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Some Recent Stories of Operational Excellence in SMES

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Abstract: ***Operational Excellence is a term associated with excellence in all stages of business for any business organization which may be manufacturing or a trading. Operational excellence deals with the achievement of improved productivity, profitability and reduced wastage. The present paper is an analysis of the relevant papers and the practices which may be considered for adoption by the small scale and medium scale organizations for the achievement of excellence in their operations. In less advanced countries like India the SME's play a major role in uplifting the economy. The SME's are facing tough competition and survival is a very big challenge in the current scenario around the globe. So, In this study an attempt was made to review some recent stories ranging from 2011 to 2023 for Lean practices and environment friendly practices leading to Green implementation, collectively achieving operational excellence. The research gaps have been studied and the focus is on identification of the best Operational practices coupled with suitable environment friendly practices for the productivity improvement, quality management and improved financial structure. The present paper is a novel approach for the evaluation of the green and lean management principles combined with Industry 4.0 for the operational excellence of the manufacturing sector.***

Keywords: Operational Excellence (OPEX); Lean and six sigma industry 4.0 integration (LS4.0); World class manufacturing (WCM); Internet of things (IOT); Green and lean six sigma(GLSS); Lean smart manufacturing (LSM); Value Stream Mapping (VSM).

I. INTRODUCTION

The SME's are a key contributors in the economy and development of skills in a country. Considering Indian context the SME's play a major role in enhancing the GDP of the country. The number of SME's is very large in comparison to the large scale enterprises. The SMEs have the benefits of flexibility, cost effectiveness and employment generation. In view of these factors the SMEs have to play a vital role in shaping the economy and employment generation for a country. The 30% of the India's GDP is contributed by SMEs and around 40% of the citizens are employed by the SMEs. Innovation and Entrepreneurship are promoted by the SMEs among the people of any country.

The SMEs have a great contribution in the export of goods from India and is nearly 40% of the total export done by the country. Indian e-commerce sector is largely dependent on the SMEs and the e-commerce is expanding continuously with the growth of SMEs.

The urban and the rural India's youth have got good employment opportunities because of the setting up of SMEs. The schemes like 'Make in India', 'Digital India' and promotion of Startups by their funding by the Indian Government has been aiding in the expansion of SMEs to both the urban and the rural areas.

Saini and Singh, (2020)evaluates the status of Lean practices in SME's of Northern India based upon percent point score methods for implementation of lean manufacturing processes in SME's [30]. The critical factor in lean implementation in SME's has the management vision as the most valued factor.

Saini and Singh, (2020) rates 5S production management and supplier management practices rated as top lean practices in SME's of India on the basis of percent points score method. The present paper is an attempt to study the application of lean principles and green principles to achieve operational excellence in SME's. Professor Pauline Found et al., (2018) establishes that many constituents such as quality, continuous improvement, lean and agile can be unified to achieve operational excellence [15]. The term operational excellence has gained importance since its inception but the publications haven't increased substantially from 1987 to 2020 as they have just doubled in a time frame of 33 years. The most common connection to Operational Excellence is Lean in Managing Principles, Sustainable Principles and Environment [44]. Green, Six Sigma and Lean is in the development stage and the sectors involved in manufacture of goods are resistant because of cultural differences and shift in the work process [42].

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An innovation was developed using a hybrid integrated Lean and Smart Manufacturing concepts for achieving economic sustainability [40]. The impact of industries practicing lean principles does not necessarily result in green improvement as concluded by *Sri Hartini et al.,(2015)* [18]. The use of Lean Sigma Techniques helped in implementing operational excellence in SME's by reducing the die changes over time for the scroll line press in the pressure shop [4]. A survey of pharmaceutical companies around Bangalore city Karnataka yielded positive results which enhanced operational excellence as presented by *V. Jaiganesh et al.*,(2015), [41]. Operational Excellence leads to enduring capacity as depicted conceptually [8]. The choice for the achievement of lean tools is dependent on the nature of the company effective and if efficient choice of operational excellence techniques in pharmaceutical industry can lead to good inventory management [17]. Leadership at the top level strongly influence the achievement of operational excellence in pharmaceutical companies as stated by *Boya and Rao*, (2019), [6].The achievement of operational excellence leads to sustainability and improves the economic environmental and social performance of Companies [29, 19]. The achievement of environmental system and the government operation excellence in Sultanate of Oman are related which can improve government citizen relationship and reduce the failure possibilities [2]. The growth of Tanzanian SME's can be done by the adoption of SCM [36]. To achieve customer satisfaction the SME's must adopt innovation management which can lead to product improvement as *Omar Al Azzouzi et al.,* (2021), [5]. The lean practices have a great effect on SCM and six sigma metrics lead to supply chain measurement and improvement. The main focus of SCM is to target right product at right cost, right time, right quality & right quantity to the right customer [24]. Popy Umbrella Mart which is an SME located in Kerala in India is a success story for innovation and Organizational Excellence. Operational excellence can be achieved by cultural shift of believing in the power of common people in attaining productivity and excellence. The 7S framework shown in figure1 can lead the SME's to operational excellence [20].

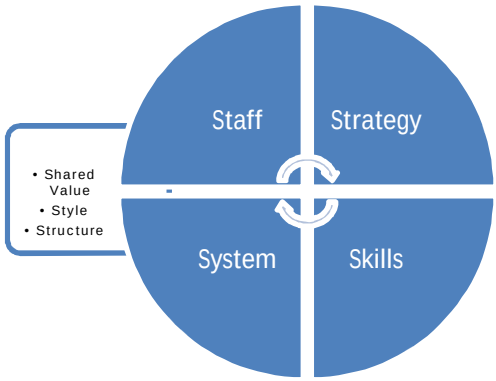


Figure 1: 7S framework of Kerala SMEs [20]

The integration of LSS 4.0 with green manufacturing, resilience and agility can be a topic of future research. The LSS4.0 can be applied to SME's which can lead to operational excellence as proposed by *Dounia Skalli et al.,* (2023), [13]. The business innovation enhances the business growth and financial performance of SME's. Ethnicity has no impact on SME innovation outcomes [12]. A study of SME's of Ghana has led to the creation of value due to the use of social media and led to a significant and positive effect on sustainability social network improves the business activities, profitability and is a promotional tool for SME's [17].

The SME's are an important part of overall economy and to improve the productivity of SME's leads to Greater participation of the people [17]. In developing countries the technology adopt in SME's is a growing area of interest which can which will improve the organization productivity [25]. The SME's performance is a cause of concern because of their low productivity, high cost and below performance [30]. In Lean manufacturing the numbers of non-value added activities were eliminated in SME's and the Six Sigma tools usage helped in achieving Operational Excellence [4]. The SME's suffer a number of challenges in the domestic and global market competition although it can adopt supply chain management [36].

The SME's face the challenge in this fast paced world of manufacturing and the determining factors are the speed to and operational efficiency. SME's in particular do not have a mindset and then neither have the kind of workforce which can implement lean practices and GWRT for improving the productivity by reducing wastage. The road to achieving operational excellence is a very complicated one for the SME's considering Indian context.

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The integration of I4.0 & WCM can benefit greater accuracy, precision and reliability of the gathered information. The I4.0 tools and the WCM tools to find the links were studied to achieve competitiveness. The I4.0 technological groups namely cloud computing, IOT, M2M Cognitive Computing, Mobile technologies, AR, Simulation, additive manufacturing and advanced robotics were studied for integration with WCM tools namely safety, cost deployment, focused improvement, autonomous maintenance, Work place organization, Professional maintenance, Quality control, Logistics, Early equipment management, People development, Energy and Environment. The I4.0 is important for the WCM as depicted in the WCM-I4.0 matrix [29].

II. METHODOLOGY

The Table 1 depicted below is an analysis of the previous research work done on the Lean, Green and I4.0 techniques for the achievement of excellence in operations of small and medium sized manufacturing firms -

Table 1: Some recent stories of the Operational Excellence in SMEs

S.No.	Topic and Author	Year	Conclusions	Research Gaps
1.	'Teaching of operational excellence in Moroccan universities and high schools A major lever for a competitive Moroccan company' Laila Elouarat, JanahSaadi and Khalid Kouiss.	2011	The teaching of operational excellence (Lean Management) a proposal has been derived to complete such a project in Morocco.	Detailed direct surveys which are required to be conducted for teaching of operational excellence so that a reasonable conclusion can be arrived [14].
2.	'Challenges and opportunities of Tanzanian SMEs in adapting supply chain management' Sama ,Hamisi.	2011	Supply chain management if adopted by the SMEs can strengthen economy and improve operational performance.	A critical mass analysis must be studied so that SCM can be adopted by the SMEs [36].
3.	'Implementing operations excellence in small and medium size manufacturing companies – using lean–sigma techniques' Ashok Kumar Puri.	2012	Reduction in Die setup time was achieved by the tools such as Lean Six Sigma manufacturing. This resulted in improvement in the Business Performance.	Study limited to just Six Sigma techniques of Lean and needs to be extended to the use of other LMPs [4]
4.	'Technology Innovation for SME Growth: A Perception for the Emerging Economies' Hanadi AL-Mubaraki & M. Aruna.	2013	Technology adoption by the SMEs in Indonesia has significantly improved performance in terms of profit and market share. The innovation in SMEs has contributed largely to the economic growth.	The areas of innovations in SMEs are largely to be explored so that an Empirical research on the innovation techniques can be suitably found [3].

5.	'POPY UMBRELLA MART-A CASE OF ORGANISATIONAL EXCELLENCE IN SMEs' BEST: JOB P. A.	2014	The case study on Poppy Umbrella Mart reveals that the family unit concept of China brought excellence to the SMEs as "Self Ownership" requirement of employees was achieved.	Case Study is limited to Human Resource and can be extended to Smart systems for achievement of operational performance [20].
6.	'Value Stream Mapping : A Lean Tool' Manjunath M., Dr. Shiv Prasad H.C., Keerthesh Kumar K.S and Deepa Purthran,	2014	VSM is an important lean tool which can bridge tools, process and people for continuous improvement.	5S, Kaizen and TPM combined with VSM can be a scope of future study for excellence achievement [27].
7.	'The relationship between government operation excellence and e-government system in sultanate of Oman' Muatasim Anwar Ahmed Al Salmi & Norlena Bt Hasnan.	2015	The e- government system is transforming the lives of citizens and improving the government citizen relationship to improve the government operational excellence.	The government needs to conduct more surveys to verify the achievement of government operational excellence [2].
8.	'The relationship between lean and sustainable manufacturing on performance: literature review, Sri Hartini and Udisubakti Ciptomulyono.	2015	This study has confirmed that lean implementation yields higher green results. Lean and Green further yield better operational performance and sustainability.	Quantitative Techniques are required to reach conclusive results of lean and green implementation on Operational Excellence [18]
9.	'Study the Influence of Lean Principles which Enhances the Operational Excellence in the Pharmaceutical Industry' V. Jaiganesh and Clement Sudhahar	2015	Knowledge of Lean Principles is missing in the different levels of people working in Pharmaceutical Industry. Operational Excellence can be achieved through a continuous effort in LEAN awareness and lean implementation	Study limited to Pharma Industry only and the survey is limited to Pharmaceutical Industry of Bangalore [41]
10.	'Review the Operational Excellence Factors of Service Firms: A Literature Review' Rana Mohammad Shehadeh,	2016	Leadership, Operations Strategy, management practices and involvement culture can lead to operational excellence in Service Industry.	Limited factors have been considered and the research can be extended to find new factors for the promotion of OE in manufacturing sector also [38].

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	Mahmoud Maqableh, Mohammad Orsan Al-Zoubi, Abdel hakim O. Akhorshaideh, Majed Khalil Al-Shami.			
11.	'Guidelines to choose Operational Excellence techniques/tools for inventory management: the case of pharmaceuticals supply chain' Malak Mouaky Abdelaziz Berrado and Loubna Benabbou.	2017	Managing Inventory is critical factor for pharmaceuticals and suitable OE techniques evaluation for improvement of the supply chain in the Pharma Sector.	Present study is limited to Pharma Industry inventory management only and it can be eye opener for OE tools not only for inventory management but for other factors also [25].
12.	'Innovation Strategies and Challenges in Emerging Economies: The Case of Research and Technology Organizations in Turkey' F. Demir	2017	The innovation strategy requires huge investment which is a very big challenge.	The sample size of just40 organizations is very low to reach to concrete conclusions [10].
13.	'Operational excellence as a means to achieve an enduring capacity to change – revision and evolution of conceptual model' Am. Carvalho, P. Sampaio, E. Rebentisch and P. Saravia.	2017	Excellence Model presented deals with the relationship between organizational culture, agility and operational excellence.	Case Studies must be done to achieve qualitative results of operational excellence model being suggested in this paper[8].
14.	'Lean practices for consummating competitive priorities in SME's: a critical review' Sachin Saini and Doordarshi Singh	2018	The comparison table is useful in selection of the best Lean practices for SME's and the problem with the people or process can be found using the 7P model.	Empirical test are required for most suitable lean practices and there is a need for in depth study of different factors which are hold importance for implementing the Lean Practices. [31].
15.	'Towards a theory of operational	2018	Lean thinking can need to operational excellence through	Empirical testing with industries is required so that the industries can

	excellence' Total Quality Management and Business Excellence Professor-Pauline Found, Mr Andrew Mason.		leadership management. Quality, Continous improvement and agility are also important to achieve operational excellence.	progress towards operational excellence. This paper is limited to only one conceptual model and lacks in detailed analysis on the factors which can lead to operational excellence [15].
16.	'Influence of Leadership at Top Level Management in Achieving Operational Excellence in Pharmaceuticals' Venkateswara Reddy Boya & K. S. Sekhara Rao.	2019	A survey of three pharmaceutical companies strongly concluded that the top level management has an important role in achieving operational excellence in pharmaceuticals.	The present work is limited to pharmaceutical companies only and Empirical analysis is the scope of future work [6].
17.	'Insights on Supply Chain Needs and Issues in Indian SMEs' G. Narkhede1 and N.R.Rajhans2	2019	In the Indian context very less literature is available on a supply chain strategy that is effective for improvement in the pursuance of SMEs which leads to low performance of SMEs.	An intensive study on SMEs in India is required so that SMEs improve on product development time, quality, cost, productivity and process flow [28].
18.	'An evaluation of the status of lean manufacturing practices in SME's in Northern India' Sachin Saini and Doordarshi Singh	2020	The percent point score method finds 5S, productivity management and supplier management lean practices score higher for implementation in SMEs of Northern India. In a collective view every lean practices is found to contribute but some score better.	This study is confined to the Northern India SMEs and some other qualitative and quantitative techniques can be exploding to select the most suitable lean practices [30]
19.	'A Systematic literature review of implementation six sigma in manufacturing industries' Indri Setiawan1#) & Fransisca Debora2	2020	Six-sigma is a systematic method which minimizes defects by using statistics and problem solving tools. The quality, productivity, lower costs and product change can be achieved by six-sigma.	SMEs have financial issues so an extended Empirical basis of study is required to check the financial feasibility for implementing six-sigma in SMEs [37].
20.	'Ethnicity, religiosity and SME innovation outcomes: some insights from a Muslim ethnic group' Donard Games,	2020	Ethnicity and religiosity had no effect on the SMEs innovation outcomes.	This research must be exhaustible carried out in large group so that the effect of ethnicity and religiosity on innovation in SMEs can be reasonably concluded [16].
21.	'Industry 4.0 and	2020	WCM promotes accuracy,	SMEs have investment issues and

	World Class Manufacturing Integration: Lorenzo D'Orazio, Roberto Messina and Massimiliano M. Schiraldi,		precision, liability when coupled with I4.0. The integration leads to continuous growth of competitiveness the paper lists nearly 100 I4.0 technologies which can empower world class manufacturing.	manpower issues for I4.0 and WCM integration. The study can be extended by surveys of SMEs [9].
22.	'Investigating the perceptions of lean manufacturing practices in Northern India in SMEs: An Empirical study'Sachin Saini and Doordarshi Singh	2020	The paper aims on the perceptions in adopting the lean and focuses on continuously improving and reducing the waste. The different lean perceptions are rated in a graphical manner with a percent score.	The different perceptions can be statistically evaluated with better techniques and more data collection is required [33].
23.	'Integration the 6th category Business Excellence Framework, the 8th clause ISO 9001:2015 and the 6th category KPKU Indonesia Framework Sri Widaningrum, Musli Mohammad and Rasidi .	2020	Indonesian OE consists of 5 criteria and 14 sub-criteria.	Verification and validation frameworks are missing in OE model of Indonesia [43].
24.	'Lean Industry 4.0' – Current trends and future perspectives, Cogent Business & Management, Krzysztof Ejsmont, Bartlomiej Gadysz, Donatella Corti, Fernado Castano, Wael M. Mohammed & Jose L. Martinez Lastra	2020	LM is linked to I4.0 and it can be correctly said that both promote each other.	LI4.0 is not well defined and availability of literature is limited so there is a great scope of research work on LI4.0. Quantitative data which certifies the advantages of combination of lean practices and I4.0 is not available[12].
25.	'Operational Excellence within Sustainable Development Concept-Systematic Literature Review' Daniel Wojtkowiak	2020	This work successfully establishes that sustainable development and operational excellence are related. Lean concepts strengthens sustainability and green policy also significant in waste reduction	Nearly 10% of the articles collected that operational excellence is connected with sustainable development and this is not a considerable percentage to reach a respectable conclusion. The concept of sustainability can be extended to

	and Piotr Cyplik,		and process efficiency improvement.	SMEs [44]
26.	Reckoning with the barriers to Lean implementation in Northern India SMEs using the AHP-TOPSIS approach' Sachin Saini and Doordarshi Singh,	2020	The barriers in implementing the lean in SMEs of upcoming economies like India have been identified to a reasonable level.	The evaluation of barriers must be extended to different sectors of the SMEs. The present work limits to the manufacturing sector only and mathematical analysis can be further used to assign weights to different barriers in implementing the Lean techniques [34].
27.	'Innovation Management in SME and Organization Development Based on Customers Satisfaction'Omar El Azzouzi&Prof. Dr. GozdeUlutagay	2021	A model which includes theoretical relationships between innovations in organizational learning and consumer satisfaction is developed in the SMEs.	Only managerial view per company has been surveyed whereas the responses from different stake holders of the company must be surveyed [5].
28.	'Integral measures and framework for green lean six sigma implementation in manufacturing environment' Vishwas Yadav, Pardeep Gahlot, RajeevRathi, Gunjan Yadav,Anil Kumar & Mahender Singh Kaswan,	2021	The integration between green, six sigma and lean can enhance profitability, quality, customer satisfaction, responsiveness and process efficiency. This integration can be achieved through management commitment and team efforts.	GLSS implementation needs to be tested practically and also it must be tested mathematically to achieve concrete results. GLSS must be studied for linking with sustainability and I4.0 environment [42].
29.	'From Lean Production to Lean 4.0: A Systematic Literature Review with a Historical Perspective' Francisco Gil-Vilda1, José A. Yagüe-Fabra2,* and Albert Sunyer3	2021	Lean 4.0 is a combination of lean manufacturing and Industry 4.0 technologies.	Lean4.0 is the future for smart implementation which can bring about green improvement and sustainability [17].
30.	'The Effects of Green SCM Implementation on Business Performance in SMEs : Sung Tae Kim, Hong-Hee	2021	GSCM implementation in electronics industry achieved sustainable competitiveness, cost reduction, flexibility and quality across supply chain.	The study is limited to Korean electronics industry only and the business performance changes over time so sustainability is a matter of study. The study is limited to SMEs sector only [21].

	Lee* and Seongbae Lim,			
31.	'Sustainability through Operational Excellence: An Emerging Country Perspective' Rafael Henríquez-Machado,Andrés Muñoz-Villamizarand Javier Santos.	2021	Operational excellence improves the economic, environment and social performance of companies. In developed countries operational excellence is implemented successfully.	The identification of most critical determinants and barriers to implement operational excellence in emerging companies is a scope for further work. In emerging countries the companies are mostly small, micro and medium sized so a method to achieve a sustainable excellence model needs to be devised [19].
32.	'A Sustainable Productive Method forEnhancing Operational Excellence in Shop Floor Management for Industry 4.0 Using Hybrid Integration of Lean and Smart Manufacturing: Varun Tripathi, Somnath Chattopadhyaya, Alok Kumar Mukhopadhyay, Shubham Sharma, Changhe Li, Sunpreet Singh, Waqas UI Hussan, Bashir Salah, Waqas Saleem and Abdullah Mohamed.	2022	This paper concludes that smart techniques like IOT and AI etc are linked to operational excellence. Shop floor management can be effectively improved by the implementation of the lean and I4.0.	The paper is unable to evaluate different factors where faults occur and the study can be extended to digital integration between lean sustainability smart manufacturing and application in I4.0 [40].
33.	'Development of a model to assess the impact to lean practices on firm performance in SMEs' Sachin Saini and Doordarshi Singh.	2022	Analytical results from approaches based on analysis have been developed in this paper. This work mainly assesses that Mixed Approach is preferred in successfully implementing LMPs	Quantitative techniques may be used in the future and the study can be extended to other manufacturing industries rather than limiting it to the SMEs sector only [32].
34.	'Lean manufacturing practices for enhancing firm performance in medium enterprises:	2022	Lean practices such as 5S, Kaizen, OEE, Kanban and JIT brought about reduced rejections. The objectives like customer satisfaction, timely deliveries and business sales improved largely	Study was limited to manufacturing organization dealing in air-conditioning and combines parts. The study results can be extended to other sectors of industry and further its impacts on green improvements

	Sachin Saini and Doordarshi Singh		on the implementation of LMPs	need to be evaluated [39]
35.	'Logistics: Impact of Industry 4.0'Appl. Sci. Sarah El Hamdi1,2,* and Abdellah Abouabdellah2	2022	Logistics 4.0 has positive environmental impacts and combined with I4.0 can lead to sustainability.	Elimination of jobs as the I4.0 and Logistics4.0 mainly concentrate on process efficiency [13].
36.	'Root Cause Analysis in the Industrial Domain using Knowledge Graphs: A Case Study on Power Transformers' Jorge Martinez-Gil, George Buchgeher, David Gabauer, Bernhard Freudenthaler, Dominik Filipiak and Anna Fensel.	2022	Use of Knowledge graphs for the detection of faults and finally using a query program leads to a possible solution to find out the faults in the system. The human operator can reach to suitable conclusion in fault detection using this novel approach of Knowledge graphs.	Artificial Intelligence techniques must be further used to process the numeric information for a more user friendly solution [24]
37.	'Social Media Usage and SME Firms' Sustainability: An Introspective Analysis from Ghana' Emmanuel Bruce, Zhao Shurong, SulemanaBankuoru Egala, John Amoah, Du Ying, Huang Rui and Tai Lyu	2022	In a developing country prospective the social media can improve business and profitability thereby promoting small and medium size businesses. The Empirical data collected from various SMEs of Ghana is the basis of this study.	The study is limited to only the manufacturing industry and must be extended to service industry [7]
38.	'The Development of an Excellence Model Integrating the Shingo Model and Sustainability' José Carlos Sá, Manuel Reis, José Dinis-Carvalho, Francisco J. G. Silva, Gilberto Santos, Luis P. Ferreira, and Vanda Lima.	2022	A new model is designed to select the best lean tools to improve the operational excellence of a company. A conceptual model based on has been proposed sustainability by applying lean six sigma and Shingo's model.	The Empirical validation of the conceptual model needs to be justified by a real case study [29].

39.	'An empirical investigation on the deployment of operational excellence in SMEs' Satyajit Mahato, Amit Rai Dixit, Rajeev Agrawal, Jiju Antony, Jose Arturo Garza-Reyes and AnbeshJamwal.	2023	"Consistency","Product-excellence", "Process - efficiency", Supplier-efficacy", Contractual-conformance" and "Competitive-potential(CP) are the key factors for implementation of OE in SMEs	Future scope is to explore Consistency procedures by usinf I4.0 enablers and quantitative and qualitative management [23].
40.	'Barriers to adoption of industry 4.0 and sustainability: a case study with SMEs' Shashank Kumar, Rakesh D. Raut, EmelAktas, Balkrishna E. Narkhede&Vidyadhar V. Gedam.	2023	The paper concluded 12 critical barriers for the adoption of sustainability and I4.0 in SMEs. The interrelationship between the barriers was studied using the interpretive structural modeling.	The results are confined to Indian SMEs and further the barriers may vary for SMEs of different countries. The study can be further extended to find out if structural equation modeling can be implemented in Indian context as done for Malaysian firms [22]
41.	'Driving Operational Excellence: Application of Lean Practices to Minimize Turnaround Time in a Pharmaceutical ManufacturingCompany' Muhammad Iqbal Suleman.	2023	Reduction of lean in pharmaceutical industry is slow because of human involvement in different stages of production. The defect finding was simple using PDCA approach.	A detailed study of the problems of pharmaceutical industry is required to identify root cause before the lean practices are adopted. [26].
42.	'Evaluating the critical success factors for lean implementation in SME's in Northern India using VIKOR approach'Sachin Saini and Doordarshi Singh	2023	Management Vision and participation of everyone, training and model of business are some of the critical success factors for implementing the lean practices in SMEs.	The scope of this research is not applicable to large scale industries of North India and a more analytical analysis is required to ascertain the success factors which are critical for Lean implementation [35].
43.	'Industry 4.0 and Lean Six Sigma integration in manufacturing: A literature review,DouniaSkalli ,	2023	LSS and I4.0 are mutually synergistic and compatible. The identification of 139 articles published between 2011 to May 2022 has very less papers dealing with the relation between LSS and I4.0.	Empirical studies such as case study and surveys is future scope of work for relationships between LSS and I4.0 [11].

	AbdelkabirCharkaoui, AnassCherrafi, Jose Arturo GarzaReyes, Jiju Antony & Alireza Shokri			
44.	'STRATEGIC HRM BEST PRACTICES AND OPERATIONAL EXCELLENCE IN IT INDUSTRY DURING AND AFTER THE COVID-19 INCIDENT' Akhilesh Kumar Das and Raj Tomad.	2023	Pandemic has taught the IT companies to focus on employee protection and seek new methods to safeguard the workforce alongwith company performance.	Study is limited to IT companies operational excellence only and can be extended for OE achievement of other sectors during and after pandemic situation [1].

The contributions of the different countries for the achievement of excellence in the operations of SMEs is depicted in the bar graph below –

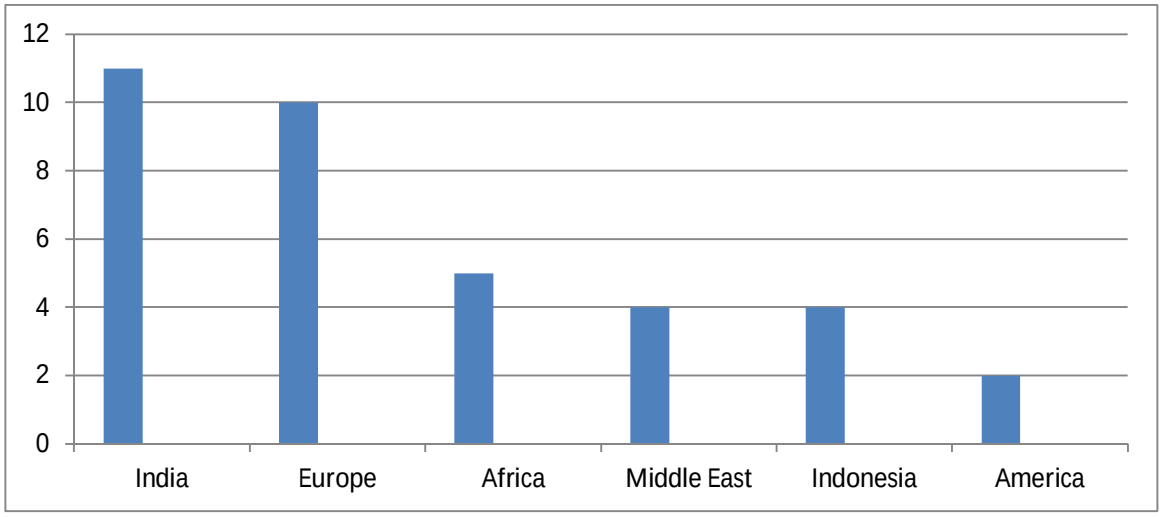


Fig 2 : Country wise papers published on Operational Excellence

III. RESULTS AND DISCUSSIONS

The papers [1, 4, 15, 23, 25, 26, 31, 38, 40, 41, 44] relate mainly to the achievement of operational excellence in SMEs. The papers chosen for study had SMEs as the main focus of study. The other papers studied in this research concentrate on the Lean, Green and Industry 4.0 principles for achievement of sustainability, agility and greater productivity. Value Stream Mapping and Six Sigma are some of the important tools of Lean for SMEs and couple with Industry 4.0 can lead to Lean 4.0 [17, 27, 37]. The latest published papers promote the Industry 4.0 concept and its integration with lean practices [11, 22, 23, 26, 35]. The environment awareness and its preservation promotes waste reduction in SMEs and elimination of harmful waste. The present study unfold that 'Self Ownership' concept is a requirement of the employee which in turn brings excellence for the organization [20]. Employee awareness and involvement is a key factor for the industry as is seen in Pharmaceutical Industry survey. The different levels of people must be aware about the lean management principles [41].The strategy for operation, leadership and implementation cultures are the desired factors for excellence in operations [38]. The top level management has to play an important role for Operations Excellence in SMEs.

IV. CONCLUSIONS

The research papers from the recent years ranging from 2011 to 2023 show that only 25 percent papers are published by taking the central theme as operational excellence. In the published work India dominates mainly coupling operational excellence with lean concepts but Europe has the maximum published work on operational excellence. Industry 4.0 is an emerging concept and latest papers are concluding it of great importance for SMEs. The SMEs have to go a long way in implementing Industry 4.0 in Indian context as revealed by the study. The African published work dominates in implementation and integration of Lean and Industry 4.0. The conclusions are very important and the novel research in this paper has a promising future for the SMEs of India which are facing global challenges.

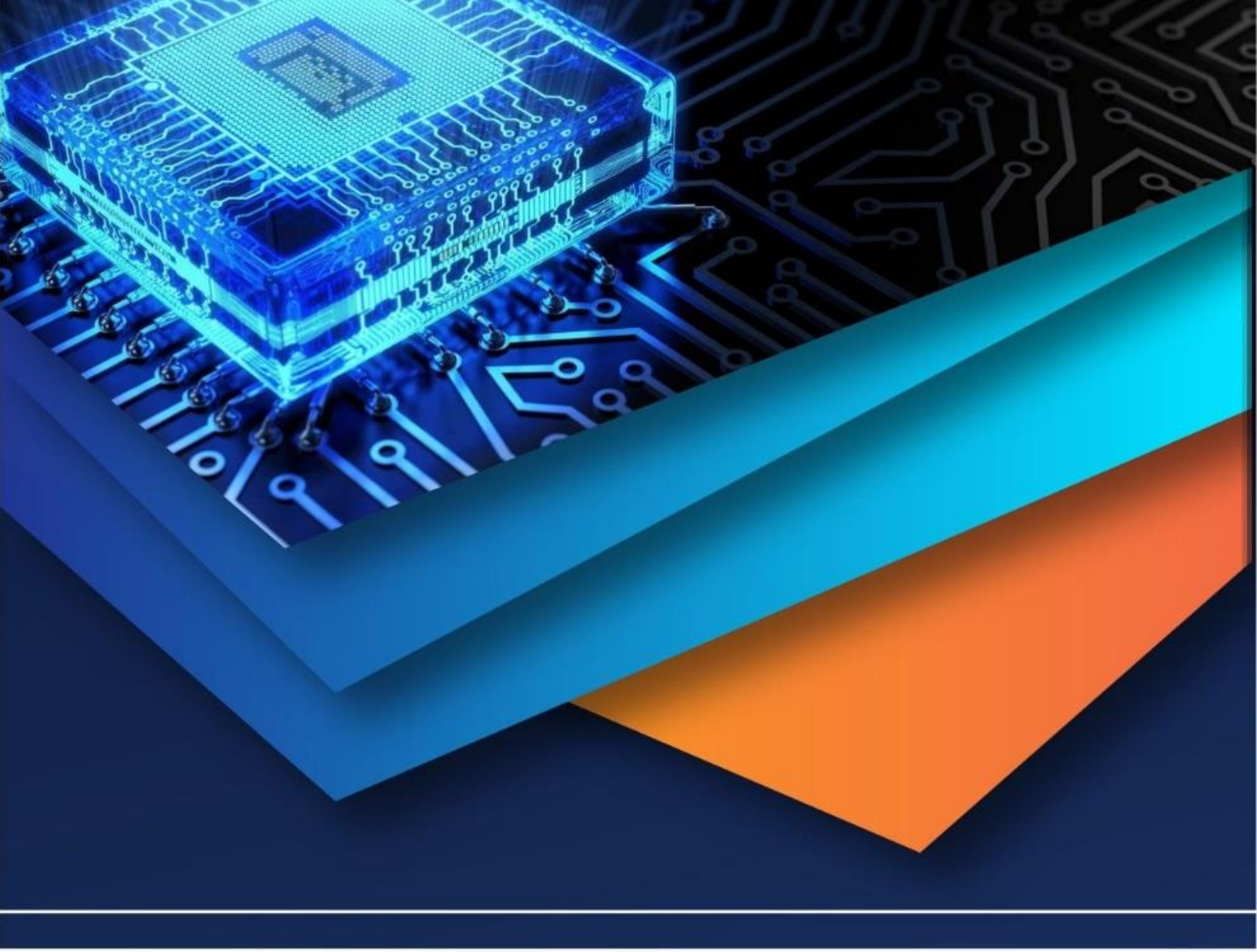
V. SUGGESTIONS FOR FURTHER RESEARCH

1) Quantification of the lean and green practices can be a scope of future study in the context of SMEs
2) Empirical studies on the digitalization of the SMEs and the essential IT tools which can rapidly transform the conventional practices.
3) A detailed study to evaluate the benefits of the GLI4.0 a new terminology for the modern SMEs and extending this to the higher phases for rapid productivity improvement.
4) Digitally linking different departments so that the management can reduce wastage at different stages and expedite innovation in SMEs

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