However, about 31% were not aware, indicating a need to improve communication and training to ensure everyone knew the SOPs, which were essential for smooth operations.

7Q. Did the Induction/Training program help you get awareness of the SOPs?

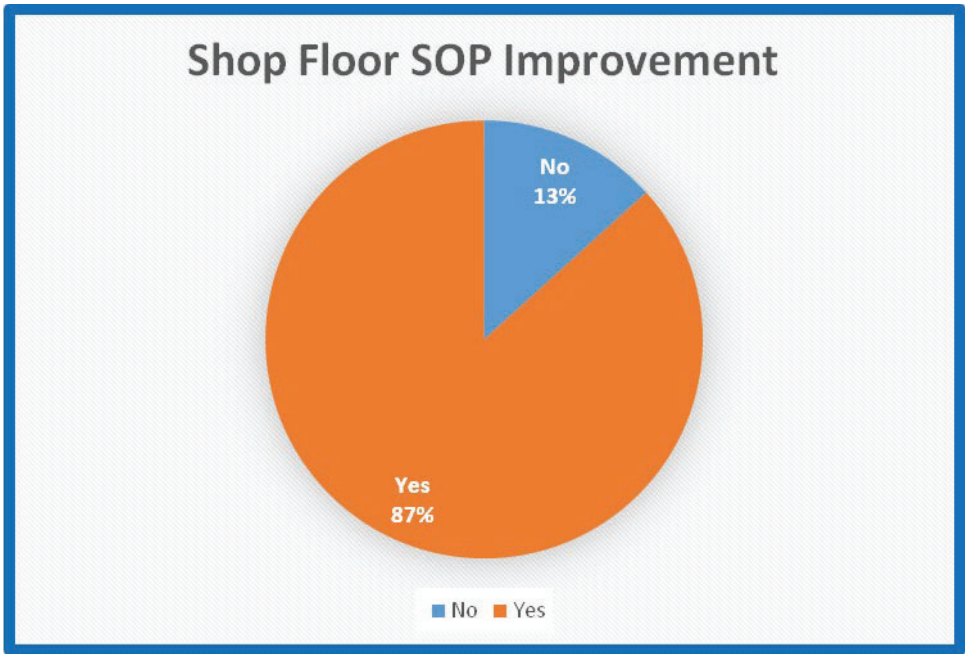
	Frequency	Percent	Valid Percent	Cumulative Percent
No	34	0.11	11	11
Yes	282	0.89	89	100
Total	316			



Most respondents, about 89.2%, found the training program effective in increasing their SOP awareness. However, 10.8% did not. This suggested that the majority benefited, but there was room for improvement to better serve those who didn't.

8Q. Do you think SOPs that were followed on the shop floor need improvement?

	Frequency	Percent	Valid Percent	Cumulative Percent
No	42	0.13	13	13
Yes	274	0.87	87	100
Total	316			



Most respondents, around 86.7%, believed shop floor SOPs needed improvement, indicating a consensus for potential enhancements. However, 13.3% did not see a need for changes, highlighting some level of satisfaction with current procedures.

9Q. The mechanisms to report the failure of any material to comply with the required specifications at different stages of manufacturing?

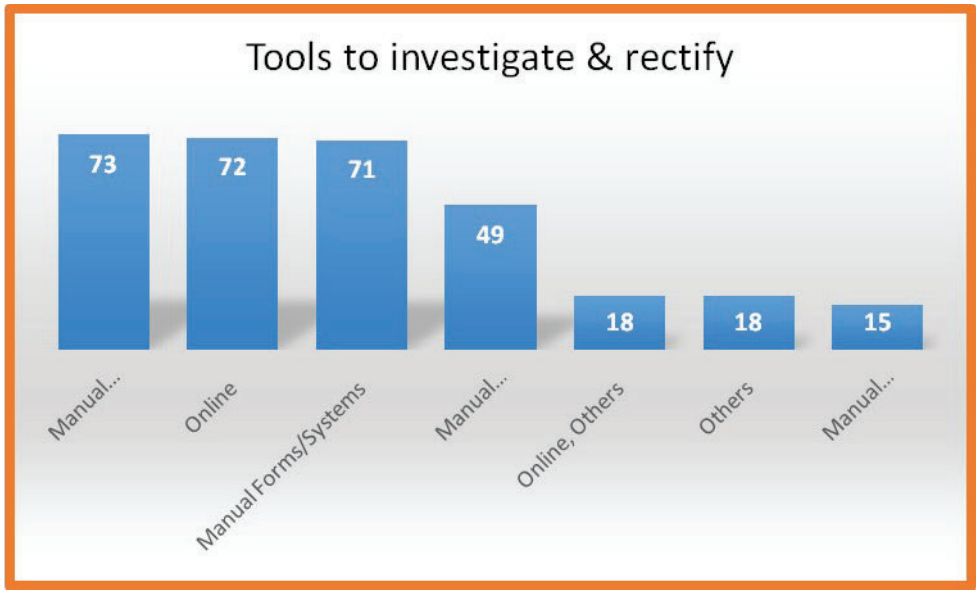
	Frequency	Percent	Valid Percent	Cumulative Percent
Manual Forms/Systems	105	0.33	33	33
Manual Forms/Systems, Online	96	0.30	30	63
Manual Forms/Systems, Online, Others	46	0.15	15	78
Online	37	0.12	12	90
Online, Others	12	0.04	4	94
Others	20	0.06	6	100
Total	316			



Multiple reporting methods were employed in manufacturing, with 'Manual Forms/Systems' (33.2%) and 'Manual Forms/Systems, Online' (30.4%) being the most prevalent. This data underscored the diverse approaches used to report material failures, highlighting the adaptability within manufacturing processes.

10. The tools used to Investigate and rectify those failures to avoid their recurrence?

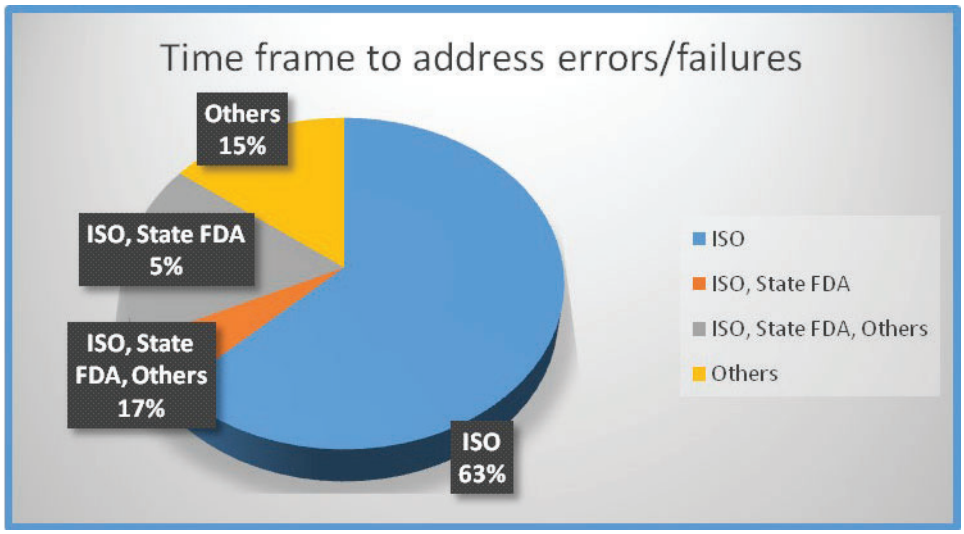
	Frequency	Percent	Valid Percent	Cumulative Percent
Manual Forms/Systems	71	0.22	22	22
Manual Forms/Systems, Online	49	0.15	15	37
Manual Forms/Systems, Online, Others	73	0.23	23	60
Manual Forms/Systems, Others	15	0.05	5	65
Online	72	0.23	23	88
Online, Others	18	0.06	6	94
Others	18	0.06	6	100
Total	316			



From the above table/chart, we concluded that most of the respondents(i.e., 58%) used the tools Manual Forms/Systems, Online, Manual Forms/Systems, and Others to investigate and rectify those failures to avoid their recurrence.

11. The time frame to address any errors/failures at different stages in manufacturing?

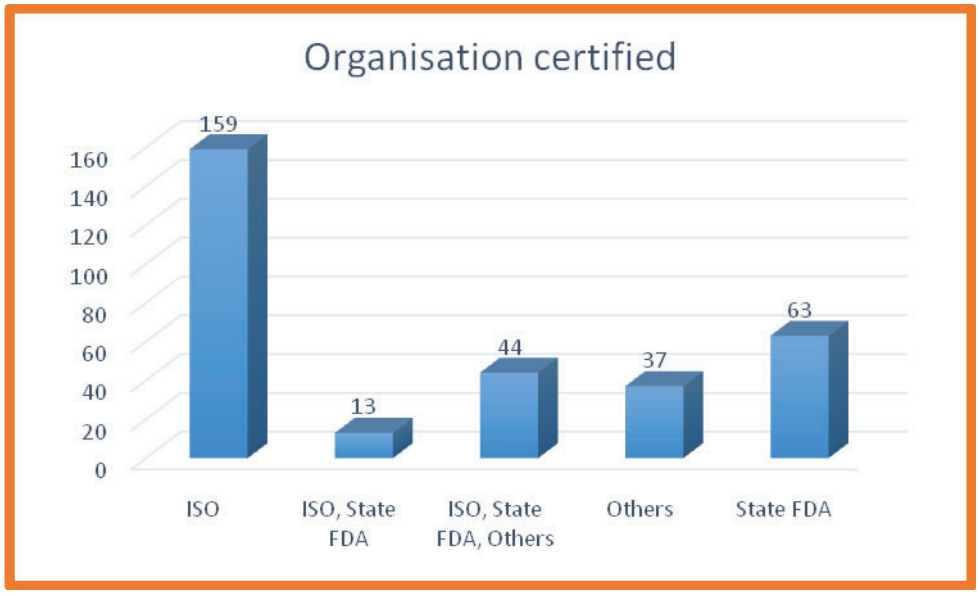
	Frequency	Percent	Valid Percent	Cumulative Percent
Between 30-60 days	84	0.27	27	27
Less than 30 days	183	0.58	58	85
More than 60 days	29	0.09	9	94
Others	20	0.06	6	100
Total	316			



From the above table/chart, we concluded that 58% of the respondents took less than 30 days to address any errors/failures at different stages in manufacturing.

12. Your organization is certified with

	Frequency	Percent	Valid Percent	Cumulative Percent
ISO	159	0.5	50	50
ISO, State FDA	13	0.04	4	54
ISO, State FDA, Others	44	0.14	14	68
Others	37	0.12	12	80
State FDA	63	0.2	20	100
Total	316			

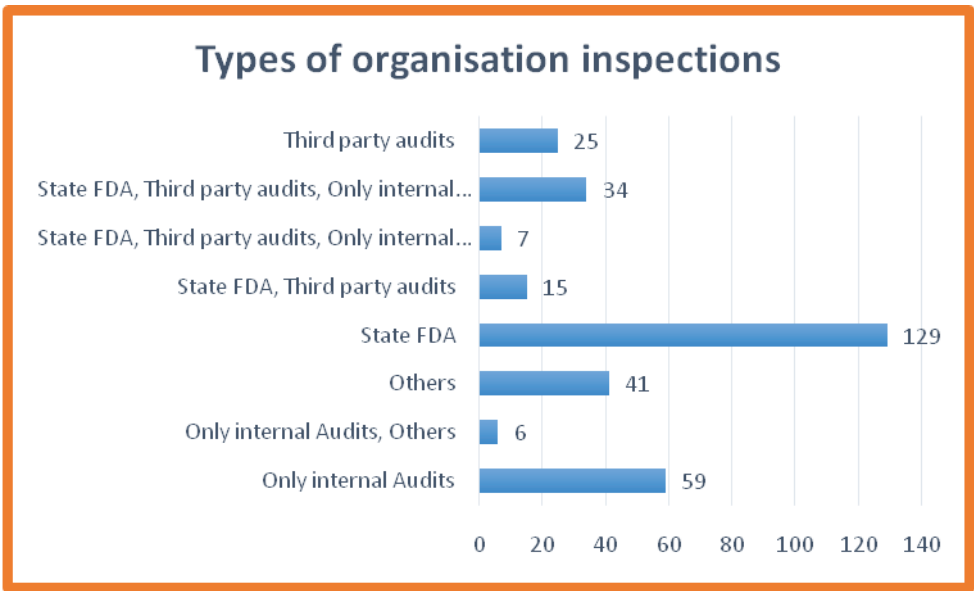


From the above table/chart, we conclude that more than 50% of the organizations were certified with ISO.

13. The type of inspections your organization undergoes:-

	Frequency	Percent	Valid Percent	Cumulative Percent
Only internal Audits	59	0.19	19	19
Only internal Audits, Others	6	0.02	2	21
Others	41	0.13	13	34
State FDA	129	0.41	41	75
State FDA, Third party audits	15	0.04	4	79
State FDA, Third-party audits, Only internal Audits	7	0.02	2	81

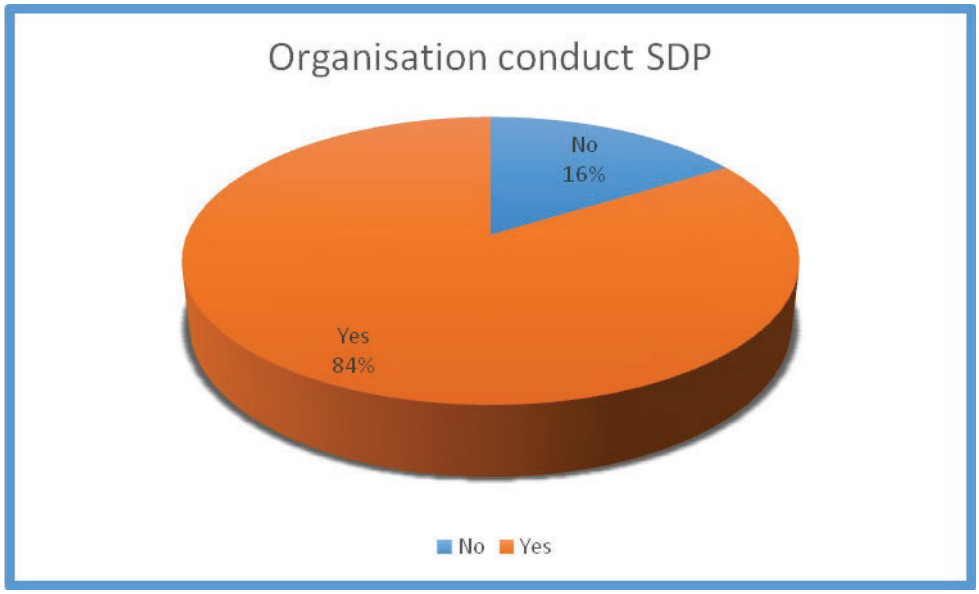
State FDA, Third-party audits, Only internal Audits, Others	34	0.11	11	92
Third-party audits	25	0.08	8	100
Total	316			



From the above table/chart we concluded that the majority of the organizations i.e., 41% had undergone FDA type of inspection.

14. Does your organization conduct/organize skill development programs

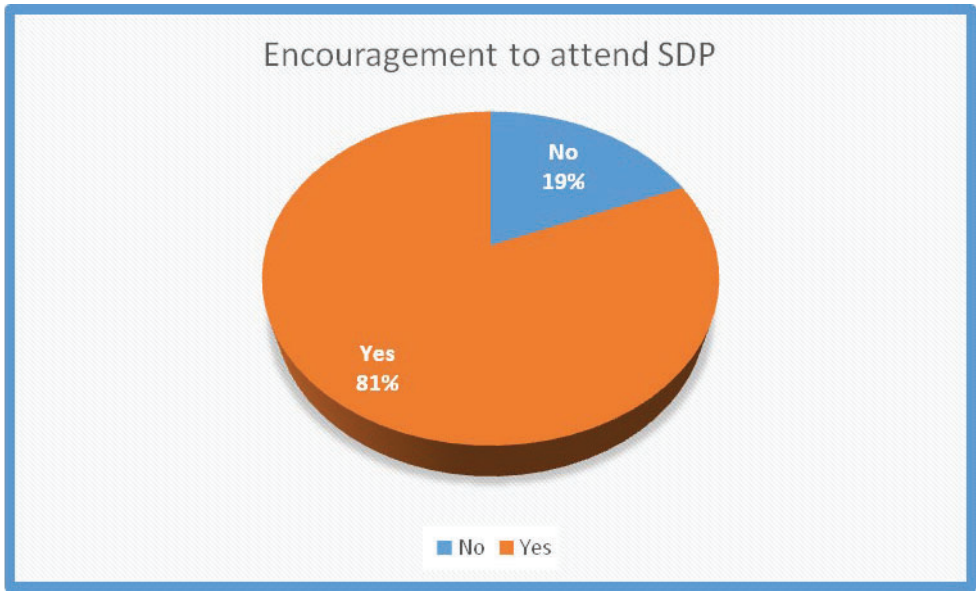
	Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
No	51	0.16	16	16
Yes	265	0.84	84	100
Total	316			



From the above table/chart, we conclude that except 16% of the organizations remaining all conducted the skill development programs.

15. Does your organization encourage you to attend skill development programs conducted by Government organizations or other peer group organizations?

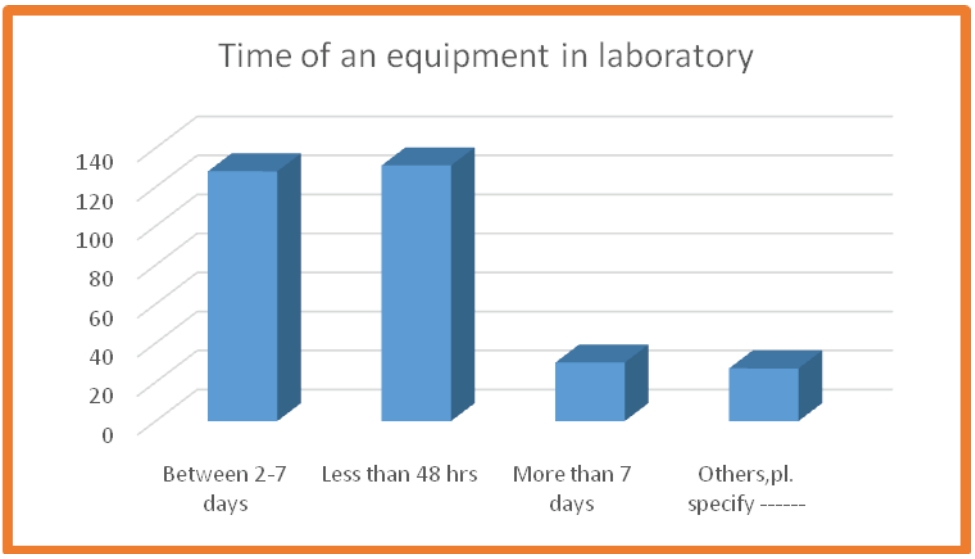
	Frequency	Percent	Valid Percent	Cumulative Percent
No	59	0.19	19	19
Yes	257	0.81	81	100
Total	316			



From the above table/chart we concluded that most of the respondents i.e., 81% felt that their organization encouraged to attend skill development programs .

16. Usual down time of equipment in the manufacturing area or the laboratory is :

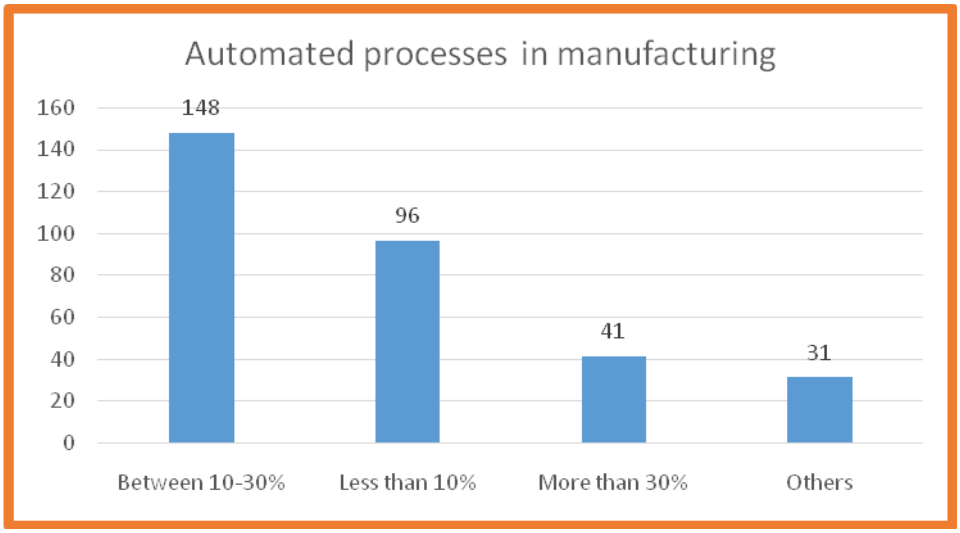
	Frequency	Percent	Valid Percent	Cumulative Percent
Between 2-7 days	128	0.4	40	40
Less than 48 hrs.	131	0.42	42	82
More than 7 days	30	0.1	10	92
Others, pl. specify ----	27	0.08	8	100
Total	316			



From the above table/chart we concluded that most of the respondents i.e., 82% felt that the usual downtime of an equipment in manufacturing area or in the laboratory was less than 7 days (42% -- less than 48hrs, 40% -- between 2 to 7 days).

17.The Processes in manufacturing were Automated up to :

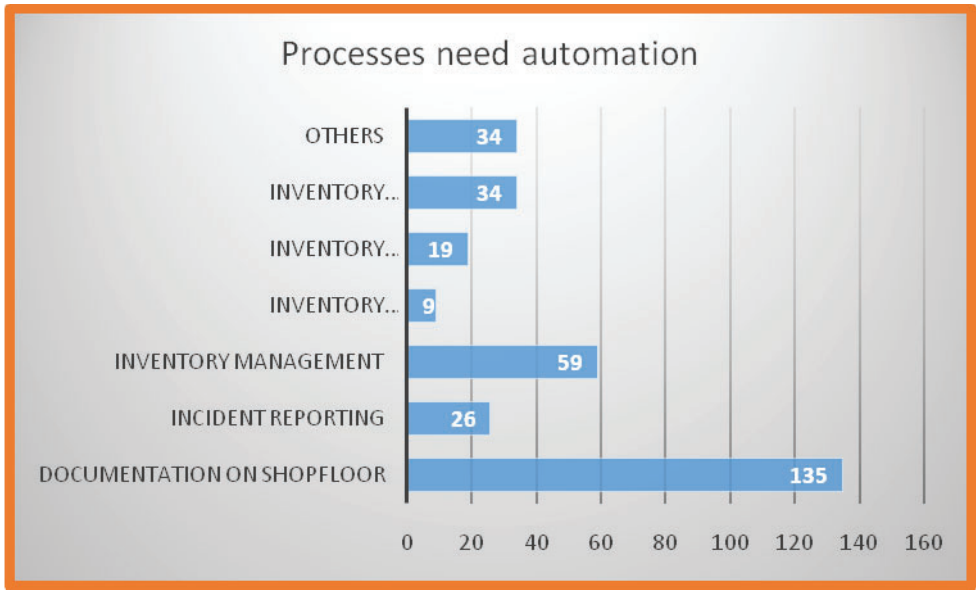
	Frequency	Percent	Valid Percent	Cumulative Percent
Between 10-30%	148	0.47	47	47
Less than 10%	96	0.3	30	77
More than 30%	41	0.13	13	90
Others	31	0.1	10	100
Total	316			



From the above table/chart we concluded that most of the respondents i.e., 47% felt that the processes in manufacturing were automated up to between 10 – 30%.

18. The processes which still need automation were :

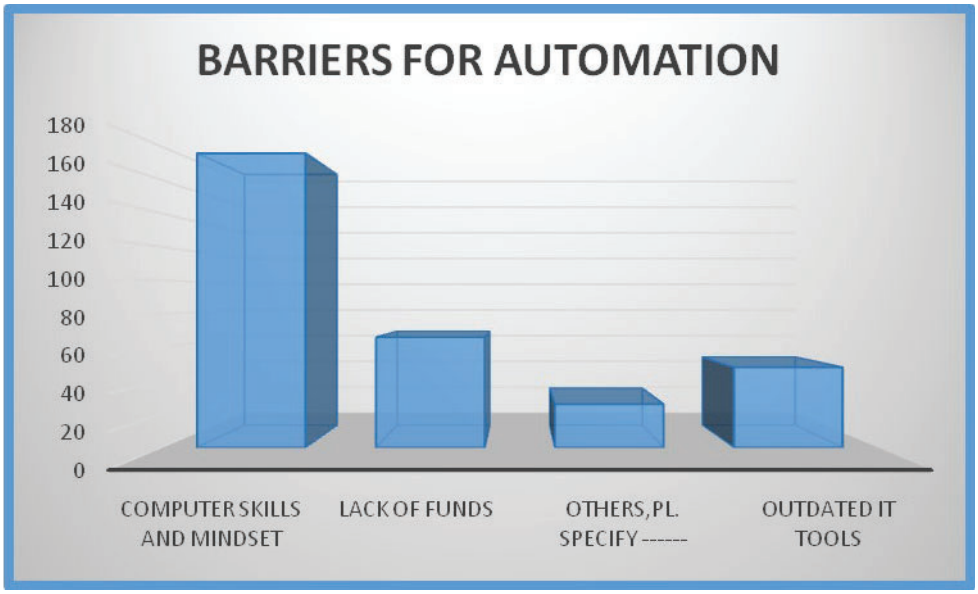
	Frequency	Percent	Valid Percent	Cumulative Percent
Documentation on shopfloor	135	0.43	43	43
Incident reporting	26	0.08	8	51
Inventory management	59	0.19	19	70
Inventory management, Documentation on shopfloor	9	0.02	2	72
Inventory management, Documentation on shopfloor, Incident reporting	19	0.06	6	78
Inventory management, Documentation on shopfloor, Incident reporting, Others	34	0.11	11	89
Others	34	0.11	11	100
Total	316			



From the above table/chart we concluded that most of the respondents i.e., 43% felt that the process documentation on shopfloor still need automation.

19. The barriers for automation were:-

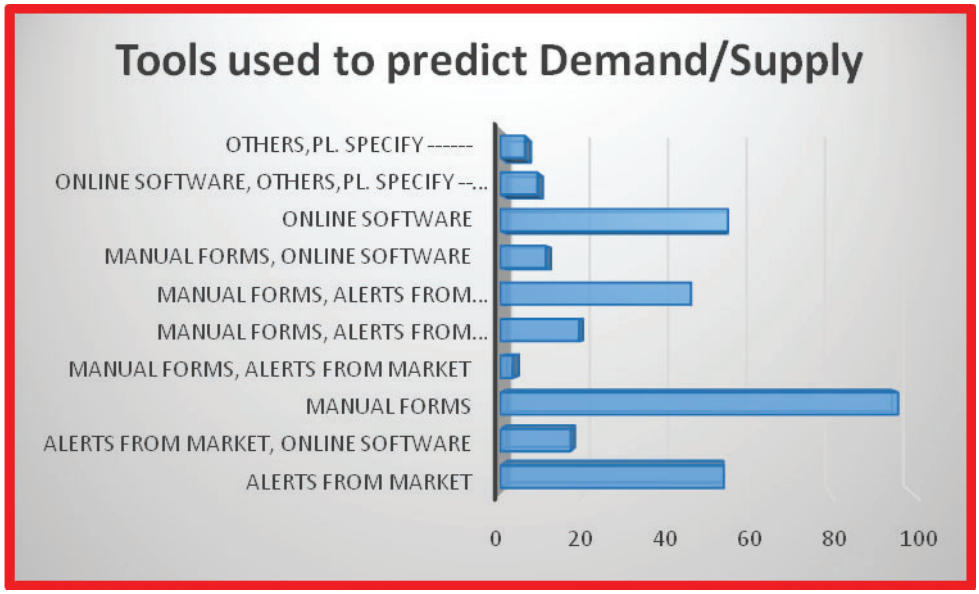
	Frequency	Percent	Valid Percent	Cumulative Percent
Computer Skills and mindset	176	0.56	56	56
Lack of funds	66	0.21	21	77
Others, pl. specify ------	26	0.08	8	85
Outdated IT tools	48	0.15	15	100
Total	316			



From the above graph, we concluded that 56% of the respondents felt that computer skills and mindset was the major barrier to automation.

20. The tools used to predict demand/supply for products being manufactured were :

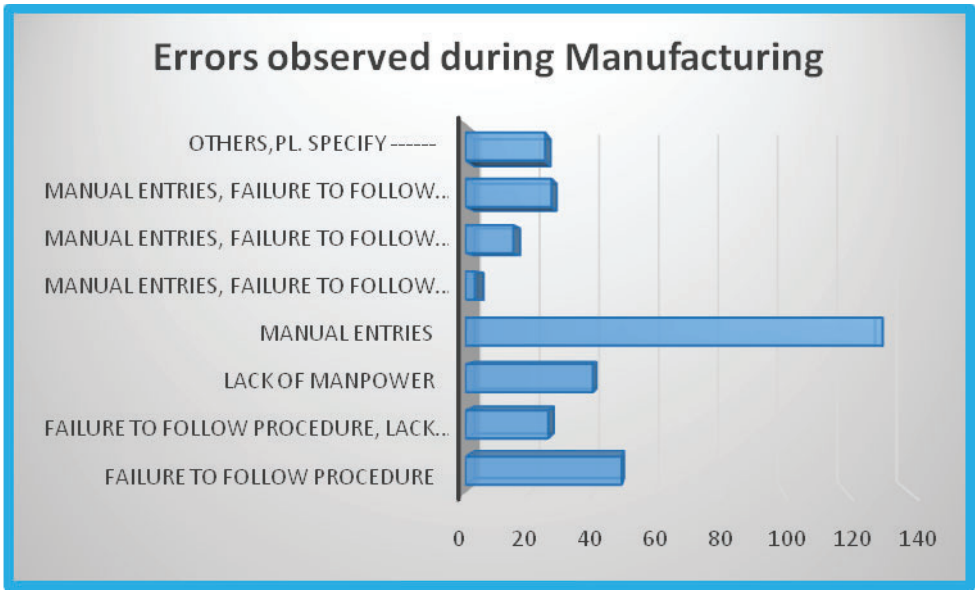
	Frequency	Percent	Valid Percent	Cumulative Percent
Alerts from market	54	0.17	17	17
Alerts from market, Online software	17	0.05		22
Manual Forms	96	0.3	30	52
Manual Forms, Alerts from market	3	0.01	1	53
Manual Forms, Alerts from market, Online software	19	0.06	6	59
Manual Forms, Alerts from market, Online software, Others,pl. specify ------	46	0.15	15	74
Manual Forms, Online software	11	0.03	3	77
Online software	55	0.17	17	94
Online software, Others,pl. specify ------	9	0.03	3	97
Others. specify ------	6	0.03	3	100
Total	316			



From the above graph we concluded that, 30% of the respondents felt that Manual Forms was the highly used tool for the predicting of Demand/Supply for products being manufactured.

21.The errors observed during manufacturing can be attributed to

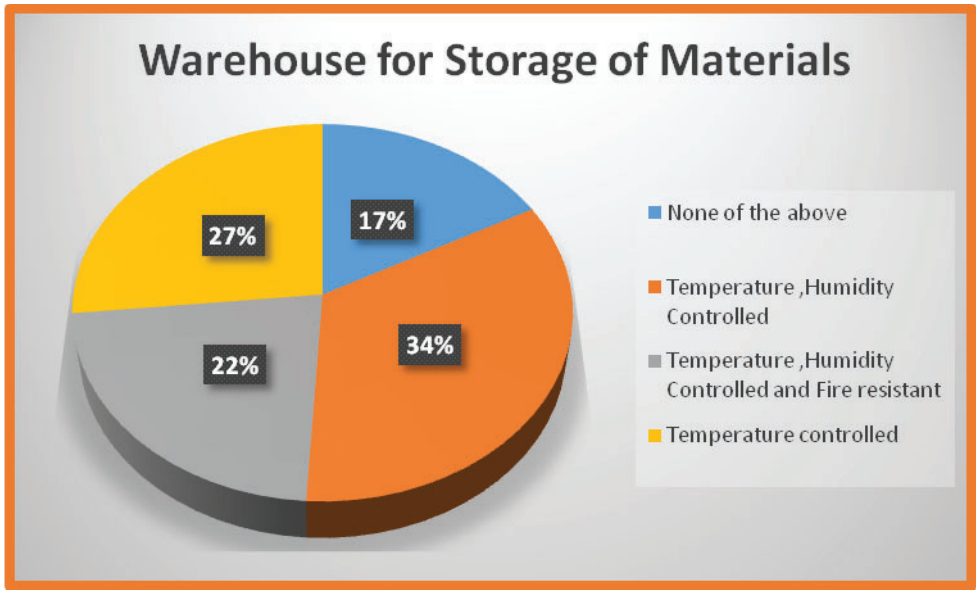
	Frequency	Percent	Valid Percent	Cumulative Percent
Failure to follow procedure	49	0.15	15	15
Failure to follow procedure, Lack of manpower	26	0.08	8	23
Lack of manpower	40	0.13	13	36
Manual entries	131	0.42	42	78
Manual entries, Failure to follow procedure	3	0.01	1	79
Manual entries, Failure to follow procedure, Lack of manpower	15	0.05	5	84
Manual entries, Failure to follow procedure, Lack of manpower, Others,pl. specify ------	27	0.08	8	92
Others,pl. specify ------	25	0.08	8	100
Total	316			



According to data, 42% of the respondents felt that Manual Entries were the major errors observed during manufacturing.

22.The warehouse for storage of materials (RM and FP) were:

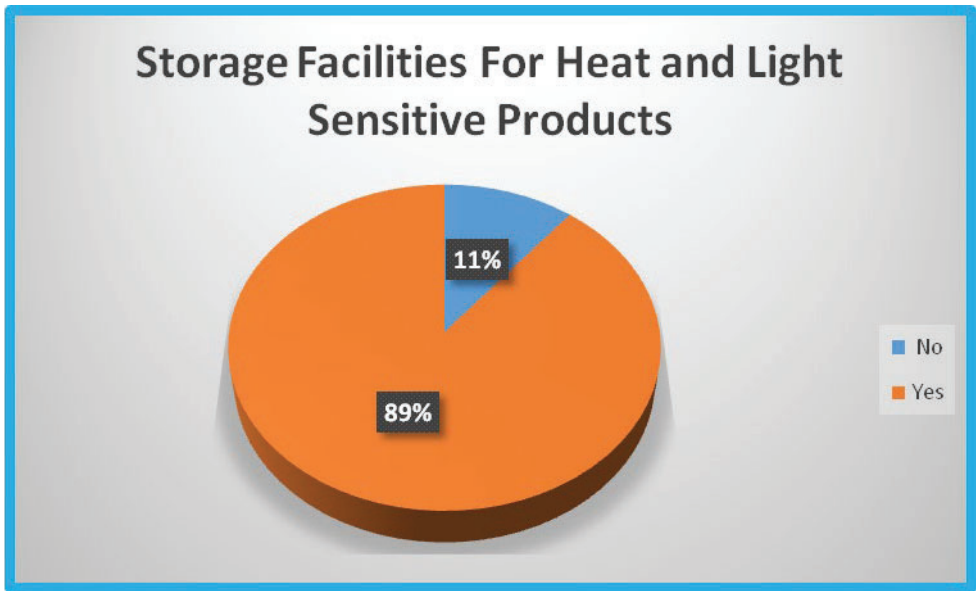
	Frequency	Percent	Valid Percent	Cumulative Percent
None of the above	54	0.17	17	17
Temperature ,Humidity Controlled	107	0.34	34	51
Temperature ,Humidity Controlled and Fire resistant	71	0.22	22	73
Temperature controlled	84	0.27	27	100
Total	316			



From the above graph we concluded that,34% of the respondents felt that Temperature ,Humidity Controlled is the best warehouse for storage of materials (RM and FP).

23.There were different storage facilities for Heat and Light Sensitive products:

	Frequency	Percent	Valid Percent	Cumulative Percent
No	34	0.11	11	11
Yes	282	0.89	89	100
Total	316			



The majority of the respondents i.e., 89% of the respondents felt that there were different storage facilities for **Heat and Light Sensitive products.**

24.The usual time of product to reach the retailer from your warehouse after dispatch is:

	Frequency	Percent	Valid Percent	Cumulative Percent
Between 5-10 days	138	0.44	44	44
Less than 5 days	154	0.49	49	93
More than 10 days	16	0.05	5	98
Others	8	0.02	2	100.0
Total	316			

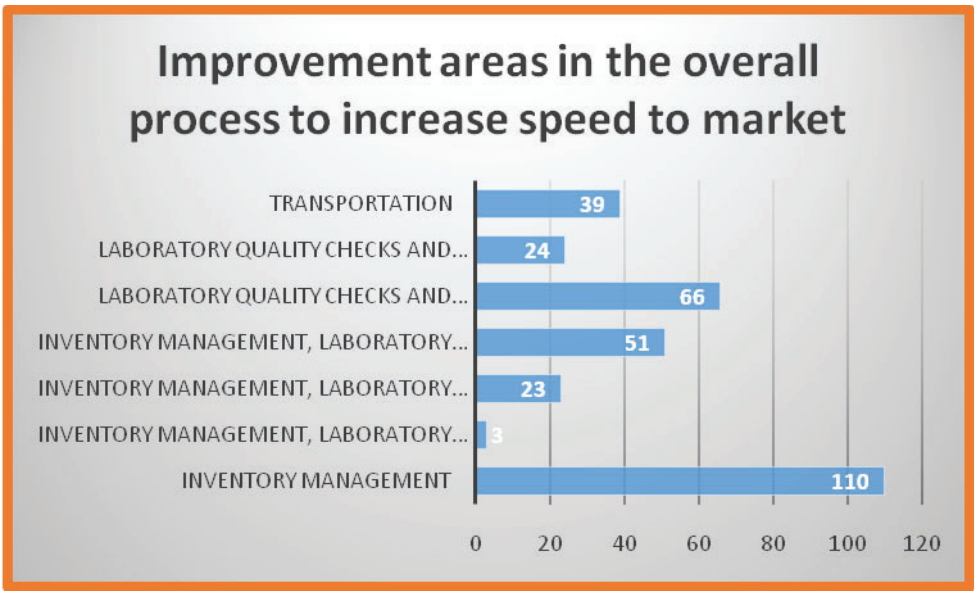


From the above graph we concluded that,93% of the respondents felt that the usual time of product to reach the retailer from warehouse after dispatch was less than 10 days. Among them, 49% of the respondents felt that the usual time of product to reach the retailer from warehouse after dispatch was less than 5 days.

25.The improvement in the overall process to increase speed to market were?

	Frequency	Percent	Valid Percent	Cumulative Percent
Inventory management	110	0.35	35	35
Inventory management, Laboratory Quality Checks and record keeping	3	0.01	1	36
Inventory management, Laboratory Quality Checks	23	0.07	7	43

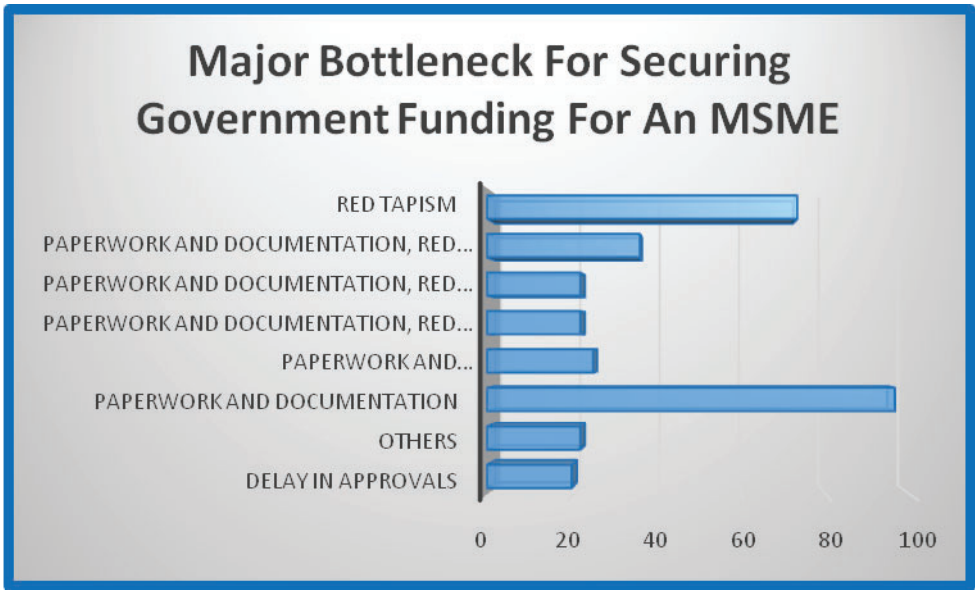
and record keeping, Transportation				
Inventory management, Laboratory Quality Checks and record keeping, Transportation, Others	51	0.16	16	59
Laboratory Quality Checks and record keeping	66	0.21	21	80
Laboratory Quality Checks and record keeping, Transportation	24	0.08	8	88
Transportation	39	0.12	12	100
Total	316			



The majority of the respondents i.e., 35% felt that the inventory management would be improved in the overall process to increase speed to market and according to respondents the next most important area for the improvement was Laboratory Quality Checks and record keeping.

26.The major bottleneck for securing government funding for an MSME is:

	Frequency	Percent	Valid Percent	Cumulative Percent
Delay in approvals	20	0.06	6	6
Others	22	0.07	7	13
Paperwork and documentation	96	0.3	30	43
Paperwork and documentation, Delay in approvals	25	0.08	8	51
Paperwork and documentation, Red Tapism	22	0.07	7	58
Paperwork and documentation, Red Tapism, Delay in approvals	22	0.07	7	65
Paperwork and documentation, Red Tapism, Delay in approvals, Others	36	0.12	12	77
Red Tapism	73	0.23	23	100
Total	316			

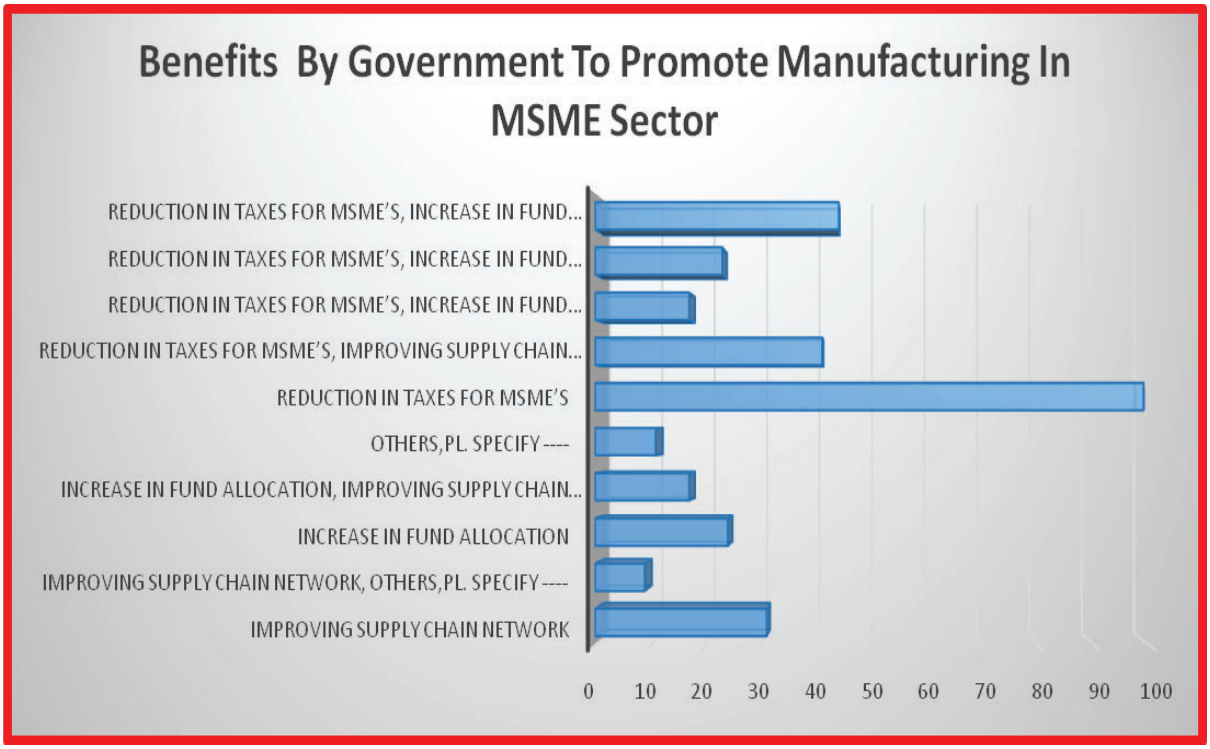


Most of the respondents felt that **paper work and documentation** and **Red Tapism** were the major bottleneck for securing government funding for an MSME. In that 30% of the

respondents felt that the **Paper work and documentation** was the reason whereas 23% of the respondents felt that **Red Tapism** was the reason.

27.Other benefits which can be extended by government to promote manufacturing in MSME sector were :

	Frequency	Percent	Valid Percent	Cumulative Percent
Improving supply chain network	31	0.1	10	10
Improving supply chain network, Others,pl. specify ----	9	0.03	3	13
Increase in Fund allocation	24	0.08	8	21
Increase in Fund allocation, Improving supply chain network	17	0.05	5	26
Others,pl. specify ----	11	0.04	4	30
Reduction in taxes for MSME's	99	0.31	31.0	61
Reduction in taxes for MSME's, Improving supply chain network	41	0.13	13.0	74
Reduction in taxes for MSME's, Increase in Fund allocation	17	0.05	5.0	79
Reduction in taxes for MSME's, Increase in Fund allocation, Improving supply chain network	23	0.07	7.0	86
Reduction in taxes for MSME's, Increase in Fund allocation, Improving supply chain network, Others,pl. specify ----	44	0.14	14.0	100.0
Total	316			



From the above graph we concluded that the major respondents i.e., 31% of the respondents felt that they needed **Reduction in taxes for MSME's** as a benefit from the government to promote manufacturing in MSME sector.

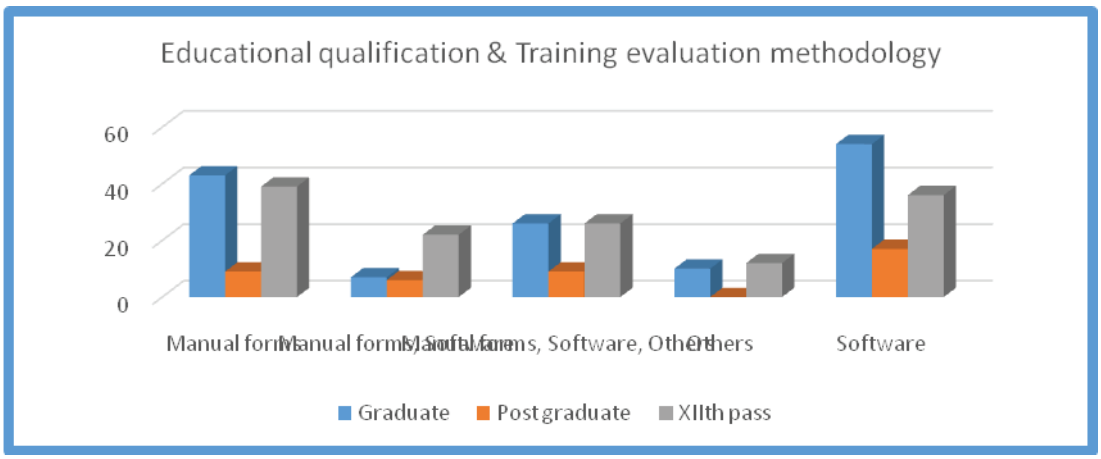
II. Relationship analysis

I. Q1 vs Q3

1.The basic educational qualification of personnel on the shop floor is:

3.Training Evaluation (effectiveness check) Methodology followed by your organization

		Q3					Total
		Manual forms	Manual forms, Software	Manual forms, Software, Others	Others	Software	
Q1	Graduate	43	7	26	10	54	140
	Post graduate	9	6	9	0	17	41
	XIIth pass	39	22	26	12	36	135
Total		91	35	61	22	107	316



From the above table one concluded that the persons with higher education qualification were using software for training evaluation methodology followed by their organization.

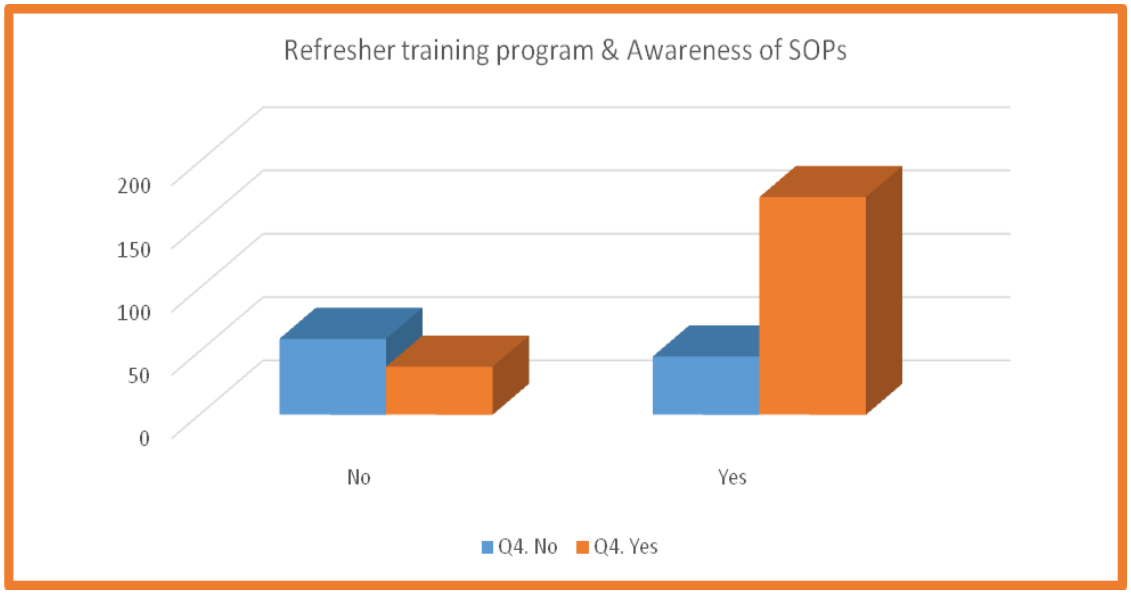
To examine results with population

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	16.753	8	0.033
Likelihood Ratio	20.419	8	0.009
N of Valid Cases	316		

Since P value = 0.033 is less than 0.05, that is, **there is some relationship between the educational qualification of personnel and Training Evaluation Methodology followed by organization**.

II. Q4 vs Q6

4.Have you undergone the refresher training program?



6.Were you aware of the Standard Operating Procedures (SOPs) of your organization?

		Q6		Total
		No	Yes	
Q4	No	60	46	106
	Yes	38	172	210
Total		98	218	316

From the above table we concluded that those who had undergone the refresher training program were mostly aware of the Standard Operating Procedures (SOPs) of organization. The refresher training program had some effect on getting awareness of SOPs of organization.

To examine results with population:

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	48.825	1	0		
Continuity Correction	47.042	1	0		
Likelihood Ratio	47.652	1	0		
Fisher's Exact Test				0	0
N of Valid Cases	316				

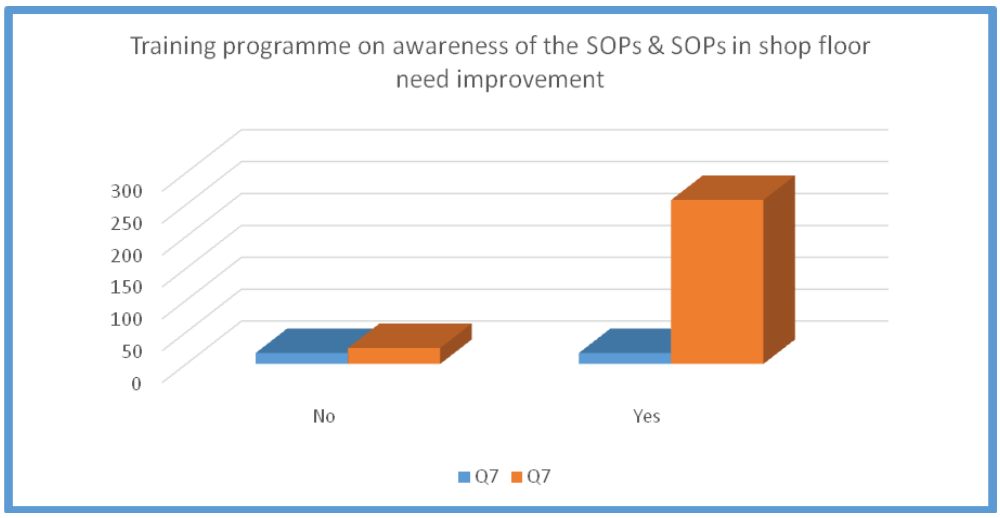
Since P value = 0 is less than 0.05, that is, **the refresher training program is beneficial in increasing awareness of SOPs of organization.**

III. Q7 vs Q8

7. Did the Induction/Training program help you get awareness of the SOPs.

8.Do you think SOPs that were followed in the shop floor need improvement?

		Q8		Total
		No	Yes	
Q7	No	17	17	34
	Yes	25	257	282
Total		42	274	316



From the above table one concluded that most of the respondents those who have awareness of the SOPs thought that SOPs that were followed in the shop floor needed improvement.

To examine results with population

Chi-Square Tests					
	Value	df	Asymptotic Significance(2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	44.548	1	0		
Continuity Correction	41.051	1	0		
Likelihood Ratio	31.67	1	0		
Fisher's Exact Test				0	0
N of Valid Cases	316				

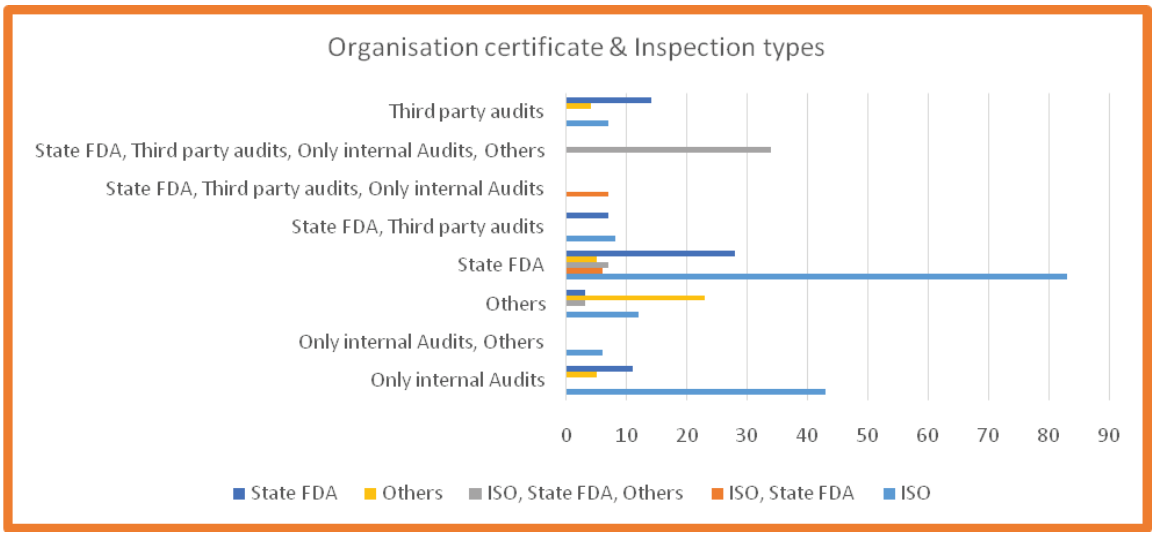
Since P value = 0 is less than 0.05, that is **those people who got awareness of SOPs through training program think that SOPs that were followed in the shop floor need improvement**.

IV. Q12 vs Q13

12.Your organization is certified with

		Q13								
		Only internal Audits	Only internal Audits, Others	Others	State FDA	State FDA, Third party audits	State FDA, Third party audits, Only internal Audits	State FDA, Third party audits, Only internal Audits, Others	Third party audits	Total
Q12	ISO	43	6	12	83	8	0	0	7	159
	ISO, State FDA	0	0	0	6	0	7	0	0	13
	ISO, State FDA, Others	0	0	3	7	0	0	34	0	44
	Others	5	0	23	5	0	0	0	4	37
	State FDA	11	0	3	28	7	0	0	14	63
	Total	59	6	41	129	15	7	34	25	316

13.The type of inspections your organization undergoes



From the above table one concluded that most of the organizations were certified with ISO and state FDA is one major inspection type which every organization had undergone.

To examine results with population

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	527.637	28	0
Likelihood Ratio	322.173	28	0
N of Valid Cases	316		

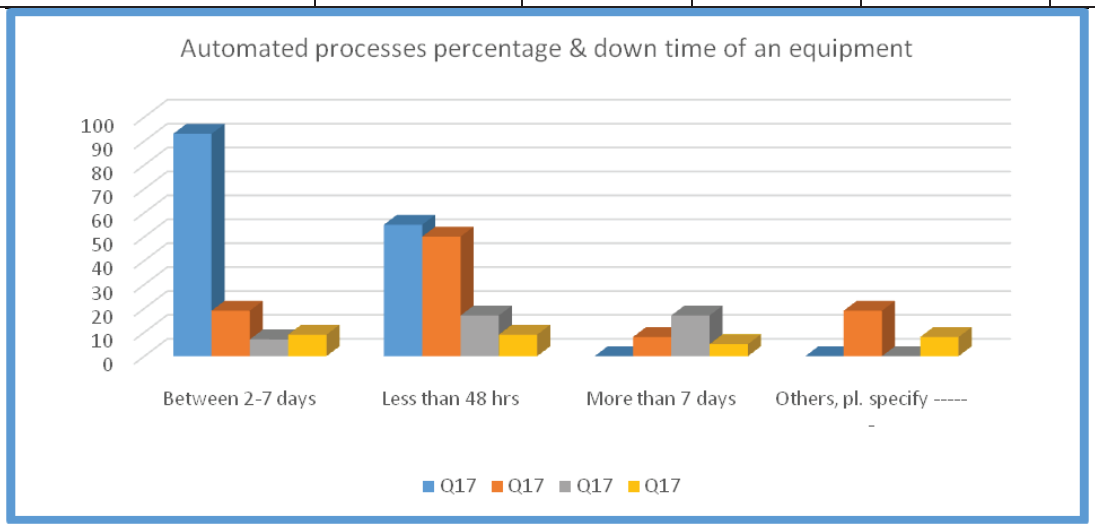
Since P value = 0 is less than 0.05 , that **is the organizational certificate depends upon type of inspections an organization undergoes.**

V. Q17 vs Q16

17.The Processes in manufacturing were Automated up to :

16.Usual down time of an equipment in manufacturing area or in the laboratory is

		Q16				Total
		Between 2-7 days	Less than 48 hrs.	More than 7 days	Others,pl. specify ---	
Q17	Between 10-30%	93	55	0	0	148
	Less than 10%	19	50	8	19	96
	More than 30%	7	17	17	0	41
	Others	9	9	5	8	31
Total		128	131	30	27	316



From the above table we concluded that, the most of the processes in manufacturing were automated up to less than 30%(i.e., both between 10-30% and less than 10%) and the usual downtime of an equipment in that processes in manufacturing area was less than 7 days (i.e., between 2-7 days and less than 48 hrs.).

To examine results with population

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	140.321	9	0
Likelihood Ratio	143.698	9	0
N of Valid Cases	316		

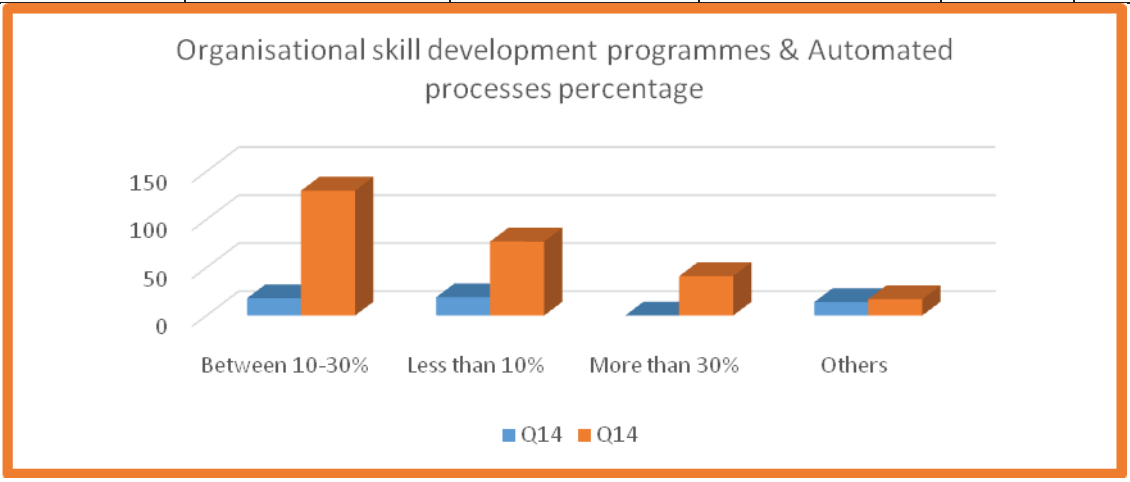
Since P value = 0 is less than 0.05 , the **less automated processes have equipment that takes more down time in manufacturing area**

VI. Q14 vs Q17

14.Does your organization conduct/organize skill development programs

17.The Processes in manufacturing were Automated up to:

		Q17				Total
		Between 10-30%	Less than 10%	More than 30%	Others	
Q14	No	18	19	0	14	51
	Yes	130	77	41	17	265
Total		148	96	41	31	316



From the above table one concluded that most of the organizations which conducted skill development program had less percentage of automated processes in manufacturing.

To examine results with population

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	29.858	3	0
Likelihood Ratio	31.559	3	0

N of Valid Cases	316		

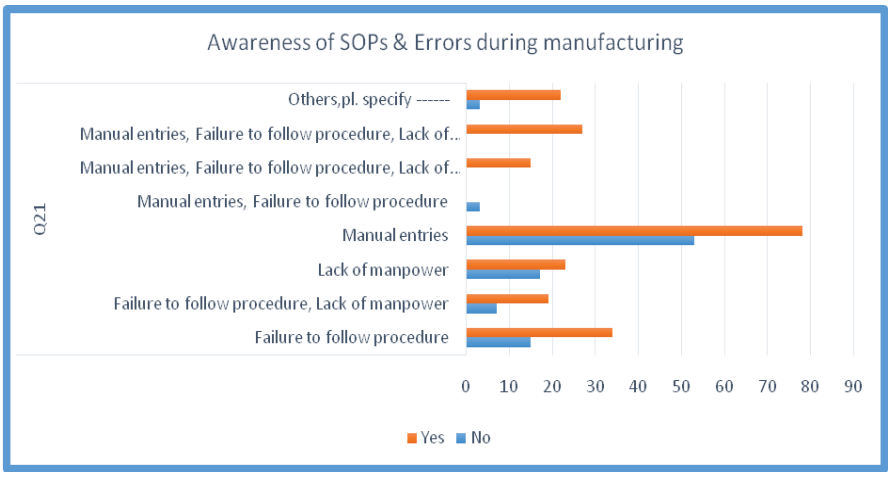
Since P value = 0 is less than 0.05 , that is **the percentage of processes in manufacturing were Automated is less than in the organizations which conduct skill development programs.**

VII. Q6 vs Q21

6.Were you aware of the Standard Operating Procedures (SOPs) of your organization?

21.The errors observed during manufacturing can be attributed to

		Q6		Total
		No	Yes	
Q21	Failure to follow procedure	15	34	49
	Failure to follow procedure, Lack of manpower	7	19	26
	Lack of manpower	17	23	40
	Manual entries	53	78	131
	Manual entries, Failure to follow procedure	3	0	3
	Manual entries, Failure to follow procedure, Lack of manpower	0	15	15
	Manual entries, Failure to follow procedure, Lack of manpower, Others,pl. specify ------	0	27	27
	Others,pl. specify ------	3	22	25
Total		98	218	316



From the above table one concluded that more number of errors during manufacturing were in the organizations where the persons were not aware of the SOPs.

To examine results with population

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	37.915	7	0
Likelihood Ratio	50.983	7	0
N of Valid Cases	316		

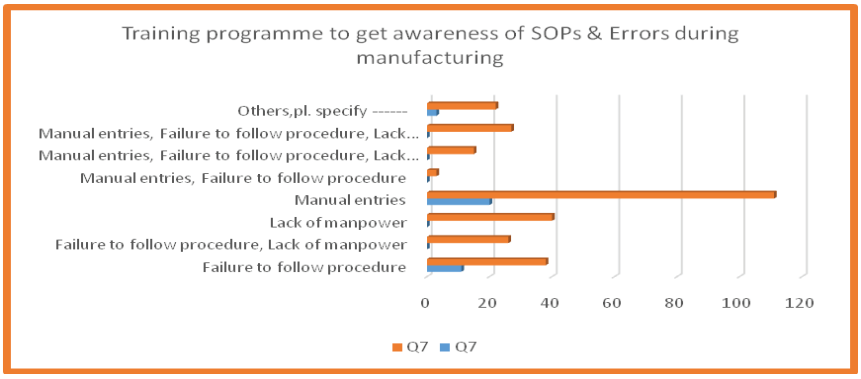
Since P value = 0 is less than 0.05 , that is **there were more number of errors during manufacturing were in the organizations in which the persons have awareness of the SOPs**.

VIII. Q7 vs Q21

7. Did the Induction/Training program help you get awareness of the SOPs.

21.The errors observed during manufacturing can be attributed to

		Q7		Total
		No	Yes	
Q21	Failure to follow procedure	11	38	49
	Failure to follow procedure, Lack of manpower	0	26	26
	Lack of manpower	0	40	40
	Manual entries	20	111	131
	Manual entries, Failure to follow procedure	0	3	3
	Manual entries, Failure to follow procedure, Lack of manpower	0	15	15
	Manual entries, Failure to follow procedure, Lack of manpower, Others,pl. specify ------	0	27	27
	Others,pl. specify ------	3	22	25
Total		34	282	316



From the above table one can concluded that there **were more number of errors during manufacturing in the organizations which got awareness of the SOPs by training program. This can be attributed to more manual systems and good detection systems**

To examine results with population

Chi-Square Tests			
	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	23.168	7	0.002
Likelihood Ratio	33.31	7	0
N of Valid Cases	316		

Since P value = 0.002 is less than 0.05 , that is **there were more number of errors during manufacturing were in the organizations which got awareness of the SOPs by training program.**

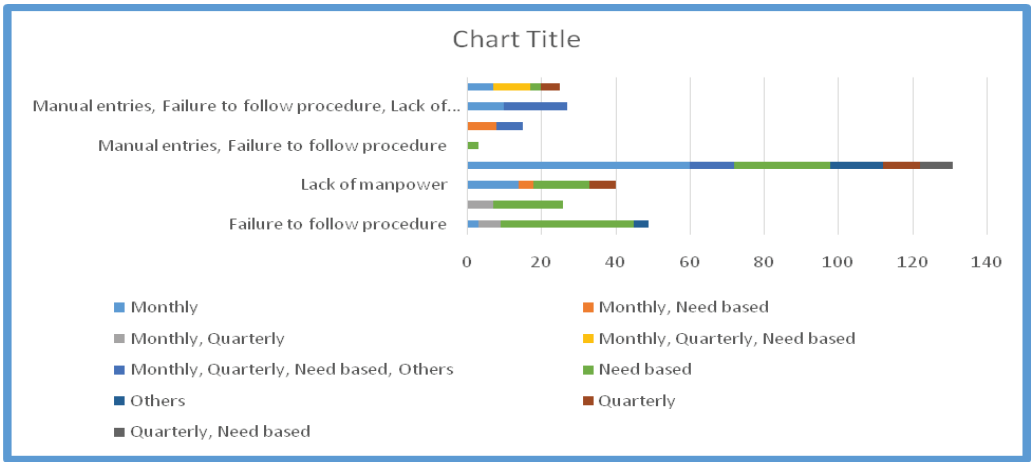
IX. Q5 vs Q21

5.Mention the frequency of the refresher training program

21.The errors observed during manufacturing can be attributed to

Q21	Q5									Total
	Monthly	Monthly, Need based	Monthly, Quarterly	Monthly, Quarterly, Need based	Monthly, Quarterly, Need based, Others	Need based	Others	Quarterly	Quarterly, Need based	
Failure to follow procedure	3	0	6	0	0	36	4	0	0	49
Failure to follow procedure, Lack of manpower	0	0	7	0	0	19	0	0	0	26
Lack of manpower	14	4	0	0	0	15	0	7	0	40
Manual	60	0	0	0	12	26	14	10	9	131

entries										
Manual entries, Failure to follow procedure	0	0	0	0	0	3	0	0	0	3
Manual entries, Failure to follow procedure, Lack of manpower	0	8	0	0	7	0	0	0	0	15
Manual entries, Failure to follow procedure, Lack of manpower, Others,pl. specify ------	10	0	0	0	17	0	0	0	0	27
Others,pl. specify ------	7	0	0	10	0	3	0	5	0	25
Total	94	12	13	10	36	102	18	22	9	316



From above table one can concluded that the frequency of refresher training program has some impact on the errors observed during manufacturing.

To examine results with population

Chi-Square Tests			
	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	523.158	56	0
Likelihood Ratio	395.149	56	0
N of Valid Cases	316		

Since P value = 0 is less than 0.05 , that **is more number of errors were occurring based on the how frequent the refresher training program is happening.**

III. Component wise/Category wise analysis

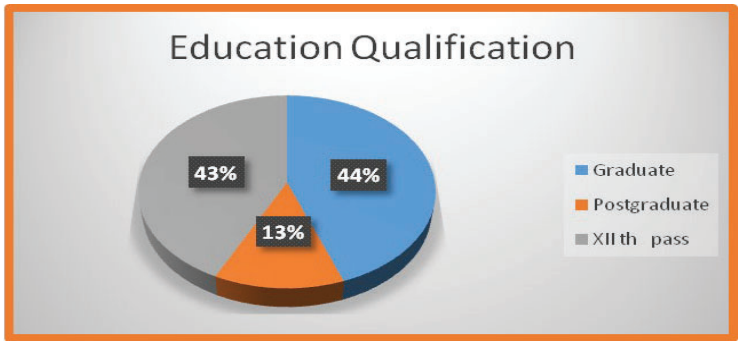
1. People:

People were critical for managing, improving the operational efficiency.

The efficiency is measured by the qualification. Higher qualification will indicate better efficiency.

Education qualification:

	Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Graduate	140	0.44	44	44
Postgraduate	41	0.23	13	57
XIIth pass	135	0.43	43	100
Total	316			



From the above chart, we concluded that graduates and XIIth pass had the same response rate(i.e.,44%).A single indicator(I_1) for people was computed:-

From principal component analysis the weight or relative importance is 0.68, i.e., $w_1 = 0.68$.

The number of graduates and postgraduates were 181 and the percentage is 0.57, i.e., p_1 = 0.57.

$$I_1 = w_1 * p_1 = 0.68 * 0.57$$

$$I_1 = 0.39.$$

A single indicator for people is 0.39, i.e., $I_1 = 0.39$.

People were influencing operational efficiency up to 0.39.

2. Processes:

Processes is the key for managing/improving Operational efficiency.

The following questions Q2,Q4,Q6,Q12,Q14 were related to the processes.

2Q. Type of Induction/Training Programmed Undergone(Tick All That Apply)?

4Q. Have You Undergone the Refresher Training Program?

6Q. Were You Aware of The Standard Operating Procedures (SOPs) Of Your Organization?

12Q. Your Organization Is Certified With?

14Q. Does Your Organization Conduct/Organize Skill Development Programs?

Summary of the questions - condense all the questions.

Must give one number /fractions which will indicate the impact of processes.

The Principal Component Analysis has the following weights for the questions.

For question 2: W_2 =0.66

For question 4: W_4=0.78

For question 6: W_6=0.75

For question 12: W_{12}=0.62

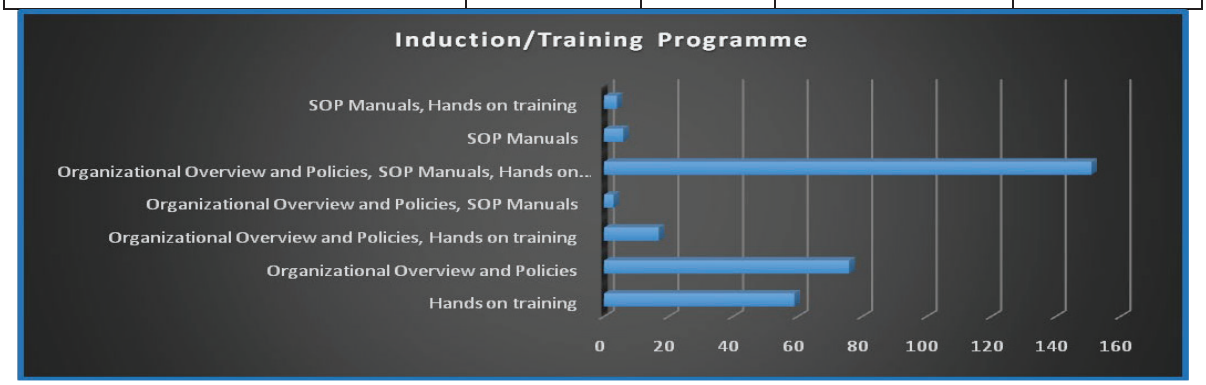
For question 14: W_{14}=0.75

A single indicator for all these questions indicating process is computed as follows.

2Q. Type of Induction/Training Programmed Undergone(Tick All That Apply).

	Frequency	Percent	Valid Percent	Cumulative Percent
Hands-On Training	59	0.19	19	19
Organizational Overview and Policies	76	0.24	24	43
Organizational Overview and	17	0.05	5	48

Policies, Hands-On Training				
Organizational Overview and Policies, SOP Manuals	3	0.01	1	49
Organizational Overview and Policies, SOP Manuals, Hands-On Training	151	0.48	48	97
SOP Manuals	6	0.02	2	99
SOP Manuals, Hands-On Training	4	0.01	1	100
Total	316			



Most of the respondents underwent an organizational overview, and reviewed policies, and sop manuals, while some chose a combination of organizational overview and policies along with hands-on training.

For this the positive respondents were :

a. Organizational Overview and Policies, SOP Manuals , Hands – On Training.
b. Only Hands on Training.
c. Only Organizational Overview and Policies Were Of High Importance From Respondents Point Of View.

The Proportions.

- 0.48 i.e., Organizational Overview and Policies, Sop Manuals, Hands – On Training.(P1)
- 0.19 i.e., Only Hands on Training.(P2)
- 0.24 i.e., Only Organizational Overview and Policies.(P3)

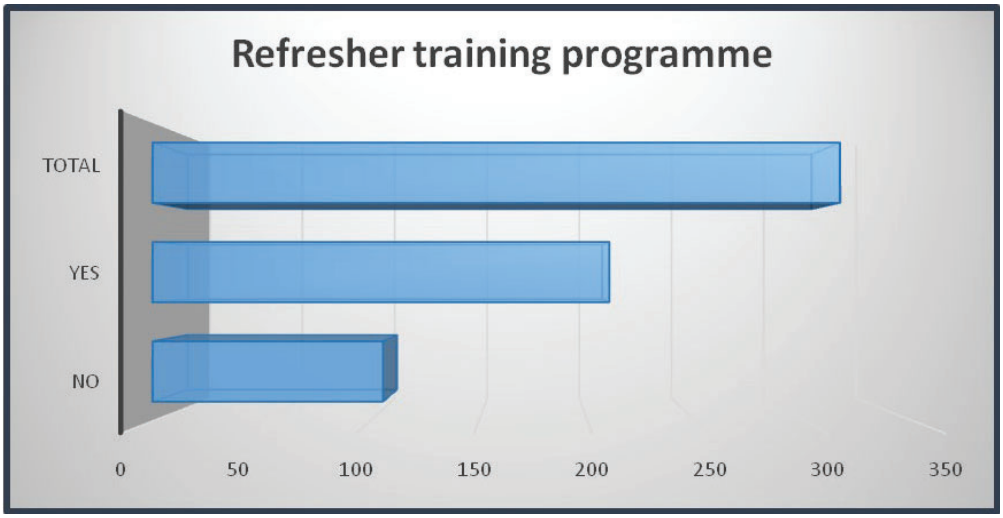
The overall proportions of Q2 can be taken as

$P_2=(0.48+0.19+0.25)/3=0.30.$

$P_2=0.30$

4Q. Have You Undergone the Refresher Training Program?

	Frequency	Percent	Valid Percent	Cumulative Percent
No	106	0.34	34	34
Yes	210	0.66	66	100
Total	316			



Based on the graph above, we concluded that the majority of respondents had participated in the refresher training program.

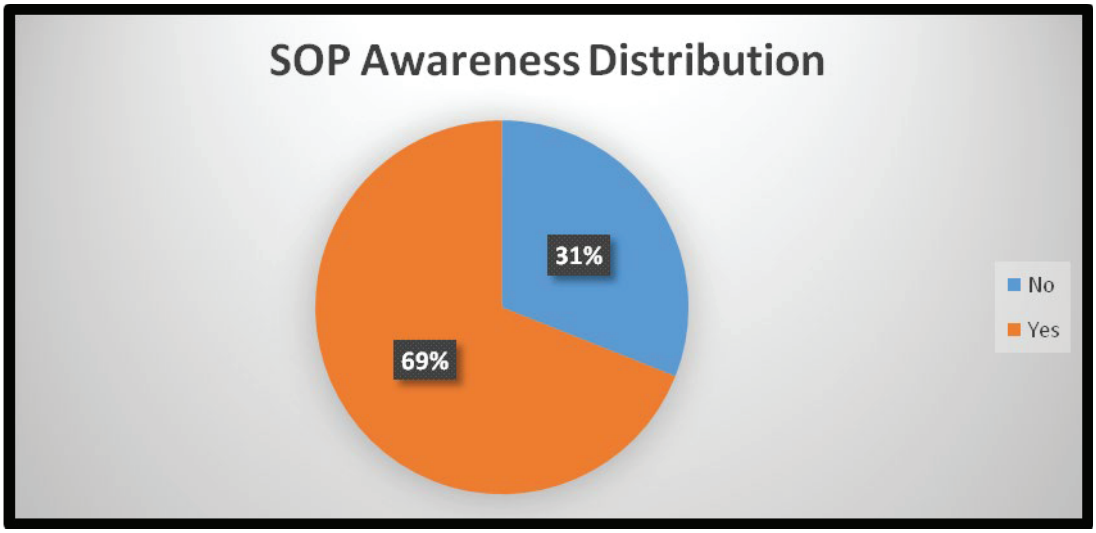
Respondents had attended the refresher training program proportions as.

$P_4 = 210/316=0.66$

$P_4 =0.66$

6Q. Were you Aware of the Standard Operating Procedures (SOPs) of Your Organization?

	Frequency	Percent	Valid Percent	Cumulative Percent
No	98	0.31	31	31
Yes	218	0.69	69	100
Total	316			



Most employees, around 69%, were aware of our organization's Standard Operating Procedures (SOPs), which was positive for maintaining consistency and quality. However, about 31% were not aware, indicating a need to improve communication and training to ensure everyone knew the sops, which were essential for smooth operations.

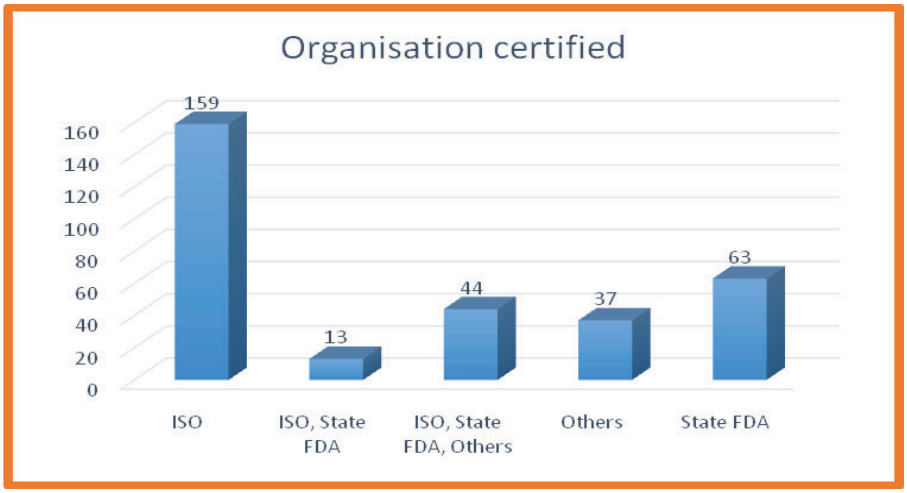
Were you Aware of the Standard Operating Procedures (SOPs) of Your Organization?

218 gave a response that they were aware of SOPs, the proportion was :-

P_6=0.69

12Q. Your Organization Is Certified With?

	Frequency	Percent	Valid Percent	Cumulative Percent
ISO	159	0.50	50	50
ISO, State FDA	13	0.04	4	54
ISO, State FDA, Others	44	0.14	14	68
Others	37	0.12	12	80
State FDA	63	0.20	20	100
Total	316			



From the above table/chart, we concluded that more than 50% of the organizations were certified with ISO.

Your Organization Is Certified With

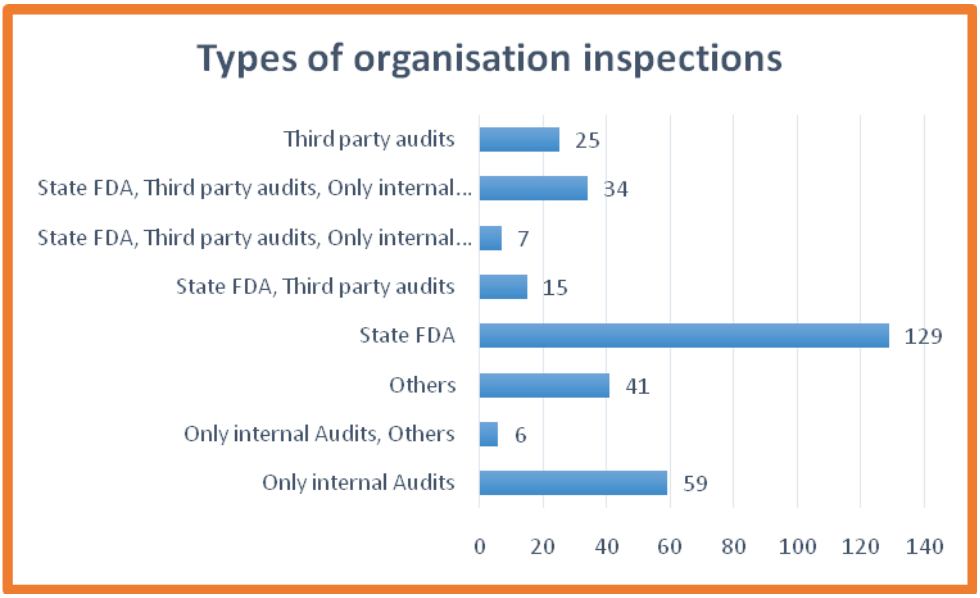
- ISO – 159 = 0.50
- State FDA – 63 = 0.20
- ISO, State FDA, Others – 44 = 0.14

The proportion of companies that have at least one type of certification.

$P_{12}=(0.50+0.20+0.14)/3 = 0.28$

14Q . Does your organization conduct/organize Skill Development Programs?

	Frequency	Percent	Valid Percent	Cumulative Percent
Only Internal Audits	59	0.19	19	19
Only Internal Audits, Others	6	0.02	2	21
Others	41	0.13	13	34
State FDA	129	0.41	41	75
State FDA, Third Party Audits	15	0.04	4	79
State FDA, Third-Party Audits, Only Internal Audits	7	0.02	2	81
State FDA, Third-Party Audits, Only Internal Audits, Others	34	0.11	11	92
Third-Party Audits	25	0.08	8	100
Total	316			



From the above table/chart we concluded that the majority of the organizations i.e., 41% had undergone the FDA type of inspection.

Does your organization conduct/ organize Skill Development Program?

254 respondents mentioned that yes, their companies conduct Skill Development Program.

The proportion was

P_{14} = 254/316=0.80(80%).

The overall percentage operational efficiency of MSME generic pharma.

$$I_2 = \frac{W_2 * P_2 + W_4 * P_4 + W_6 * P_6 + W_{12} * P_{12} + W_{14} * P_{14}}{W_2 + W_4 + W_6 + W_{12} + W_{14}}$$

$$I_2 = \frac{0.66 * 0.30 + 0.78 * 0.66 + 0.75 * 0.69 + 0.65 * 0.28 + 0.75 * 0.80}{0.66 + 0.78 + 0.75 + 0.65 + 0.75}$$

I_2=0.56

We could inform that the processes impacted/improved operational efficiency up to 56%.

3. Technology

The influence of technology in managing/ improving the operational Efficiency of MSME in generic pharma.

Technology is key for any company in particular Bulk Drug/Generic Pharmacy Industry.

The following QuestionsQ10,Q17,Q20,Q21 considered to represent technology.

10Q. The tools used to Investigate and rectify those failures to avoid their recurrence?

17Q.The Processes in manufacturing were Automated up to :

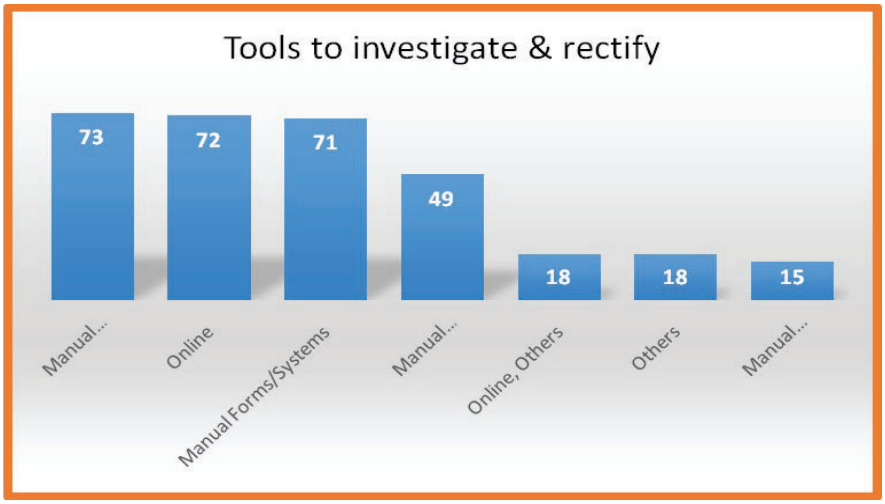
20Q. The tools used to predict demand/supply for products being manufactured were :
21Q.The errors observed during manufacturing can be attributed to:

The weights or relative importance's were 0.70,0.60,0.60,0.30.These weights were obtained from principal component analysis.

Summary of the questions/condense the questions.
A single indicator of all these questions indicating technology in computed as follows

10. The tools used to Investigate and rectify those failures to avoid their recurrence?

	Frequency	Percent	Valid Percent	Cumulative Percent
Manual Forms/Systems	71	0.22	22	22
Manual Forms/Systems, Online	49	0.15	15	37
Manual Forms/Systems, Online, Others	73	0.23	23	60
Manual Forms/Systems, Others	15	0.05	5	65
Online	72	0.23	23	88
Online, Others	18	0.06	6	94
Others	18	0.06	6	100
Total	316			



From the above table/chart, we concluded that most of the respondents(i.e., 58%) used the tools Manual Forms/Systems, Online, Manual Forms/Systems, and Others to investigate and rectify those failures to avoid their recurrence.

The tools used to investigate and rectify these failures to avoid their recurrence .

1.manual Forms /systems -71/316=0.22

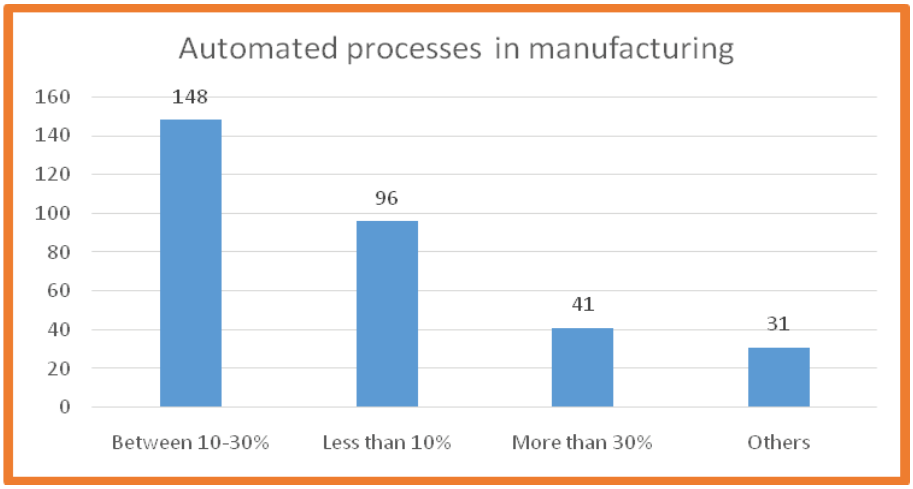
2.online-72/316=0.23

3.Manual forms/sysytems,online,others-73/316=0.23

The overall proportion is 0.22+0.23+0.23/3=0.23

17.The Processes in manufacturing were Automated up to :

	Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Between 10-30%	148	0.47	47	47
Less than 10%	96	0.3	30	77
More than 30%	41	0.13	13	90
Others	31	0.1	10	100
Total	316			



From the above table/chart we concluded that most of the respondents i.e., 47% felt that the processes in manufacturing were automated up to between 10 – 30%.

148 Respondents indicated that the Automation is due up to 10% -30%.

41 Respondents indicates that they have Automation more than 30%.

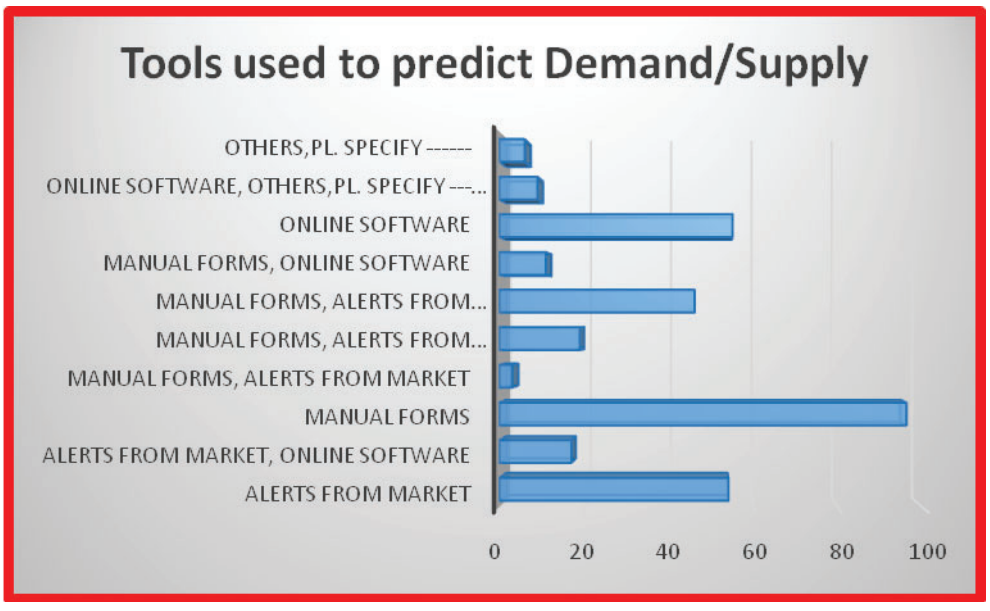
The Proportion is 148/316=0.47 ; 41/316=0.13

Let the proportion be p_{17} = (0.47+0.13)/2=0.30

20. The tools used to predict demand/supply for products being manufactured were :

	Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Alerts from market	54	0.17	17	17
Alerts from market, Online software	17	0.05		22
Manual Forms	96	0.3	30	52
Manual Forms, Alerts from market	3	0.01	1	53
Manual Forms, Alerts from market, Online software	19	0.06	6	59

Manual Forms, Alerts from market, Online software, Others,pl. specify ------	46	0.15	15	74
Manual Forms, Online software	11	0.03	3	77
Online software	55	0.17	17	94
Online software, Others,pl. specify ------	9	0.03	3	97
Others,pl. specify ------	6	0.03	3	100
Total	316			



From the above graph we concluded that, 30% of the respondents felt that Manual Forms was the highly used tool for the predicting of Demand/Supply for products being manufactured.

The tool used to predict Demand/Supply for products being manufactured were

1.Manual Forms 96/316=0.30

2.Online Software 55/316=0.17

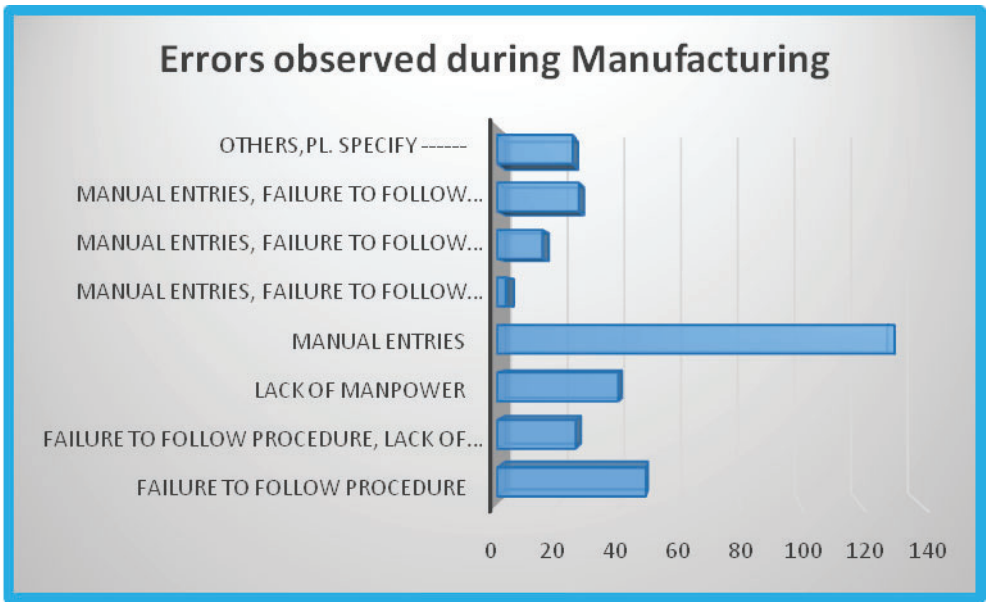
3.Alerts Form Market 54/316=0.17

The overall proportion is p_{20} = (0.17+0.17+0.30)/3= 0.21

21.The errors observed during manufacturing can be attributed to

	Frequency	Percent	Valid Percent	Cumulative Percent
Failure to follow procedure	49	0.15	15	15
Failure to follow procedure, Lack of manpower	26	0.08	8	23
Lack of manpower	40	0.13	13	36
Manual entries	131	0.42	42	78
Manual entries, Failure to follow procedure	3	0.01	1	79
Manual entries, Failure to follow procedure, Lack of manpower	15	0.05	5	84
Manual entries, Failure to follow procedure, Lack of	27	0.08	8	92

manpower, Others,pl. specify ------				
Others,pl. specify ------	25	0.08	8	100
Total	316			



According to 42% of the respondents felt that Manual Entries were the source of major errors observed during manufacturing

The error observed during manufacturing can be attribute to

1.Manual Entities - 131/316=0.41

2.Filure to follow procedure - 49/316=0.16

3.Lack of Manpower - 40/316=0.13

Overall proportion is 0.41+0.16+0.13/3=0.23

Overall impact of Technology on managing/improving operation/efficiency of MSME in generic pharma industry

$$I_3 = \frac{W_{17} * P_{17} + W_{20} * P_{20} + W_{10} * P_{10} + W_{21} * P_{21}}{W_{17} + W_{20} + W_{10} + W_{21}}$$

$$I_3 = \frac{0.70 * 0.3 + 0.60 * 0.21 + 0.60 * 0.23 + 0.30 * 0.23}{0.70 + 0.60 + 0.60 + 0.30}$$

$I_3 = 0.25$

It can be concluded that technology impacted operational efficiency of MSME in generic pharma industry unto 0.25(25%).

4. Infrastructure:

Following Questions Q22, Q23 were related to the infrastructure :

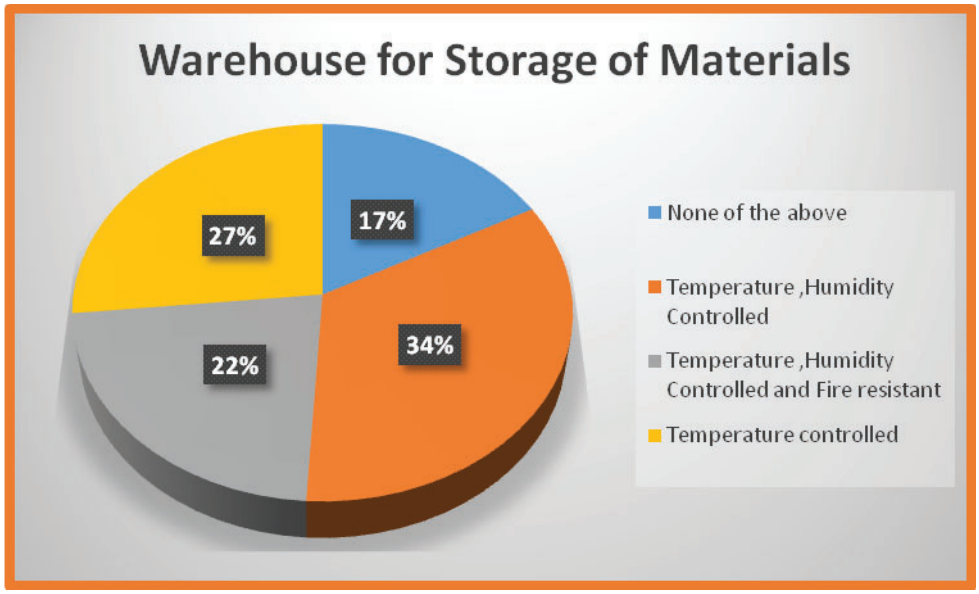
22Q.The warehouse for storage of materials (RM and FP) were:

23Q.There were different storage facilities for Heat and Light Sensitive products:

In the pharmaceutical industry, ensuring proper material storage was essential. A significant 89% of respondents acknowledged the need for specialized storage facilities for heat and light-sensitive products. Among preferred warehouse features, 34% opted for 'Temperature, Humidity Controlled' facilities, and 22% preferred those that were 'Temperature, Humidity Controlled and Fire Resistant', while 27% choose 'Temperature Controlled' storage.

22.The warehouse for storage of materials (RM and FP) were:

	Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
None of the above	54	0.17	17	17
Temperature ,Humidity Controlled	107	0.34	34	51
Temperature ,Humidity Controlled and Fire resistant	71	0.22	22	73
Temperature controlled	84	0.27	27	100
Total	316			



From the above graph we concluded that,34% of the respondents felt that **Temperature ,Humidity Controlled** was the best **warehouse for storage of materials (RM and FP).**

The Factors

1.Temperature ,Humidity Controlled

2. Temperature Controlled,

3. Temperature ,Humidity Controlled and Fire resistant

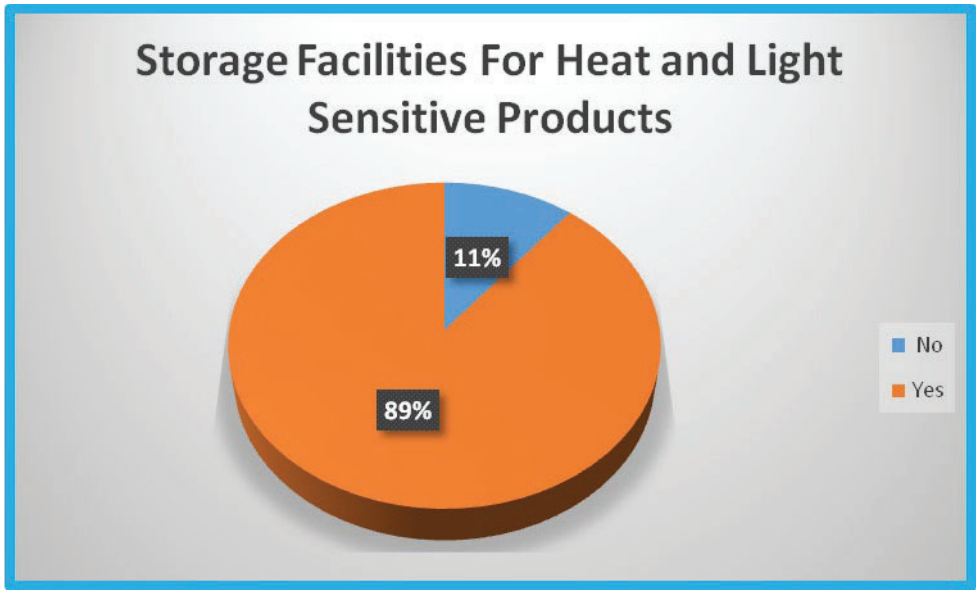
were the majority respondents chosen factors with Proportions 0.34,0.27,0.22

$$P_{22} = \frac{0.34 + 0.27 + 0.22}{3}$$

Overall Proportion of Q22 can be $P_{22} = 0.28$

23.There were different storage facilities for Heat and Light Sensitive products:

	Frequency	Percent	Valid Percent	Cumulative Percent
No	34	0.11	11	11
Yes	282	0.89	89	100
Total	316			



The majority of the respondents i.e., 89% of the respondents felt that there were different storage facilities for **Heat and Light Sensitive products.**

282 Respondents chosen option yes and it tells that There were different storage facilities for Heat and Light Sensitive products. i.e., $P_{23} = 0.89$

An indicator(I_4) for Infrastructure is computed as follows.

From principal component analysis the weights or relative importance is 0.82, 0.80

i.e., $w_{22} = 0.82$, $w_{23} = 0.80$, $P_{22} = 0.28$ and $P_{23} = 0.89$

The overall Percentage Operational Efficiency of MSME Generic pharma

$$I_4 = \frac{W_{22} * P_{22} + W_{23} * P_{23}}{W_{22} + W_{23}}$$

$$I_4 = \frac{0.82 * 0.28 + 0.80 * 0.89}{0.82 + 0.80}$$

An indicator for Infrastructure is 0.58, i.e., $I_4 = 0.58$.

Infrastructure is influencing operational efficiency up to 0.58.

5. Funding Ecosystem:

Following Questions Q26, Q27 were related to the Funding Ecosystem:

Q26: The major bottleneck for securing government funding for an MSME is:

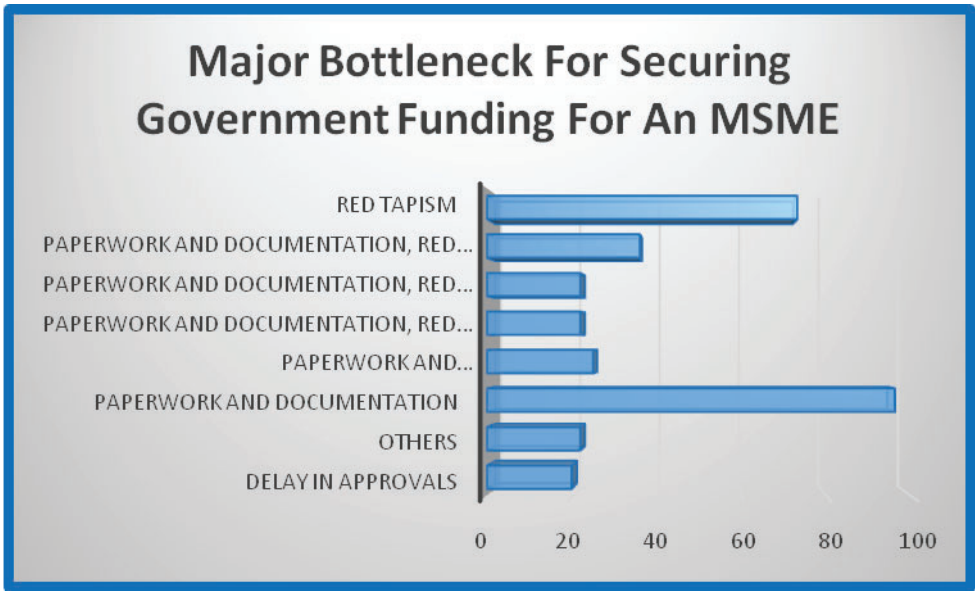
27.Other benefits which can be extended by government to promote manufacturing in MSME sector were:

In the generic pharmaceutical industry, MSMEs faced significant hurdles in securing government funding, with paperwork and documentation (30%) and red tape (23%) being the

major challenges. Respondents stressed the importance of reducing taxes for MSMEs (31%) and enhancing the supply chain network (10%) to promote manufacturing in the sector.

Q26: **The major bottleneck for securing government funding for an MSME is:**

	Frequency	Percent	Valid Percent	Cumulative Percent
Delay in approvals	20	0.06	6	6
Others	22	0.07	7	13
Paperwork and documentation	96	0.30	30	43
Paperwork and documentation, Delay in approvals	25	0.08	8	51
Paperwork and documentation, Red Tapism	22	0.07	7	58
Paperwork and documentation, Red Tapism, Delay in approvals	22	0.07	7	65
Paperwork and documentation, Red Tapism, Delay in approvals, Others	36	0.12	12	77
Red Tapism	73	0.23	23	100
Total	316			



The majority of the respondents felt that **paper work , documentation** and **Red Tapism** were the major bottleneck for securing government funding for an MSME, in that 30% of the respondents felt that the **Paper work and documentation** is the reason whereas 23% of the respondents felt that **Red Tapism** is the reason.

The Factors

1. Paperwork and documentation,
2. Red Tapism and
3. Paperwork and documentation, Red Tapism, Delay in approvals, Others.

Were the major bottleneck for securing government funding for an MSME from Respondents Point of View with Proportions 0.30,0.23,0.12.

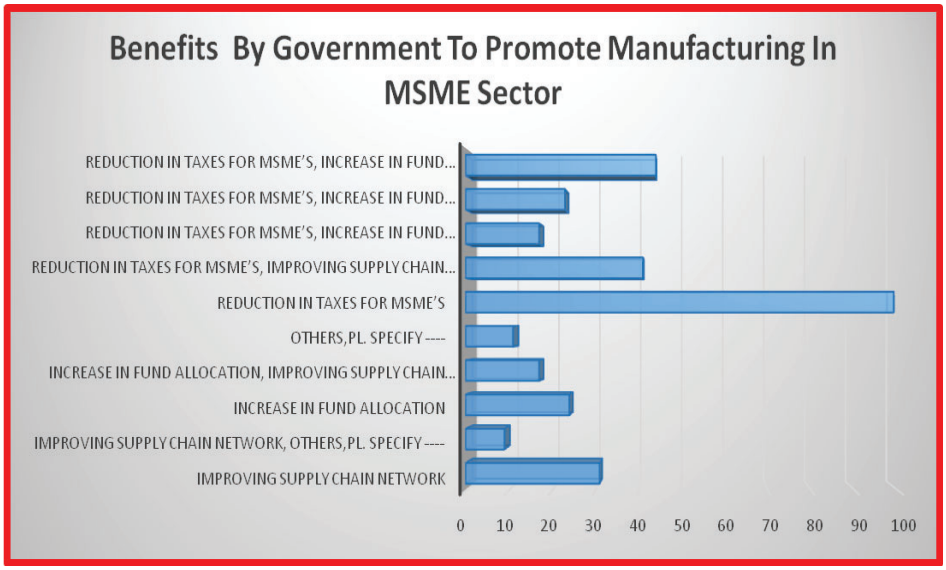
$$P_{26} = \frac{0.30 + 0.23 + 0.12}{3}$$

Overall Proportion of Q26 can be P26 = 0.22

27.Other benefits which can be extended by government to promote manufacturing in MSME sector were:

	Frequency	Percent	Valid Percent	Cumulative Percent
Improving supply chain network	31	0.1	10	10
Improving supply chain network, Others ,pl. specify -	9	0.03	3	13
Increase in Fund allocation	24	0.08	8	21
Increase in Fund allocation, Improving supply chain network	17	0.05	5	26
Others,pl. specify ----	11	0.04	4	30
Reduction in taxes for MSME's	99	0.31	31.0	61
Reduction in taxes for MSME's, Improving supply chain network	41	0.13	13.0	74
Reduction in taxes for MSME's, Increase in Fund	17	0.05	5.0	79

allocation				
Reduction in taxes for MSME's, Increase in Fund allocation, Improving supply chain network	23	0.07	7.0	86
Reduction in taxes for MSME's, Increase in Fund allocation, Improving supply chain network, Others,pl. specify ----	44	0.14	14.0	100
Total	316			



From the above graph we concluded that the major respondents i.e., 31% of the respondents felt that they needed "Reduction in taxes for MSME's" as a benefit from the government to promote manufacturing in MSME sector.

1. Reduction in taxes for MSME's,
2. Reduction in taxes for MSME's, Increase in Fund allocation, improving supply chain network, Others,pl. specify others,
3. Reduction in taxes for MSME's, Improving supply chain network
4. Improving supply chain network

These were the major benefits by government with proportions 0.31, 0.14, 0.13 and 0.10

$$P_{27} = \frac{0.31 + 0.14 + 0.13 + 0.10}{4}$$

Overall Proportion of Q27 can be $P_{27} = 0.17$

An indicator(I_5) for Funding is computed as follows. From principal component analysis the weights or relative importance is 0.82, 0.81 i.e., $w_{26} = 0.82$, $w_{27} = 0.81$, $P_{26} = 0.22$ and $P_{27} = 0.17$

The Overall Percentage Operational Efficiency of MSME Generic pharma

$$I_5 = \frac{W_{26} * P_{26} + W_{27} * P_{27}}{W_{26} + W_{27}}$$

$$I_5 = \frac{0.82 * 0.22 + 0.81 * 0.17}{0.82 + 0.81}$$

An indicator for Funding is 0.20, i.e., $I_5 = 0.20$.

Funding Ecosystem influencing operational efficiency up to 0.20.

HYPOTHESIS 1

H01: The relationship between people and process significantly impacts the operational efficiency in MSME

The people were impacting 57% and processes were impacting 56%. Both people and processes were managing/improving Operational Efficiency by 56.5% (or) 57% ----------(1)

Technology is managing/influencing operates efficiency up to 44% ----------(2)

From 1 & 2, It can be concluded that people and processes were more impactful than technology.

To check or examine whether the results can be attributes to the population, let us use large sample test for equality of means.

Let P1 be the proportion of impact of people and processes on Operational Efficiency in generic pharma industry.

Let P2 be the proportion of impact of technology on Operational Efficiency in generic pharma Industry.

H_0:p1=p2 i.e., Both people + processes and technology will leave same impact on operational efficiency.

Against

H_1:p1>p2 i.e., people + processes have higher impact than technology on operational efficiency.

Consider 5% Level of significance

$$Z_{cal} = \frac{p1 - p2}{\sqrt{pq(\frac{1}{n1} + \frac{1}{n2})}}$$

$$Z_{cal} = \frac{0.565 - 0.44}{\sqrt{0.5025 * 0.4975(\frac{1}{316} + \frac{1}{316})}}$$

= 0.12/0.040 = 3

$$p = \frac{316 * 0.565 + 316 * 0.44}{316 + 316}$$

$$p = \frac{0.565 + 0.44}{2}$$

$$p = 0.5025$$

Decision:

Reject H_0 at 5% Level of Significance when Z_{cal}>1.645

Z_{cal}=3 (i.e,3>1.645)

Hence, we concluded that, in **the sample, people and process significantly impact Operational efficiency. The effect of People and Process on Operational efficiency was more than Technology.**

HYPOTHESIS 2 & 3

H02: Infrastructure is a significant factor in enhancing operational efficiency in MSME

H03 :Technology is a significant factor in enhancing operational efficiency in MSME

Technology is managing/influencing operations efficiency up to 25% --------(1)

Infrastructure is managing/influencing operations efficiency up to 58% .....(2)

From 1 and 2, It can be concluded that infrastructure was more impactful than technology.

To check or examine whether the results can be attributed to the population.

Let us use a large sample test for equality of means.

Let P1 be the proportion of the impact of technology on operational efficiency in the generic pharma Industry.

Let P2 be the proportion of the impact of infrastructure on operational efficiency in the generic pharma Industry.

H_0:p1=p2 i.e., Both technology and infrastructure will leave same impact on operational efficiency.

Against

H_1:p1>p2 technology has a higher impact than infrastructure.

Consider a 5% Level of significance.

$$Z_{cal} = \frac{p1 - p2}{\sqrt{pq(\frac{1}{n1} + \frac{1}{n2})}}$$

$$Z_{cal} = \frac{0.25 - 0.58}{\sqrt{0.415 * 0.585(\frac{1}{316} + \frac{1}{316})}}$$

= -0.33/0.012 = -27.5

$$p = \frac{316 * 0.25 + 316 * 0.58}{316 + 316}$$

$$p = \frac{0.25 + 0.58}{2}$$

$$p = 0.415$$

Decision:

Reject H_1 at 5% Level of Significance when $Z_{cal} < 1.645$

Z_{cal}=-27.5 (i.e.,- 27.5 < 1.645)

From statements 1 and 2 above, based on analysis and interpretation, it could be concluded that Infrastructure impacts Operational Efficiency more than Technology.

HYPOTHESIS 4

H04: There is a significant relationship between Technology and Funding to enhance Operational efficiency in MSME

The funding ecosystem is managing/influencing operational efficiency by up to 20% .....(1)

The infrastructure is managing/influencing operational efficiency up to 58% .....(2)

To check or examine whether the results can be attributed to the population.

Let us use a large sample test for equality of means.

Let P1 be the proportion of the impact of the funding ecosystem on Operational Efficiency in the generic pharma Industry.

Let P2 be the proportion of the impact of Infrastructure on Operational Efficiency in the generic pharma Industry.

H_0:p1=p2 i.e., funding ecosystem and infrastructure have the same impact on Operational Efficiency.

Against

H_1:p1>p2 i.e., funding ecosystem have a higher impact than infrastructure on Operational Efficiency.

Consider a 5% Level of significance.

$$Z_{cal} = \frac{p1 - p2}{\sqrt{pq(\frac{1}{n1} + \frac{1}{n2})}}$$

$$Z_{cal} = \frac{0.20 - 0.58}{\sqrt{0.39 * 0.61(\frac{1}{316} + \frac{1}{316})}}$$

= -0.38/0.037 = -10.270

$$p = \frac{316 * 0.20 + 316 * 0.58}{316 + 316}$$

$$p = \frac{0.20 + 0.58}{2}$$

$$p = 0.39$$

Decision:

Reject H_1 at 5% Level of Significance when $Z_{cal} < 1.645$

Z_{cal}= -10.270 (i.e,-10.270 < 1.645)

From 1 and 2 above, it could be concluded that infrastructure was more impactful than funding ecosystem for enhancing Operational Efficiency. Also funding was not impacting Operational Efficiency in a significant way.

4.2 Hypothesis – Overall Findings

Hypothesis-1

H01: The relationship between people and process significantly impacts the operational efficiency in MSME

The people were impacting 57% and processes were impacting 56%. Both people and processes were managing/improving Operational Efficiency by 56.5% (or) 57% ----------(1)

Technology is managing/influencing operates efficiency up to 44% ----------(2)

Hence, we concluded that, in **the sample, people and process significantly impacted Operational efficiency. The effect of People and Process on Operational efficiency was more than Technology.**

Hypothesis 2 & 3

H02: Infrastructure is a significant factor in enhancing operational efficiency in MSME

H03 :Technology is a significant factor in enhancing operational efficiency in MSME

Technology is managing/influencing operations efficiency up to 25% --------(1)

Infrastructure is managing/influencing operations efficiency up to 58% .....(2)

From statements 1 and 2 above, based on analysis and interpretation, it could be concluded that Infrastructure impacted Operational Efficiency more than Technology.

Hypothesis 4

H04: There is a significant relationship between Technology and Funding to enhance Operational efficiency in MSME

The funding ecosystem is influencing operational efficiency by up to 20% .....(1)

The infrastructure is influencing operational efficiency up to 58% .....(2)

From 1 and 2 above, it can be concluded that infrastructure was more impactful than funding ecosystem for enhancing Operational Efficiency. Also based on limited data ,we concluded funding was not impacting Operational Efficiency in a significant way.

CHAPTER V.

CONCLUSION, IMPLICATIONS AND RECOMMENDATIONS FOR IMPROVEMENT AND FUTURE RESEARCH

Discussion, Evaluation and Recommendations for Improvement

Based on the responses collected by administering the questionnaire during the research, the following results and findings were obtained for each of the factors studied:

5.1 PEOPLE

Observations

- Among the respondents from MSMEs, 56% of companies required a minimum of a graduate degree for shop floor positions, while 43% accepted candidates with a 12th-grade education.
- Regarding the induction program at MSMEs, 78% of respondents reported receiving an organizational overview, policies, and hands-on training during induction.
- 44% of respondents reported receiving an organizational overview, policies, hands-on training, and an SOP manual as part of induction.
- 70% of the companies had a system (either manual or software-based) for checking training effectiveness, though only 33% used software.
- One-third of the respondents had not undertaken a refresher training program. Similarly, 32% said the refresher training was need-based, while 30% conducted training on a monthly basis.
- 68% of the respondents were familiar with the organization's SOPs, while 31% were not. A significant 88% indicated that the induction program helped them become aware of the SOPs.

Summary of findings and recommendations -People

- While the staff on the shop floor knew the organizational overview, they may not have had enough time to thoroughly review the SOPs before starting work. Technology adoption was minimal, with a heavy reliance on manual processes prone to errors and the risk of lost paperwork .The paper records were also prone to damage and manipulation with little or no protection. The data also indicated a gap in the continuous learning process as most of the trainings were done on need basis and not at regular frequency.
- The induction program helped newcomers but lacked a robust system to evaluate its effectiveness and did not provide enough time to go through SOP manuals before starting work.

- Approximately 40% of companies had 12th-grade graduates as their basic qualification for shop floor staff, highlighting the need for rigorous training and continuous learning programs.

5.2 PROCESS

Observations

- 87% of respondents indicated that shop floor SOPs needed improvement in terms of language, content, and communication.
- Mechanisms to report failures and investigate them were manual in 33% of respondent companies, while 31% used a combination of manual and online processes. Tools for rectifying failures were manual in 21% of companies, online in 23%, and a combination of both in 15%.
- 58% of respondents addressed failures on the shop floor within 30 days, while 26% took 30-60 days, exceeding regulatory standards.
- Nearly half of the MSMEs (48%) had ISO certification, 20% had State FDA certification, and only 4% had both. 38% had undergone State FDA inspections, but 19% had only internal audits, indicating a lack of regulatory oversight.
- 80% of MSMEs organized skill development programs and encouraged attendance.

Summary of findings and recommendations-Process

- Shop floor SOPs needed significant improvement in language and content. Quality issues should be handled electronically to build trust with regulators and create a robust system. Certifications should be expanded to increase market reach domestically and internationally.
- There was a need for better refresher training programs and a reduction in manual processes to improve skill levels and reduce errors.
- The low rate of State FDA-certified facilities highlighted the need to enhance systems and processes to meet both domestic and international regulatory standards.
- Internal processes could be made more efficient, with a focus on reducing the time to address failures and improving the training of staff.

5.3 TECHNOLOGY

Observations

- 40% of MSMEs addressed equipment downtime within 48 hours, and 80% addressed it within a week.
- 76% of companies reported that less than 30% of their processes were automated, while only 12% had more than 30% automation. Errors during manufacturing were due to failure to follow procedures (15%), lack of manpower (13%), and manual entries (39%).
- Two-thirds of respondents identified inventory management, documentation on the shop floor, and incident reporting as areas needing automation.
- 68% believed the main barriers to automation were computer skills, mindset, and outdated IT tools, while 20% cited a lack of funds. Demand-supply prediction tools were manual for 30% of companies, and 17% relied on market alerts.

Summary of findings and recommendations-Technology

- There was a need to reduce equipment downtime to improve productivity.Technology adoption should be increased to move processes to online platforms.
- Inventory management, documentation, and incident reporting were largely manual and needed automation. Improved demand-supply prediction tools would help optimize manufacturing and market reach.
- Manual entries contributed to most errors on the shop floor, highlighting the need for online systems and better training programs.

5.4 INFRASTRUCTURE

Observations

- Warehouse storage facilities were temperature-controlled (26%), temperature and humidity controlled (28%), and temperature, humidity, and fire-resistant (23%).
- 88% had different storage facilities for heat and light-sensitive products, while 10% did not had that facility.
- 47% of respondents said products took less than 5 days to reach retailers from the warehouse, and 90% said it took within 10 days.
- 55% identified inventory management, laboratory quality checks, and record-keeping as main improvement areas, while 12% cited transportation.

Summary of findings and recommendations-Infrastructure

- Around 80% of MSMEs lacked fire-resistant warehouses, and 70% did not have humidity control, indicating a need for improved storage facilities to protect product quality.
- While 88% had different facilities for heat and light-sensitive products, the lack of humidity control in most facilities could impact product quality.
- Inventory management, laboratory quality checks, and record-keeping needed improvement to enhance speed to market and ensure product quality.

5.5 FUNDING

Observations

- The major bottlenecks for securing government funding were paperwork, documentation, and red tape (50%), with the remaining 50% citing these factors plus delays in approvals.
- Major benefits that could be extended by the government included tax reductions (30%), increased fund allocation, and improved supply chain networks (18%).

Summary of findings and recommendations-Funding

- More than one-third of respondent companies felt that reducing taxes could help invest the saved amount in upgrading technology and infrastructure. .
- Paperwork and bureaucratic processes were key reasons for not securing government funding, indicating a need for simpler approval processes and well-defined timelines.

5.6 Overall Recommendations for strategies for improvement and conclusion

Following were the specific areas affecting the Operational efficiency of MSMEs that were identified through this research :

Qualified and Trained Personnel

Develop talent with a robust induction program and hands-on training on the shop floor before starting work. Refresher training programs should be conducted at predefined intervals.

Technology Adoption – Manual to Online (for each Unit Operation)

Upgrade technology used by MSMEs, moving from manual to online processes to reduce errors and improve regulatory compliance.

Overhaul of Inventory Management, Product testing ,Storage and Distribution

Automate inventory management and ensure storage warehouses are temperature, humidity-controlled, and fire-resistant. Reduce equipment downtime and improve incident reporting and investigation processes.

MSME Tax policy restructuring, Seamless approvals for funding

Simplify paperwork and approval processes for government schemes, define turnaround times, and implement online systems for approval to ease the funding process. Restructuring tax policies for MSMEs would also be beneficial.

Model depicting key focus areas for enhancing Operational Efficiency for MSMEs



5.7 Recommendations for further studies

- **Regulatory Understanding**: Among MSMEs, there is a lack of understanding of the requirements of the regulatory pharmaceutical landscape. This could be an area for future study.
- **Funding Ecosystem**: While 316 responses were analyzed, providing good insight into factors like People, Process, Technology, and Infrastructure, one area needing further assessment is the funding ecosystem. Companies were not fully aware of many government schemes and seemed disinterested due to bureaucratic red tape. A suggested sub-area could be to explore the utilization of tax rebates and other government schemes.
- **Regional Comparison**: The current study targeted only South India, so other regions in India could be explored to study the factors and then carry out a comparison of the maturity levels of MSMEs across different regions.
- **Management Oversight**: The oversight of management personnel could also be studied to assess the knowledge and technical skills of supervisors at the shop floor and other levels.

CHAPTER VI.
REFERENCES

Journals

1. Shyamsunder Chitta, Jain,Ravi Kumar, Metri ,Bhimaraya E Metri (2020). "Funding Landscape and Gap Analysis for Pharmaceutical MSMEs in Hyderabad", (PP7-16) *Small Enterprises Development, Management and Extension (SEDME)Journal,*Vol 45(2)
2. Mohanty, J. J. (2018). A Study on Micro, Small and Medium Enterprises(MSMEs)in India:Status and its Performance. *International Journal of Research and Scientific Innovation (IJRSI)*, V(V):105-114.
3. Gade, S. (2018). MSMEs' Role in Economic Growth – a Study on India's Perspective. *International Journal of Pure and Applied Mathematics*, 118(18):1727- 1741.
4. Golla, S. K. (2018). Growth and Performance of Micro Small and Medium Enterprises in India after MSMED Act 2006. *International Journal of Research in Management, Economics and Commerce*, 08(1):52-59.
5. Reddy, C.R.(2018).Analytical Study on Micro, Small and Medium Enterprises. *JNNC E journal of Engineering & Management(JJEM),*2(1):8–14.
6. Jena, N. R. and Thatte, L. R. (2018). Performance of the Micro, Small and Medium Enterprises(MSMEs)Manufacturing Sector in Select States in India: The Concept of MSME Manufacturing Business Facilitator (MSME-MBF) Index. *Academy of Entrepreneurship Journal,* 24(1):1 -22.
7. Zanjurne, P. (2018). Growth and Future Prospects of MSME in India. *International Journal of Advanced Engineering, Management and Science (IJAEMS)*, 4(8):608 – 614.
8. Behera, G.K., Das, S., and Mahapatra, R. P. (2018). Factors influencing the performance of MSMEs in the state of Odisha. *International Journal of Creative Research Thoughts (IJCRT)*, 6(2):710 -716.
9. Khanna,R.andSingh,S.S.(2018).StatusofMSMEsinIndia:ADetailedStudy. *Journal of Applied Management-Jidnyasa,10(2):1-14.*
10. Marmaya, N. H., Razak, N. A., Wee, M., Karim, R., and Ridzuan, A. R. (2018). Factors affecting Firm Performance of SMEs in Malaysia. *International Journal of Academic Research in Business and Social Sciences*, 8(10):789–798.
11. Peter, F.O., Adegbuyi, O.,Olokundun, M. A., Peter, A. O., Amaihian, A. B., and Ibidunni, S. A. (2018). Government Financial Support and Financial Performance of SMEs. Academy of Strategic Management Journal, 17(3):1- 10.

12. Machado,M.C.,Mendes, E.F.,Telles,R.,and Sampaio,P.(2018).Towards a new model for SME self-assessment: a Brazilian empirical study. *Total Quality Management & Business Excellence*, 1-19.DOI: 10.1080/14783363.2018.1460195
13. Taşlıyan, M., Eren, A.S., and Yücel, D. K. (2018). Defining the Determinants of Organizational Performance in Turkish Manufacturing SMEs. *IOSR Journal of Business and Management (IOSR-JBM),* 20(5 Ver. III):26-35.
14. Ombongi, P. N. and Long, W. (2018). Factors Affecting Financial Performance of Small and Medium Enterprises(SMEs):ACase of Manufacturing SMEs in Kenya. *International Journal of Research in Business Studies and Management,* 5(1):37-45.
15. Abebaw, W.K., Mulate, S., and Nigussie, L. (2018). Factors Affecting the Performance of Micro and Small Scale Enterprises: Experience from North Shewa Zone, Ethiopia. *Journal of Investment and Management*,7(2): 70-76.
16. Igwe, P. A., Amaugo, A.N., Ogundana, O.M., Egere, O.M., and Anigbo, J. A.(2018). Factors Affecting the Investment Climate, SMEs Productivity and Entrepreneurship in Nigeria. *European Journal of Sustainable Development*7(1):182-200.
17. Ojuye, T. E. and Egberi, O. E. (2018).Determinants of Small and Medium Enterprises (SMEs) Performance in Delta State, Nigeria. *International Journal of Business & Law Research,* 6(2):59-70.
18. Singh,H.P.and Kumar,S.(2017).Workingcapital requirements of manufacturing SMEs: evidence from emerging economy. *Rev. Int. Bus. Strat.*, 27:369–385.
19. Thinji, B. M. and Gichira, R. (2017). Entrepreneurial Factors Influencing Performance of Small and Medium Enterprises in Ongata Rongai Town, Kajiado County, Kenya. *The Strategic Journal of Business & Change Management*, 4(3-26): 347 – 364.
20. Majama,N.S.and Magang,T.I.T.(2017).Strategic Planning in Small and Medium Enterprises (SMEs): A Case Study of Botswana SMEs. *Journal of Management and Strategy*, 8(1):74 -103.
21. Das, P. (2017a). Micro, Small and Medium Enterprises (MSME) in India: Opportunities, Issues & Challenges. *Great Lakes Herald*, 11(1):77-88
22. Sharma, S. and Neog, J. (2017). Role of Micro, Small and Medium Enterprises in the Development of Entrepreneurship in Sonitpur District of Assam. *IOSR Journal of Business and Management (IOSR-JBM)*, 19(9-version V): 24-29.
23. Satpathy, S., Sailaja Rani, P., and Nagajyothi, M. L. (2017).A Study of Micro, Small and Medium Enterprises; the Backbone for Economic Development of Indian Economy. *International Journal of Research and Scientific Innovation (IJRSI)*,

IV(VI):75 -82.

24. Balasubramanian, K. and Madhavan, S. (2017). Sector Wise Analysis of MSME–Contribution to Growth of Indian Industry. *International Journal of Management Studies*, IV (Special Issue-1):84 -92.
25. Malakar, K. (2017). Problems Faced By Micro, Small and Medium Enterprises–A Special Reference to Small Entrepreneurs in Karimganj District, Assam. *International Journalo fHumanities & Social Science Studies (IJHSSS)*, III(VI):415- 424.
26. Manna, P. and Mistri, T. (2017). Status of Micro Small and Medium Enterprises (MSME) in India: A Regional Analysis. *IOSR Journal of Humanities and Social Science (IOSR-JHSS),* 22(9-13):72-82.
27. Kumar,V.(2017).An Analysis of Growth of MSMEs in India and Their contribution in Employment and GDP of the Country. *International Journal of Interdisciplinary and Multidisciplinary Studies (IJIMS)*, 4(2):187-191.
28. Chakrabartty, K. (2016). Contribution of MSMEs with Reference to Entrepreneurship Development and Employment Generation in North-East India: A Critical Evaluation. *Social Science Spectrum,* 2(3): 208-215.
29. Hayakawa, H. (2016). Theory of the Firm: A Reformulation with Primary Factors of Production and Procurement of Ingredient Inputs. Journal of Economics and Political Economy, 3(3):418-439.
30. Sankaraiah, M. and Mohan, B. (2016). Growth and Development of MSMEs – An Analytical View. *International Journal of Research and Development - A Management Review (IJRDMR)*, 5(4): 48-56.
31. Upendar, E. and Ramulu, K. (2016). MSME's Sector in India: Challenges and Opportunities. *IRA-International Journal of Management & Social Sciences,* 4(3):612-618. DOI: http://dx.doi.org/10.21013/jmss.v4.n3.p11
32. Margweretha, F. and Supartika, N. (2016). Factors Affecting Profitability of Small Medium Enterprises (SMEs) Firm Listed in Indonesia Stock Exchange. *Journal of Economics, Business and Management,*4(2):132 – 137.
33. Kishore, S. (2016). Growth of Micro, Small and Medium Enterprises (MSMEs) In India. *BIMS International Journal of Social Science Research*, 1(2):6-13.
34. Farajollahzadeh, G., Noorinasab, A. R., and Yazdanpanah, B. (2016). Role of MSMEs in Economic Growth of India. *International Journal of Multidisciplinary Research and Modern Education (IJMRME)*, II(I):199 -211.
35. Suhardiyah, M., Subakir, and Sulistyowati (2016).Analysis of Factors Affecting: Sales

Volume of Small and Medium Enterprises (SMEs) in Surabaya. *International Journal of Economics and Finance*, 8(5):63-74.

36. Habtoor, N. (2016) Influence of human factors on organisational performance Quality improvement practices as a mediator variable. *International Journal of Productivity and Performance Management*, 65(4): 460 – 484.
37. Elaswad, H., Islam, S., Tarmizi, S., Yassin, A., Lee, M.D., and Ting, C.H. (2015). Benchmarking of Growth Manufacturing SMEs: A Review. *Sci. Int.(Lahore)*, 27(3):2039-2048.
38. Kanu, A. M. and Sesay, I. (2016). The Practice of Performance Measurement in Small and Medium Enterprises: Empirical Evidence from a Developed Economy Perspective. *Quarterly Journal of Business Studies*, 2(3): 160-173.
39. May ChiunLo, Yin ChaiWang, Constance Rinen Justin Wah,T.Ramayah (2016), "The critical success factors for organizational performance of SMEs in Malaysia: a partial least squweres approach", Revista Brasileira de Gestão deNegócios, vol.18 no.61 São Paulo June/Sept. 2016
40. Sarkar, B. (2016). Government Policies and Assistance for MSMEs in North East (Assam). *International Journal for Innovative Research in Multidisciplinary Field*, –2(–2):30 -33.
41. Karadag,H.(2016).TheRole of SMEs and Entrepreneurship on Economic Growth in Emerging Economies within the Post-Crisis Era: an Analysis fromTurkey. *Journal of Small Business and Entrepreneurship Development*, 4(1):22-31.
42. Matanda,M.J.,Ndubisi,N.O.,andJie,F.(2016).EffectsofRelational Capabilities and Power Asymmetry on Innovativeness and Flexibility of Sub-Sahara AfricaSmallExportingFirms.*JournalofSmallBusinessManagement*,54(1):118–138. DOI:http://doi.org/10.1111/jsbm.12134
43. Sitharam,S.and Hoque,M.(2016).Factors affecting the performance of small and medium enterprises in KwaZulu-Natal, South Africa. *Problems and Perspectives in Management*, 14(2):277 - 288
44. Yeboah, M. A. (2015). Determinants of SME Growth: An Empirical Perspective of SMEs in the Cape Coast Metropolis, Ghana.*The Journal of Business in Developing Nations*, 14:1- 30.
45. Phan, U.H.P., Nguyen, P.V., Mai, K. T., and Le, T. P. (2015). Key Determinants of SMEs in Vietnam. Combining Quantitative and Qualitative Studies. *Review of European Studies*, 7(11):359-375.

46. Abdullahi,I.S. and Sulaiman,C.(2015).The Determinants of Small and Medium-sized Enterprises Performance in Nigeria. *Advances in Economics and Business,* 3(5):184-189.
47. Kusi,A.,Opata,C.N.,and Narh,T.-W.J.(2015).Exploring the Factors That Hinder the Growth and Survival of Small Businesses in Ghana (A Case Study of Small Businesses within Kumasi Metropolitan Werea). *American Journal of Industrial and Business Management*, 5:705-723.
48. Afande, F. (2015). Factors Influencing Growth of Small and Microenterprises in Nairobi Central Business District. *Journal of Poverty, Investment and Development*, 9:104-137.
49. Bouazza, A. B., Ardjouman, D., andAbada, O. (2015). Establishing the Factors Affecting the Growth of Small and Medium-sized Enterprises in Algeria. American International Journal of Social Science,4(2):101 – 115.
50. Wang, Y., Bhanugopan, R., and Lockhart, P. (2015).Examining the quantitative determinants of organizational performance: evidence from China. Measuring Business Excellence, 19(2):23-41. DOI: https://doi.org/10.1108/MBE-05-2014-0014
51. Kadian, R. and Chahal, A. (2015). International Journal of Research in Social Sciences and Humanities Make India Innovative and Competitive: Role of MSMEs. *International Journal of Research in Social Sciences and Humanities*, 5(III):65-73.
52. Barki, G. S. and Vibhuti, S. G. (2015). MSME's in India – An Overview. *International Journal of Multidisciplinary Research and Devlopment*, 2(9):688 –691.
53. Maisnam, C. (2015). MSMEs Sector in North East India. In *XVI Annual Conference Proceedings*, January, pages 569 – 577. Retrieved on 15 Jan. 2021 from http://www.internationalconference.in/XVI_AIC/INDEX.HTM Page 569
54. Siddiqui, M. A. (2015). Engines of Growth - A Study of the Growth andPerformance of Indian MSMES in the Present Scenario. *International Journal of Core Engineering & Management (IJCEM)*, 2(1):44 – 59.
55. Meganathan, M., Balaji Kumar, P., and Saravanan, R. (2015). Sustainable Trends of MSME in India: An Empirical Study. *International Journal of Research in Management, Economics & Commerce*, 5(2): 42 – 51.
56. Hashim, M. K. (2015).*Business Strategy in Malaysian Companies.* Asas Nadi SDN, BHD, Malaysia, 1st edition.
57. Mendoza, R. R. (2015). Financial performance of micro, small and Medium enterprises (MSMEs) in the Philippines. *International Journal of Business and Finance Research*, 9(4):67-80.

58. Dubihlela, J. and Dhurup, M. (2015). Determinants Of, And Barriers To, Market Orientation and The Relationship With Business Performance Among SMEs.*Journal of Applied Business Research*, 31(5):1667–1678.
59. Kemayel, L. (2015). Success Factors of Lebanese SMEs: an Empirical Study. Procedia - Social and Behavioral Sciences, 195: 1123 – 1128.
60. Kadian, R. and Chahal, A. (2015). International Journal of Research in Social Sciences and Humanities Make India Innovative and Competitive: Role of MSMEs. *International Journal of Research in Social Sciences and Humanities*, 5(III):65-73.
61. Kannan, A. S. and Sudalaimuthu, S. (2014). Indian MSMEs: Initiatives and Financing Trends. *International Journal of Management (IJM)*, 5(10):58-70.
62. Arham, A. F. (2014). Leadership and Performance: The Case of Malaysian SMEs in the Services Sector. *International Journal of Asian Social Science,* 4(3):343-355.
63. Sultan, J.S (2014). Problems and Prospects of Micro, Small & Medium Enterprises (MSME's) in India. *International Journal of Innovative Research and Studies*, 3(5):141-161.
64. Barman, K. and Das, B. (2014). The Performance of KVIs in India-An Economic Analysis. *International Journal of Multidisciplinary Educational Research (IJMER)*, 3(1-1):22-37
65. Pujar, U. (2014). MSMEs and Employment in India: an analytical study. *IOSR Journal of Business and Management (IOSR-JBM),* 16(5-II):13-15.
66. Chandraiah, M. and Vani, R. (2014). The Prospects and Problems of MSMEs sector in India an Analytical study. *International Journal of Business and Management Invention*, 3(8):27-40.
67. Dey, S. K. (2014). MSMEs in India: It's Growth and Prospects. *Abhinav National Monthly Refereed Journal of Research in Commerce & Management*,3(8):26 -33.
68. Yadav, S. S. (2014). Technological Flexibility in Micro Small and Medium Enterprises (MSMEs): A Case of Small Scale Engineering Industries of Gujarat. *International Conference on Multidisciplinary Research & Practice*,I(VII):318-327.
69. Shahbaz, M. A., Javed, A., Dar, A. and Sattar, T. (2014). Performance measurement of small and medium enterprises (SMEs) in Pakistan. *Archives of Business Research*, 2(3):42- 49.
70. Kinyua, A. N. (2014). Factors Affecting the Performance of Small and Medium Enterprisesin the Jua Kali Sector In Nakuru Town, Kenya. *IOSR Journal of Business*

and Management (IOSR-JBM), 16(1-er. IV):80-93.

71. Anggadwita, G. and Mustafid, Q. Y. (2014).Identification of factors influencing the performance of Small Medium Enterprises (SMEs). *Procedia - Social and Behavioral Sciences*, 115: 415 – 423.
72. Bejaoui,R.andBouzgarrou,H.(2013).DeterminantsofTunisianBankProfitability. *The* International Journal of Business and FinanceResearch,8(4):121-131.
73. Nagaraja, B. (2013). A micro analysis on the performance of micro, small and medium enterprises in North-Eastern states. *International Research Journal of Agricultural Economics and Statistics*, 4(1):109-114.
74. Shukla, O.J. and Misra, A.K. (2013). Easily & Economically Feasible Value Analysis &Value Engineering Concepts for Manufacturing Industry. *Engineering Management Reviews (EMR),* 2(3):81-85.
75. Mokhothu-Ogolla, P. and Wanjau, K. (2013) Factors affecting value addition in the leather industry in Kenya. *European Journal of Business and Innovation Research*, 1(3):45-55Lokhande, M.A. (2011). Evolution of the MSMEs in India. *Journal of Social and Development Sciences*, 1(2):79-90.
76. Das, B. and Barman, K. K. (2013). A Study of Micro Enterprises in Hajo Development Block, Kamrup (Assam). *Journal of Rural Development*, 32(3):321-332.
77. Abdul Naser. V (2013). A critical evaluation of the contributions made by Themicro, small and medium enterprises in Indian Economy. *International Journal of Marketing, Financial Services & Management Research*, 2(7):151 – 158.
78. Singh, R., Verma, O.P., and Anjum, B. (2012). Small Scale Industry: An Engine of Growth. *Zenith International Journal of Business Economics & Management Research*, 2(5). Retrieved on 20 July 2020 from http://www.zenithresearch.org.in
79. Subramanyam, P. and Reddy, B. R. (2012). Micro, small and medium enterprises in India: An overview. *VSRD International Journal of Business and Management Research*, II (XI):532-539.
80. Aldaba, R. M.(2012). Small and Medium Enterprises' Access to Finance. *Discussion Paper Series of the Philippine Institute for Development Studies, 2012- 05*, 17. Philippines: Makati. Retrieved on 10 June 2021 from https://dirp4.pids.gov.ph/ris/dps/pidsdps1205.pdf
81. Moorthy, M.K., Tan, A., Choo, C., Wei, C. S., Ping, J. T. Y., and Leong, T. K. (2012). A Study on Factors Affecting the Performance of SMEs in Malaysia, *International*

Journal of Academic Research in Business and Social Sciences, 2(4):224 – 239.

82. Bhavani, T. A. (2011). Dynamic Business Environments: What These Mean for Indian Small Enterprises. In Das, K., editors, Micro and Small Enterprises in India: Era of Reforms, pages 27-45.
83. Jasra, J. M., Khan, M. A., Hunjra, A. I., Rehman, R. A., and Rauf-I-Azam, A.(2011). Determinants of Business Success of Small and Medium Enterprises. *International Journal of Business and Social Science,* 2(20): 279.
84. Dixit, A. and Pandey, A.K. (2011). SMEs and Economic Growth in India: Co integration Analysis. *The IUP* Journal of Financial Economics*,* IX(2):41-59
85. Barua, A. N. and Mali, A. (2011). Entrepreneurship and its role in the growth of micro and small enterprise: A case study of Assam. *Small Enterprise Development, Management & Extension Journal,* 38(2): 69-83.
86. Kassim, Z. A. and Sulaiman, M. (2011). Market orientation and leadership styles of managers in Malaysia. *International Journal of Leadership Studies,* 6(2): 230-245.
87. Kumar, N. K. and Sardar, G. (2011). Competitive performance of micro, small and Medium enterprises in India. *Asia pacific journal of social sciences*, 3(1):128-146.
88. Jamil, C. M. and Mohamed, R. (2011).Performance Measurement System (PMS) In Small Medium Enterprises (SMES): A Practical Modified Framework. *World Journal of Social Sciences, 1(3):200-212.*
89. Chittithaworn, C., Islam, M. A., Keawchana, T., and Yusuf, D. H. M. (2011).Factors Affecting Business Success of Small & Medium Enterprises (SMEs) in Thailand. *Asian Social Science*, 7(5):180 – 190.
90. Gaur, S.S., Vasudevan, H., and Gaur, A. S. (2011).Market orientation and manufacturing performance of Indian SMEs: Moderating role of firm resources and environmental factors. *European Journal of Marketing*, 45(7/8):1172-1193. DOI: https://doi.org/10.1108/03090561111137660
91. Gavrea, C., Ilieş, L., and Stegerean, R. (2011).Determinants of Organizational Performance: The Case of Romania. *Management & Marketing Challenges for the Knowledge Society,*6(2):285-300.
92. Geetha and Govindappa (2011).Socio-economic background and problems of entrepreneurs in Industrial estate: A case study of Industrial Estate in Davangere. *SEDME*, 38(3):1-41.
93. Al-mahrouq, M. (2010). Success Factors of Small and Medium-Sized Enterprises (SMEs): The Case of Jordan. *Anadolu University Journal of Social Sciences*, 10(1): 1–17.

94. Kale,P.T.,Banwait,S.S.,and Laroiya,S.C.(2010).Performance evaluation of ERP implementation in Indian SMEs. *Journal of Manufacturing Technology Management*, 21(6):758-780. DOI:https://doi.org/10.1108/17410381011064030
95. Cocca, P. and Alberti, M.(2010).A framework to assess performance measurement systems in SMEs. *International Journal of Productivity and Performance Management*, 59(2):186-200. DOI:https://doi.org/10.1108/17410401011014258
96. Antony, J. P. and Bhattacharyya, S. (2010). Measuring organizational performance and organizational excellence of SMEs–Part1: a conceptual framework. *Measuring Business Excellence,* 14(2):3–11.
97. Kalpande, S.D., Gupta, R. C., and Dandekar, M.D. (2010). SWOT analysis of small and medium scale enterprises implementing total quality management. *International Journal of Business, Management and Social Sciences* 1(1):59-64.
98. Narwwere, P.C. (2010). Working Capital Management: The Effect of Market Valuation and Profitability in Malaysia. *International Journal of Business and Management,* 5(11):140-147. DOI:10.5539/ijbm.v5n11p140
99. Chelliah, S., Sulaiman, M., and Yusoff, Y. M. (2010). Internationalization and Performance: Small and Medium Enterprises (SMEs) in Malaysia. *International Journal of Business and Management*, 5(6):27 – 37.
100. Bargal, H., Dashmishra, M., and Sharma, A. (2009). Performance Analysis of Small Scale Industries - A Study of Pre-liberalization and Post-liberalization period.*International Journal of Business and Management*, 1(2): 17-26
101. Tran, T. B., Grafton, Q., and Kompas, Tom. (2009). Contribution of productivity and firm size to value-added: Evidence from Vietnam. *Int. J. Production Economics*, 121: 274–285.
102. Singh, D.A. (2009). Export performance of emerging market firms. *International Business Review*, 18(4):321-30.
103. Salamon, S. D.and Robinson, S. L.(2008).Trust that binds: The impact of collective felt trust on organizational performance. *Journal of Applied Psychology*, 93:593-601.
104. McAdam, R., Hazlett, S. A., and Anderson-Gillespie, K. (2008). Developing a conceptual model of lead performance Measurement and benchmarking: A multiple case analysis. *International Journal of Operations & Production Management*, 28(12):1153–1185.
105. Singh, R.K., Garg, S. K., Deshmukh, S.G. (2008).Strategy development by SMEs for competitiveness: a review. *Benchmarking: An International Journal*, 15(5):525-547.DOI:https://doi.org/10.1108/14635770810903132

106. Chong, H. G. (2008). Measuring Performance of Small-and Medium-Sized Enterprises: The Ground Theory Approach. *Journal of Business and Public Affairs,* 2(1):6-7.

107. Das, K.(2008). SMEs in India: Issues and Possibilities in Times of Globalization. In Lim, H., editors *Asian SMEs and Globalization, ERIA Research Project Report 2007 No. 5*, pages 69-97. Economic Research Institute for ASEAN and East Asia-Bangkok.

108. Bhagwat, R. and Sharma, M. K. (2007). Information system architecture: a framework for a cluster of small- and medium-sized enterprises (SMEs). *Production Planning & Control*, 18(4):283-296.

109. Bala Subrahmanya, M.H. (2007). Development strategies for Indian SMEs: promoting linkages with global transnational corporations. *Management Research News*, 30(10): 762-774.

110. Siggel,E.(2007).Economic Reforms and their Impact on the Manufacturing Sector: Lessons from the Indian Experience. *Asia Pacific Development Journal*, 14(1):73-104.

111. Kodithuwakku, S. and Priyanath, H.M.S. (2007). Reasons for the Improvement of Labor Productivity in Tea Plantations after Privatization with Special Reference to the Estate Laborers in the Ratnapura District. *Sabaragamuwa University Journal*, 7(1):37-47.

112. Vargas, D.M. and Rangel, R.G.T. (2007). Development of internal resources and capabilities as sources of differentiation of SME under increased global competition: a field study in Mexico. *Technological Forecasting and Social Change*, 74(1):90-9.

113. Whitley, W. and England, G. (2007). Variability in Common Dimensions of Managerial Values Due to Value Orientation and Country Differences. *Personal Psychology*, Spring: 77-89.

114. Mandal,R.K.(2007).Khadi and Village Industries in NorthEast India with Special Reference to Arunachal Pradesh: Retrospect and Prospect. *Journal of Global Economy*, 3(2):88–99. DOI: 10.1956/jge.v3i2.165.

115. Sharma,M.K.and Bhagwat,R.(2006).Practice of information systems: Evidence from select Indian SMEs. *Journal of Manufacturing Technology Management*, 17(2):199-223. DOI:https://doi.org/10.1108/17410380610642278

116. Manvile, G. (2006). Implementing a balanced scorecard framework in a not for profit SME. *Journal of Productivity and Performance Management*, 56(2):162 -169.

117. Green, C.J., Kirkpatrick, C.H., and Murinde, V. (2006) Finance for Small Enterprise Growth and Poverty Reduction in Developing countries. *Journal of International Development*, 18:1017–1030.

118. Manville, G. (2006). Implementing a balanced scorecard framework in a not for profit SME. *Journal of Productivity and Performance Management*, 56(2):162-169.

119. Sharma, M.K., Bhagwat, R., Dangayach, G.S. (2005). Practice of performance measurement: experience from Indian SMEs. *International Journal of Globalisation and Small Business*, 1(2), 183-213.

120. Van Dyck, C., Frese, M., Baer, M., and Sonnentag, S. (2005). Organizational error management culture and its Impacton performance: A two-study replication. *Journal of Applied Psychology*, 90:1228-1240.

121. Gwerengo,P.,Biazzo,S., and Bititci, U.S.(2005).Performance measurement systems in SMEs: A review for a research agenda. *International Journal of Management Reviews*, 7(1):25–47.

122. Indarti, N. and Langenberg, M.(2005). A Study of Factors Affecting Business Success among SMEs: Empirical Evidences from Indonesia. *Asian Social Science, 7*(5): 67-86.

123. Abouzeedan,A.andBusler,M.(2004).Typologyanalysisofperformancemodels of small and medium-size enterprises (SMEs). *Journal of International Entrepreneurship*, 2:155–177.

124. Gomes, C. F., Yasin M. M., and Lisboa, J. V. (2004). An examination of manufacturing organizations' performance evaluation : Analysis, implications and a framework for future research. *International Journal of Operations & Production Management, 24(5):488-513.*

125. Bala Subrahmanya, M. H. (2004). Small Industry and Globalization: Implications, Performance and Prospects. *Economic and Political Weekly*, XXXIX (18):1826-1834.

126. Rao, M.P. and Miller, D.M. (2004). Expert systems applications for productivity analysis. *Industrial Management & Data Systems*, 104 (9):776-85.

127. Henri, J. F. (2004). Performance measurement and organizational effectiveness: bridging the gap. *Managerial Finance*. 30(6):93–123.

128. Wang, C. K. and Ang, B. L. (2004). Determinants of Venture Performance in Singapore. *Journal of Small Business Management*, 42(4):347-363.

129. Tangen, S. (2003). An overview of frequently used performance measures. *Work Study*, 52(7): 347-354. DOI: https://doi.org/10.1108/00438020310502651

130. Deloof, M. (2003). Does Working Capital Management Affect Profitability of Belgian Firms?, Journal of Business & Accounting, 30 (3-4): 573-588.

131. Kristiansen, S., Furuholt, B., and Wahid, F. (2003). Internet cafe entrepreneurs: pioneers in information dissemination in Indonesia. *The International Journal of Entrepreneurship and Innovation,* 4(4):251-263.

132. Man, T.W.Y., Lau, T., and Chan, K.F. (2002). The competitiveness of small and medium enterprises: a conceptualization with focus on entrepreneurial competencies. *Journal of Business Venturing*, 17(2):123-42.

133. Henczel,S.(2002).Benchmarking measuring and comparing for continuous improvement *Information Outlook*, 6(7). Retrieved on 15 April 2021 from https://www.researchgate.net/publication/275716918_Benchmarking_Measuring_and Comparing_for_Continuous_Improvement/citation/download

134. Neely, A., Mills, J., Platts, K., Richards, H., Gregory, M., Bourne, M.,and Kennerley,M. (2002). PMS design: developing and testing a process-based Approach. *International Journal of Operations & Production Management*, 20(10):1119-1145.

135. McAdam, R. and Kelly, M. (2002). A Business Excellence Approach to Generic Benchmarking in SMEs. Benchmarking: An International Journal, 9(1):7-27. DOI:https://doi.org/10.1108/14635770210418551

136. McMahon, R. G. P. (2001). Growth and performance of manufacturing SMEs: The influence of financial management characteristics. *International Small Business Journal,* 19(3):10-28.

137. McMahon,R.G.P.(2001).Growth and performance of manufacturing SMEs: The influence of financial management characteristics. *International Small Business Journal,* 19(3):10-28.

138. Hudson, M., Smart A., and Bourne, M. (2001). Theory and practice in SME performance measurement in SMEs. *Production, Planning & Control*, 12(8):804 – 813.

139. Staw, B. M. and Epstein, L.D. (2000). What bandwagons bring: Effects of popular management techniques on corporate performance, reputation, and CEO pay? *Administrative Science Quarterly*, 45:523-556.

140. Medori, D. and Steeple, D. (2000). A framework for auditing and enhancing performance measurement systems. *International Journal of Operations & Production Management*, 20(5):520-53.

141. Brush, T., Bromiley, P., and Hendrickx, M. (1999). The Relative Influence of

Industry and Corporation on Business Segment Performance: An Alternative Estimate. *Strategic Management Journal,* 20(6):519-547.

142. Neely, A. (1999). The performance measurement revolution: why now and what next? *International Journal of Operations & Production Management*, 19(2): 205- 223.
143. Rolstadas, A. (1998). Enterprise performance measurement. *International Journal of Operations and Production Management*, 18(9/10):989-99.
144. Lockamy, A. (1998). Quality focused performance measurement systems: a normative model. *International Journal of Operations & Production Management,*18(8):740– 766.
145. Mali,D.D.(1998).Development of Micro,Small and Medium Enterprises of India Current Scenario and Challenges. *SEDME (Small Enterprises Development, Management and Extension) Journal*, 25(4), December.
146. Stainer, A. (1997). Capital input and total productivity management. *Management Decision*, 35(3): 224-232. DOI: https://doi.org/10.1108/00251749710169431
147. Sapienza, H. J. & Grimm, C. M. (1997). Founder Characteristics, start-up process, and strategy/structure variables as predictors of short line railroad performance. *Entrepreneurship Theory and Practice*, 22(1):5-24.
148. Bititci, U.S., Turner, T., and Begesmann, C. (1997). Integrated Performance Measurement System: a development guide. *International Journal of Operation & Production Management*, 17(5):522-534.
149. Kravchuk, R. S. and Schack, R. W. (1996). Designing effective performance measurement systems under the Government Performance and Results Act of 1993. *Public Administration Review,* 56(4), 348-358.
150. Kaplan,R.S. and Norton,D.P.(1996).Using the balanced scorecard as a strategic management system. *Harvard Business Review,* 74(1):75-85.
151. Neely, A., Gregory, M. and Platts, K. (1995). Performance Measurement System Design: A literature review and research agenda. *International Journal of Operations & Production Management*, 15(4):80 – 116.
152. Daft,R.L.(1995).*Organization Theory and Design.* West Publishing,New York.
153. Huselid, M. A. (1995). The impact of human resource management practices on turnover, productivity, and corporate financial performance. *Academy of Management Journal*, 38:635-672.
154. Andersan, A. R. (1995). The Arcadian enterprise: An enquiry into the nature and

conditions of rural small business. Retrieved on 15 May 2021 from www.emeraldinsight.com/Insight/ViewContentServlet?Filename.html

155. Kanitkar,A.(1994).Entrepreneurs and Micro-Enterprises in Rural India. *Economic and Political Weekly,29(9):25-30.*

156. Papola, T. S. (1994). Structural Adjustment, Labour Market Flexibility and Employment. *The Indian Journal of Labour Economics*,37(1): 3-16.

157. Griffin, A. and Page, A. L. (1993). An interim report of measuring product development success and failure. *Journal of Product Innovation Management*, 10: 291 -308.

158. Levy, B. (1993). Obstacles to Developing Indigenous Small and Medium Enterprises: An Empirical Assessment. *The World Bank Economic Review*, 7(1):65-83.

159. Sohal,A.S.and Lionel,N.G.(1993).The role and impact of information technology on Australian business. *Journal of Information Technology*, 13: 201-11.

160. Ahluwalia,I.J.(1992).*Productivity and Growth in Indian Manufacturing*. Oxford University Press, Delhi.

161. Kaplan, R.S. and Norton, D.P. (1992). The balanced scorecard Measures that drive performance. *Harvard Business Review*, 70(1):71-79.

162. Kaplan,R.S .and Norton,D.P.(1992).The balanced scorecard Measures that drive performance. Harvard Business Review, 70(1):71-79.

163. Brush,C.G. and Vanderwerf,P.A.(1992).A comparison of methods and sources for obtaining estimates of new venture performance. *Journal of Business Venturing*, 17(2):157-170.

164. Lynch, R. and Cross, K. (1991). *Measure up! Yardsticks for continuous improvement.* Blackwell, Cambridge.

165. Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17:100-20.

166. Brignall, T. J., Fitzgerald, L., Johnston, R., and Silvestro, R. (1991). *Performance Measurement in Service Businesses.* 69(10): 34-36.

167. Keegan, D.P., Eiler, R.G., and Jones, C.R. (1989). Were your performance measure obsolete*? Management Accounting*, 70: 45-50.

168. Hutchinson, P., Meric, I., and Meric, G. (1988). The financial characteristics of small firms which achieve quotation on the UK unlisted securities market. *Journal of Business Finance & Accounting*, 15(1):9-19.

169. Thomas, J. and Evanson, R. V. (1987). An empirical investigation of association

between financial ratio use and small business success. *Journal of Business and & Accounting*, 14(4). Retrieved on 15 May 2021 from https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1468-5957.1987.tb00112.x

170. Storey, D., Keasy, K., Watson, R., and Wynarczyk, P. (1987). *The performance of small firm: Profits, jobs and failures.* Routledge, London.

171. Kirchhoff, B. A. and Kirchhoff, J. J. (1987). Family contribution to productivity and profitability in small businesses. *Journal of Small Business Management,* October: 25(4): 25-31.

172. Jacobson,R.(1987).The Validity of ROI a sa Measure of Business Performance. *The American Economic Review,77(3):470-478.*

173. Ibrahim,A. and Goodwin,J.(1986).Perceived causes of success in small business. *American Journal of Small Business*, 11(2):41-50.

174. Deolankar, V. (1984). Role of entrepreneurship in industrialization. *Southern Economist*, 22*(*February 19):14.

175. Galbraith,C.and Schendel,D.(1983).An Empirical Analysis of Strategy Types. *Strategic Management Journal, 4:153–173.*

176. Lev,B.(1983).Some economic determinants of time series properties of earnings. *Journal of Accounting and Economics, 5(1):31-48.*

177. Robinson, R.B.(1982).The Importance of "Outsiders" in Small Firm Strategic Planning. *Academy of Management,25(1),80–93.*

178. Quinn, E.R. and Rohrbaugh, J. (1981). A Competing Values Approach to Organizational Effectiveness. *Public Productivity Review*, 5:122-140.

179. Tamari, M. (1980). The financial structure of the small firm: an international comparison of corporate accounts in the USA, France, UK, Israel and Japan. *American Journal of Small Business,* 4:20 – 34.

180. Reese, James S. and Cool, William R. (1978). Measuring Investment Center Performance. *Harvard Business Review*, 56:28-46.

181. Bilkey,W.(1978).An attempted integration of the literature on the export behaviour of firms. *Journal of International Business Studies*, 9:33-46.

182. Edmister, R. O. (1970). Financial ratios as discriminant predictors of small business failure. Doctoral dissertation, The Ohio State University, USA.

183. Gupta, M. C. (1969). The effect of size, growth and industry on the financial structure of manufacturing companies. Journal of Finance, 24: 517 – 29.

184. Jen, F. C. (1963). The determinants of the degree of insufficiency of bank credit to

small business. Journal *of Finance,* 18: 694 – 695.

185. Yuchtman, E. and Seashore S. (1967). A system resource approach to organizational effectiveness. *American Sociological Review*. 32:891-903.

186. Etzioni, A. (1960). Two approaches to organizational analysis: A critique and a suggestion. *Administrative science Quarterly*, 5:257-278.

187. Shyamsunder Chitta, Jain,Ravi Kumar, Metri ,Bhimaraya E Metri (2020).” Funding Landscape and Gap Analysis for Pharmaceutical MSMEs in Hyderabad”, (PP7-16) *Small Enterprises Development, Management and Extension (SEDME)Journal,Vol 45(2)*

188. Ali,Anis, Hussain Firoz.(June 2014).” MSME`S in India: Problems,Solutions and Prospectus in present scenario”.(PP109-115),*International Journal of Engineering and Management Sciences.Vol5(2)*

Books

189. Chary, S.N. (2012). Production and Operations Management Tata McGraw Hill Education Private Limited, New Delhi, 3rd edition, pages 19.1 – 19.6.

190. Adam, Jr., E.E., and Ebert, R. J. (2007). Production and Operations Management Concepts, Models, and Behaviour. Prentice-Hall of India Private Limited, New Delhi,5thedition.

191. Ross, S.A., Westerfield, R.W., and Jaffe,J.(1999).,Corporate Finance. Irwin and McRaw-Hill, Boston, 5th edition.

192. Neely, A. (1998). Measuring Business Performance: Why, What and How. The Economist Books, London.

193. Cohen, W. A. (1989). The Entrepreneur and Small Business Financial Problem Solver. John Wiley & Sons, New York.

194. Burns, P.(1985),Financial characteristics of small companies in the UK. Cranfield School of Management, UK.

195. Pfeffer, J. and Salancik, G.R. (1978). The External Control of Organizations: A Resource Dependence Perspective. Harper and Row, New York.

196. Thiripurasundari, K. and Gurumurthy, V. (2009). Challenges for Small Scale Industries in the Era of Globalization. In Rathakrishnan, L., editors, Small and Medium Enterprises under Globalization: Challenges and Opportunities, pages 332-346.

Conference proceedings, articles and reports

197. Nanda, S.S. (2016). Growth and Performance of Indian MSMEs: An Appraisal. In

XVII Annual International Seminar Proceedings, January, pages 294 – 305, India.

198. Indarti, N. and Langenberg, M. (2004). Factors affecting business success among SMEs: empirical evidences from Indonesia. In Proceedings of the (19) 20 & 21 September, 2004 Second Bi-Annual European Summer University, pages 1-14, University of Twente, Enschede, The Netherlands.
199. Chennell, A., Dransfield, S., Field, N., Saunders, I., and Shaw, D.(2000). OPM: A for organizational performance measurement. In conference proceedings performance measurement, pages 96-103, Cranfield University.
200. Laitinen, E. (1996). Framework for small business performance measurement: towards integrated PMS. In proceedings of the University of Vasaa, Vasaa, Finland.
201. Government of India,(2021-2022) "Annual Report, Ministry of Micro Small and Medium Enterprises"
202. CRISIL Quantix(June 2022) ."Over a fourth of MSMEs lost >3% market shwere last fiscal"
203. Bhardwaj N.(July 2022)."How will India's new scheme RAMP and CBFTE benefit small businesses". India Breifing
204. Soni, S.(November 2021) " MSMEs in pharma: Why revenue growth for the sector in FY22 may dip despite Covid vaccine opportunity". *Financial Express*
205. Indian Brand Equity Foundation (IBEF).(November 2021),Report,www.ibef.org
206. Jain, Ashpnani.(August 2021)."Advantage MSMEs "Hindu Business Line
207. Sharma AK.(June 2020),"MSME Gazette of India" Notification by Ministry of Micro Small and Medium Enterprises (MSME),Government of India

Websites

1. FDA, "Quality Management Maturity for Active Pharmaceutical Ingredients Pilot Program for Foreign Facilities; Program Announcement," Notice, *federalregister.gov*, Oct. 16, 2020.
2. https://www.mckinsey.com/industries/life-sciences/our-insights/a-new-operating-model for-pharma-how-the-pandemic-has-influenced-priorities

CHAPTER VII.

APPENDICES

7.1 List of Tables /Figures /Charts

- Table-1 Estimated Employment in MSME sector…….……...7
- Fig-1 -Map of India highlighting the survey states for the current study- Telangana, Andhra Pradesh, Karnataka, Tamil Nadu and Kerala…..……9
- Fig-2 FDA- and/or EMA-Approved Pharma Manufacturing Facilities in Karnataka, Tamil Nadu, Andhra Pradesh, Telangana and Kerala …….....10
- Fig-3 FDA- and/or EMA-Approved Pharma Manufacturing Facilities per company Karnataka, Tamil Nadu, Andhra Pradesh, Telangana and Kerala..…..10
- Fig. 4: Overlap of EMA- and FDA-Approved Facilities in Karnataka, Tamil Nadu, Andhra Pradesh, Telangana and Kerala…… 11
- Survey Questions-Data Tables and Charts (Question Wise)……...36-60
- Relationship Analysis-Data Tables and Charts……....60-71
- Component (Factor) Wise /Category Wise Analysis....…..……..……71-89
- Model (Picture) depicting key aspects to be focused upon for enhancing the Operational Efficiency of MSMEs……100

7.2 MAIN STUDY QUESTIONNAIRE

Demographic Details(People)

1. The basic educationalqualification of personnel on the shopfloor is:
   a. XIIth pass
   b. Graduate
   c. Post graduate
   d. Others ,pl. specify---------

2. **Experience:**
   a. Less than 1 year
   b. Between 1-3years
   c. More than 3 years

3. **Type of Induction/Training Programme undergone(Tick all that apply)**
   a. Organizational Overview and Policies
   b. SOP Manuals
   c. Hands on training

4. Training Evaluation (effectiveness check) Methodology followed by your organization
   a. Manual forms
   b. Softwwere
   c. Others,please specify ------

5. Have you undergone the refresher training programme?
   a. Yes
   b. No
6. Mention the frequency of the refresher training programme
   a. Monthly
   b. Quarterly
   c. Need based
   d. Others,please specify ------

7. Were you awwere of the Standard Operating Procedures (SOPs) of your organisation?
   a. Yes
   b. No

8. Did the Induction/Training programme help you get awwereness of the SOPs.

a. Yes

b. No

Process

9. Do you think SOPs that were followed in the shopfloor need improvement?

a. Yes

b. No

10. If yes, Tick the ones which you felt need to be improved

a. Language / Communication

b. Content

c. Content and language

d. Others,please specify ------

11. The mechanisms to report failure of any material to comply to the required specifications at different stages of manufacturing?

a. Manual Forms/Systems

b. Online

c. Others, please mention

12. The tools used to Investigate and rectify those failures to avoid their recurrence?

a. Manual Forms/Systems

b. Online

c. Others, please mention

13. The time frame to address any errors/failures at different stages in manufacturing?

a. Less than 30 days

b. Between 30-60 days

c. More than 60 days

d. Others, please mention

14. The region wise sales and distribution of the products manufactured in your organisation

a. Only in state where manufacturing unit is located

b. Across the states of India

c. International markets (non / semi regulated)

d. Others, please mention

15. Your organisation is certified with

a. ISO

b. State FDA

c. Others, please mention

16. The type of inspections your organisation undergoes:-

a. State FDA

b. Third party audits

c. Only internal Audits

d. Others, please mention

17. Does your organisation conduct/organise skill development programmes

a. Yes

b. No

18. If yes, Does your organisation conduct/organise the skill development programmes only for?

a. Inhouse employees

b. Other organisation employees

c. Both

19. Does your organisation encourage you to attend skill development programmes conducted by Government organisations or other peer group organisations?

a. Yes

b. No

20. If Yes, Does the organisation sponsor you?

a. Yes

b. No

21. If Yes, Has it helped you to improve your skills?

a. Yes

b. No

If No, give reason, why you were not allowed to attend?

Technology

22. Usual down time of an equipment in manufacturing werea orin the laboratory is :

a. Less than 48 hrs
b. Between 2-7 days
c. More than 7 days
d. Others,pl. specify ------

23. The IT tools used to report and address quality issues during manufacturing were:

a. Online forms
b. End to end incident management system
c. Manual Forms
d. Others,pl. specify ------

24. The Processes in manufacturing were Automated upto :

a. Less than 10%
b. Between 10-30%
c. More than 30%
d. Others,pl. specify ------

25. The processes which still need automation were :

a. Inventory management
b. Documentation on shopfloor
c. Incident reporting
d. Others,pl. specify ------

26. The barriers for automation were :-

a. Computer Skills and mindset
b. Outdated IT tools
c. Lack of funds
d. Others,pl. specify ------

27. The tools used to predict demand/supply for products being manufactured were :

a. Manual Forms

b. Alerts from market

c. Online software

d. Others,pl. specify ------

28. The errors observed during manufacturing can be attributed to

a. Manual entries

b. Failure to follow procedure

c. Lack of manpower

d. Others,pl. specify ------

29. New technologies being used in your organization :

a. Artificial Intelligence

b. Machine Learning

c. Augmented Reality/Virtual Reality

d. None of the above

Infrastructure

30. The warehouse for storage of materials (RM and FP) were :

a. Temperature controlled

b. Temperature ,Humidity Controlled

c. Temperature ,Humidity Controlled and Fire resistant

d. None of the above

31. The quality of final product before despatch is ensured by :

a. Physical appearance check

b. Physical appearance and Certificate of analysis check

c. Others,pl. specify ------

32. There have been products recalled from market due to quality issues :

a. Yes

b. No

33. Mechanism of addressing market recalls is :

a. Investigation by Internal Subject Matter Experts(SME)

b. Investigation by External Parties

c. Others,pl. specify ------

34. There were different storage facilities for Heat and Light Sensitive products :

a. Yes

b. No

35. The usual time of product to reach the retailer from your warehouse after dispatch is:

a. Less than 5 days

b. Between 5-10 days

c. More than 10 days

d. Others,pl. specify ------

36. The improvement areas in the overall process to increase speed to market were ?
(Tick all that apply)

a. Inventory management

b. Laboratory Quality Checks and record keeping

c. Transportation

d. Others,pl. specify ----

Funding

37. The Financial Operating model for your unit is :

a. Fully funded by government

b. Partially funded by government

c. Others,pl. specify ----

38. The out go in taxes(as %age of revenue) is:

a. Less than 10%

b. Between 10-30%

c. More than 30%

d. Others,pl. specify ------

39. The major bottleneck for securing government funding for an MSME is :

a. Paperwork and documentation

b. Red Tapism

c. Delay in approvals

d. Others,pl. specify ----

40. To attract more funds for the MSME sector following can be done : (Tick all that apply)

a. Simplified procedures and fast approvals

b. Tax rebate holidays

c. Encouraging Entrepreneurship

d. Others,pl. specify ----

41. The funding schemes or incentives being availed from government of India?

a. No

b. Yes, partially

c. Others,pl. specify ----

42. Other benefits which can be extended by government to promote manufacturing in MSME sector were :

a. Reduction in taxes for MSME's

b. Increase in Fund allocation

c. Improving supply chain network

d. Others,pl. specify ----

7.3 PILOT STUDY (Brief Report)

As mentioned (Chapter 3, Section 3.1,Pg. 49) the Pilot Phase of the Research was conducted for testing the reliability and validity of the questionnaire. For this 30 companies were selected for the survey in Telangana state of south India.

Data collected from the respondents through questionnaire by direct interview, telecalling and through online by use of Google forms, using emails, WhatsApp and LinkedIn. The responses were analyzed quantitatively using SPSS.

Data Treatment

For Pilot study 30 responses were collected and factor analysis was done through matrix and determined Eigen values using the Cronbachs Alpha [Reliability Test]

Eigen Values			
	Component		
	1	2	Uniqueness
3	0.833	0.470	0.0854
4		0.834	0.2959
1	0.670	0.439	0.3574
5	0.919		0.1373
6	0.842		0.2816
7	0.862	0.300	0.1672
8	0.862	0.300	0.1672
9	0.862	0.300	0.1672
11		0.919	0.0961
12		0.919	0.0961
13		0.834	0.2959
15		0.875	0.2181
16	0.778	0.557	0.0836
17	0.953		0.0613
19	0.861		0.2483
22	0.301	0.874	0.1462
24	0.797	0.432	0.1779
25	0.615	0.567	0.2991
26	0.562	0.716	0.1710

27		0.305		0.911		0.0760	
28		0.689		0.655		0.0965	
30		0.689		0.655		0.0965	
34		0.953				0.0613	
35		0.953				0.0613	
36		0.953				0.0613	
42		0.666		0.616		0.1779	
45				0.919		0.0961	
Note. 'varimax' rotation was used							

Cronbach's α test

Scale Reliability Statistics			
		Cronbach's α	
Scale		0.968	

Interpretation

Based on above Eigen values the set of questions were identified with same value of Uniquenes. Questions of value more than 0.6 were only considered for "Second Phase" or "Main Study". In pilot study majority of questions values were more than 0.6 in either of the components.

Cronbachs Alpha [Reliability Test] value is 0.968 which tells that questions in questionnaire were reliable for study.

Analysis of data (for Pilot Study)

Based on responses received for questions asked for **Primary factors (People, Process, Technology)**following were the observations :-

While most of MSME's employ Graduates with more than 3 y experience, their internal training systems ,induction process were heavily dependent on Manual processes which were largely ineffective in long run. Trainings to employees (Initial or refresher) need a complete overhaul with Electronic systems, proper tracking and effectiveness checks .

Language ,content for SOPs followed needs a deep dive and improvement .Quality issues need to be handled electronically to build trust with regulators and make a robust system at shopfloor to avoid manual entries and errors .Certifications need to be expanded which will

further give companies a chance to look at other states in India and also outside of India .Skill dev programs, refresher trainings practically do not exist and need enforcement in MSME's.

Automation is key in today's world and there is a heavy scope for MSME to automate their manufacturing processes and eliminate Manual handling of records,equipments etc. wherever possible .Quality issues as seen by data were attributed largely to Failure to follow procedure which can be reduced by using electronic systems (Technology).Manpower shortage also seems to be one of the major reasons for issues during manufacturing .There is no use of new technologies like AI etc. as most of systems were still manual.

Based on responses received for questions asked for **Secondary factors(Infrastructure and Funding)**following were the observations :-

Almost 65% MSMEs have facilities do not have fire resistant warehouse which is a necessity. Also 40% have humidity control along with Temp which is again a risk to pdt quality .Most of the MSME do not have separate facilities for heat and light sensitive pdts which again would impact pdt quality. Speed to market needs to be increased .

Tax outgo for MSME is very high. Most of them have highlighted that Tax rebates and simplifies process and approvals will help them . Awareness of govt schemes need to be increased with specific programs. Need of more funds has been indicated as well.

QUESTIONNAIRE RESPONSES (n=30)

(For reference only)

	PARTICULARS	RESPONSES				
		1	2	3	4	5
1	Basic educational qualification		5	22	3	
2	Experience:			30		
3	Type of Induction/Training Programme undergone(	7	8	15		
4	Training Evaluation (effectiveness check) Methodology	25	5			
5	Have you undergone the refresher training programme?	6	24			
6	Mention the frequency of the refresher training programme	3		3	24	
7	Were you aware of the Standard Operating Procedures (SOPs) of your organisation?	10	20			
8	Did the Induction/Training programme help you get awareness of the SOPs.	10	20			
	Process					

9	Do you think SOPs that were followed in the shopfloor need improvement?	10	20			
10	If yes, Tick the ones which you felt need to be improved	4	3	3		
11	The mechanisms to report failure of any material to comply to the required specifications at different stages of manufacturing?	20	10			
12	The tools used to Investigate and rectify those failures to avoid their recurrence?	20	10			
13	The time frame to address any errors/failures at different stages in manufacturing?	25	5			
14	The region wise sales and distribution of the products manufactured in your organization	30	0	0	0	
15	Your organisation is certified with	23	7			
16	The type of inspections your organisation undergoes:-	7	10	13		
17	Does your organisation conduct/organise skill development programmes	7	23			
18	If yes, Does your organisation conduct/organise the skill development programmes only for?	7	0	0		
19	Does your organisation encourage you to attend skill development programmes conducted by Government organisations or other peer group organisations?	**5**	**25**			
20	If Yes, Does the organisation sponsor you?	5				
21	If Yes, Has it helped you to improve your skills?	5				
	If No, give reason, why you were not allowed to attend?					
	Technology					
22	Usual down time of an equipment in manufacturing area or in the laboratory is :	18	10	2		
23	The IT tools used to report and address quality issues during manufacturing were:	5	2	23	0	
24	The Processes in manufacturing were Automated up to :	4	10	14	2	
25	The processes which still need automation were :	0	14	16		
26	The barriers for automation were :-	12	5	13		
27	The tools used to predict demand/supply for products being manufactured were :	18	3	9		
28	The errors observed during manufacturing can be attributed to	8	12	10		
29	New technologies being used in your organization :				30	
	Infrastructure					
30	The warehouse for storage of materials (RM and FP)	8	12	10	0	

	were :					
31	The quality of final product before despatch is ensured by :	15	15	0		
32	There have been products recalled from market due to quality issues :		30			
33	Mechanism of addressing market recalls is :	0	0			
34	There were different storage facilities for Heat and Light Sensitive products :	8	22			
35	The usual time of product to reach the retailer from your warehouse after dispatch is:	8	0	0	22	
36	The improvement areas in the overall process to increase speed to market were ?		8		22	
	(Tick all that apply)					
	Funding					
37	The Financial Operating model for your unit is :			30		
38	The out go in taxes(as %age of revenue) is:		12	18		
39	The major bottleneck for securing government funding for an MSME is :	10	5		15	
40	To attract more funds for the MSME sector following can be done : (Tick all that apply)	10	20			
41	The funding schemes or incentives being availed from government of India?	30				
42	Other benefits which can be extended by government to promote manufacturing in MSME sector were :	20	10			

7.4 Table for Sample Size Selection

Required Sample Size†

Population Size	Confidence = 95% Margin of Error				Confidence = 99% Margin of Error			
	5.0%	3.5%	2.5%	1.0%	5.0%	3.5%	2.5%	1.0%
10	10	10	10	10	10	10	10	10
20	19	20	20	20	19	20	20	20
30	28	29	29	30	29	29	30	30
50	44	47	48	50	47	48	49	50
75	63	69	72	74	67	71	73	75
100	80	89	94	99	87	93	96	99
150	108	126	137	148	122	135	142	149
200	132	160	177	196	154	174	186	198
250	152	190	215	244	182	211	229	246
300	169	217	251	291	207	246	270	295
400	196	265	318	384	250	309	348	391
500	217	306	377	475	285	365	421	485
600	234	340	432	565	315	416	490	579
700	248	370	481	653	341	462	554	672
800	260	396	526	739	363	503	615	763
1,000	278	440	606	906	399	575	727	943
1,200	291	474	674	1067	427	636	827	1119
1,500	306	515	759	1297	460	712	959	1376
2,000	322	563	869	1655	498	808	1141	1785
2,500	333	597	952	1984	524	879	1288	2173
3,500	346	641	1068	2565	558	977	1510	2890
5,000	357	678	1178	3288	586	1066	1734	3842
7,500	365	710	1275	4211	610	1147	1960	5165
10,000	370	727	1332	4899	622	1193	2098	6239
25,000	378	760	1448	6939	646	1285	2399	9972
50,000	381	772	1491	8056	655	1318	2520	12455
75,000	382	776	1506	8514	658	1330	2563	13583
100,000	383	778	1513	8762	659	1336	2585	14227
250,000	384	782	1527	9248	662	1347	2626	15555
500,000	384	783	1532	9423	663	1350	2640	16055
1,000,000	384	783	1534	9512	663	1352	2647	16317
2,500,000	384	784	1536	9567	663	1353	2651	16478
10,000,000	384	784	1536	9594	663	1354	2653	16560
100,000,000	384	784	1537	9603	663	1354	2654	16584
300,000,000	384	784	1537	9603	663	1354	2654	16586

X—X—X—X--X