Lean Optimization of Admission Process in Educational Institute

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Abstract

Process Optimization proved to be the one of the widely used technique for improvement in the production and service industry. Implementation of optimization with lean tools in the educational institute assist to eliminate the waste for better prospects for students and stakeholders equally. This study emphasises on application of lean principles in admission process at educational institutes to transform their process, eliminate waste and improve productivity. Ten colleges of business administration had selected for study where admissions were centralised and through a common admission process(CAP). The parameter like time spans of admission and the activities involved were alike for selected sample where 3M model of lean management identifies the types of wastage and their treatment up to optimum level. This helps in streamline the admission process along with subprocesses by utilizing optimal resources to enhance utilities for stakeholders.

Key Words: Process Optimization, admission, process improvement, Education, 3M for Education, Lean.

Introduction

The Efficacy of lean management in the manufacturing industry hadevident since almost four decades. Though the lean concept was initiated to overcome the resource constraints in factories in terms of space, machines, materials and capital. Industry had already into lean concepts to enhance their operations along with more focus on technologies of industry 4.0. The skillset and infrastructure required to come with industry 4.0 is different in nature and reskilling is required. The lean philosophy has continued to support industry 4.0 as per 48% of positive responses and 39% neutral responses whereas 8% were negative (Saxby, R., Cano-Kourouklis, M., & Viza, E. (2020). Though technologies like smart factory, 3D printing, integrated enterprises and IoT received a positive lean support whereas smart product, cloud computing, customised product and big data received the neutral support. The probable reason for the neutral support is due to longer payback period and therefore least effective as of now.

Automation had been the prime focus of industry for the last two decades and major driving force to reduce monotonous work, improved working conditions, enhanced workload, ergonomics along with improved production and increased capacity. Industry is facing tremendous pressure due to global world, online shopping store, improved competitiveness, less wastage, defined process, automated process controls (Steffen Landscheidt et al., 2017). Post covid era, industries had forcibly moved towards complete automation along

with remote control, smart machinery and smart gadgets. Industry 4.0 and its components support massive lean manufacturing by improving efficiency and productivity of the systems. IoT enhance the efficient execution with the help of adjustment, monitoring and controls of assembly line workstation with time, spatial and controls on various parameters. This also aids in remotely manage and controls the basic operation of workstations. Cyber physical systems employ self- optimize production system, perform remote maintenance of equipment, improve process safety and improve performance of equipment. Cloud computing integrates information from different plant and sector, sharing information with internal and external customers, increasing security for storing and retrieving data etc. Big data to optimize the maintenance of complex equipment, reduce cost with data storage. Robotics perform complex tasks with high accuracy along with artificial intelligence and human interaction. Augmented reality uses smart glasses and gadgets to improve real life experiences.(Pagliosa, M.et. al., 2019).

The implementation of the lean system in the service sector is equally well received. The Indian postal system implemented the lean service to increase productivity, reduce spaces, reduce lead time, reduce cycle time, reduce cost and augmented throughput and time. The same is also implemented at the National Sorting hub and benefitted with areas like layout modification, housekeeping, sealing and packing and sorting section. (Murugesan, V. S. et. Al, 2021). Customer satisfaction is another area wherelean six sigma plays a very decisive role in minimizing the company's response time to customers.In telecom sector the average order lead time for sales order and value-added services was reduced to 5.9 from 10.3 days and 2.5 from 1.5 days and the sigma level increased from 0.44 to 0.73 and 1.26 to 2.66respectivelyShamsuzzaman, M.et al, 2018. The lean tools in healthcare reduced the patient waiting times by 30% triage (measuring BP, measuring temperature, trace patient medical history, symptoms, frequency etc.) care times by 40%. (Calero, L. et. Al., 2019). Even patients' satisfaction in mobile hospitals by reducing the turnaround time significantly. (Sunder M, V,2019)

Education as a service sector is not lagging the race and initiated implementation of lean and six sigma in higher education from last two decades ago. The systematic study of literature regarding the lean implementation in higher education has defaced many issues like lack of awareness, process transformation, lack of commitment, and involvement of stakeholder, understanding the internal and external customers (Cudney, E. A. 2018). The main advantage of implementing the lean six sigma in higher education is preparation for accreditation, improving its quality parameters related to the infrastructure like library, computer lab, its service quality etc. (Sunder, M.V., 2018). This study also suggested that not only administrative services but also academic services should be considered for continuous improvement by Lean Six Sigma.The mentorship programin an undergraduate program to improve the engagement in STEM (Science, Technology, Engineering, Maths) in their first- and second-year programs. After implementing the QFD and mapping of critical to satisfaction parameters, improved the retention ratio of female student in STEM (Kloos, E.,2019)The lean six sigma improves many process in Higher Education Institute and improve the process like transparency in the system, rationalizing scanning process, to ensure delivery of required documents, improving the payment process, improve the efficiency of meeting held with respect to time and manhours, workload-time management in peak and non-peak time, overtime reduction process and upgraded teaching learning process is quite evident (Jiju Antony et. al ,2017), The interconnection between the lean philosophy and engineering students needs to be establish for tackling multidisciplinary nature of problem and challenges face in modern system. The education system must be equipped with the skills of lean management so that the students will perform better in the organization from the first day. Experience of lean management should be implemented to improve the educational process and remove the overburdeningprocesses, curriculum and courses which are considered less relevant in recent timesand seen as waste. It should be identified and remove the less productive processes, practices, uneconomical and repetitive things from the teaching learning process. The benefitsinclude cost and time saving, enhanced engagement of students, faculty and resource person. (Saveta V. et. al., 2017)

The implementation of lean is value-additive, when the focus is on employee's awareness, training and continuous improvement of the individual process. The confidence of employeesmust be high in order to achieve the target improvement in the organization's process. Lean is meant for removing the waste and hone the skills of employee, process and system. Change agentsplays anvital role toidentifying the area of improvement and removing the waste to upgrade performance. This will help to understand the benefit of lean better than the classroom training. There should be lean academy establish to help and promote lean thinking from bottom to top echelons. This also helps in identifying the process, functioning, barriers, accountability, and performance of the team to achieve the target within the specified time. Successful implementation will become standard practice for others to follow within and outside the organization. (William K Balzer et.al.,2015). The lean six sigma implemented in a small district school has improved its process through DMAIC tools. There is a need to identify the quality parameters in the teaching learning process and map with outcomes,which helps to remove the bottlenecks in education processes. Identifying the problem, make a hypothesis, collect the data, implement PDSA along with best practices to significantly improve specific process based on various parameters adistrict wise, district division level, school wise and classroom wise. (Paul G. LeMahieu et.al., 2017)

The admissions process in the education sector is one of the essential time-specific processes. Institute needs to optimize uses of all resources convert into full admission. The result of a non-efficient process is a shortage of admissions and its impact will be cascaded for 3-4 years in degree program, 2-3 years in master and many more years in case of schools. The rationale behindthe studiesto be carried out is related to the complex admission process for national and international prospects, offering various types of programmes and integration of various departments where identifying waste with respect to time, efforts, manpo1wer, formats, etc. By understanding the existing process and its flow for admission and furthers subprocess, submodules and activities to detect types of waste mostly related to time, communication, integration, dependent processes, delay, pending decision, payment postponement etc. The waste in each process is to be considered for optimized treatment and elimination of waste. This enhances the overall admission process. (Jin, K. et. al, 2010). Similar situation in the case of a polytechnic where the admission process is time consuming due to unwarranted administrative protocols, poor information delivery and a lengthy process. After finding the waste and implementation of DMAIC process of lean, the institute has increased the cycle time by 36.4%, lead time improved by 11.3%, utilization time increased by 40%, rework has been reduced from 40% to 0, idle time reduced from 21 days to 0 and improved the higher process cycle efficiency by 33%. (Oko, A. et. al., 2015)

As action-based research applies in educational institutes in scheduling, procurement and distribution, teaching, feedback, assessment and grading areas to find out the waste and on the scale of 1-6, where 1-rework, 2-motion, 3-waiting, 4-over processing, 5- overproducation, 6- Defects etc. Further applying lean tools like process standardization, Poka-Yoke, Hiejunka for reducing cycle and lead time and optimized information sharing in education institute. (Gopalakrishnan Narayanamurthy et.al., 2017). The step wise lean implementation in Higher education for assessing the workplace climate, improving leadership awareness, strengthening organizational structure, improvement in the employee's skill is essential for continuous improvement.(William K Balzer, 2016). Institutional culture helps to grasp organization dynamics for better adoption of leanphilosophy. This involves top management, director, dean, faculty members, academic advisors, senior lecturer and head of the department. They must be agreed upon the fact if institution lacks vision to drive such projects and lacks freedom of work. The response of 25 participants of a higher educational institute explains, identifying the critical success factors that helps the instituteto lead and manage lean project along with their cultural and organizational behaviour issues. This refers to thecapability index of an individual institute to lean towards a lean project. The teaching faculties do not review the progress regularly due to their increased workload. They are good at developing new ideas, new initiatives, having greater autonomy along with well-structured cohesive team. (Andrew J. Thomas, 2015). This leads to the better implementation of lean

journey to control the progress of the project. Another method to implement lean through fuzzy DEMATEL and MCDM model, i.e. the multi criteria decision model, where decision has been identified the sources of waste and its effect is mapped on lack of time, physical exhaustion, metal exhaustion and lack of resources other than time. The excessive academic units, greater strength of students, variations in course content, variation in course completion, lack of academic sources, missing information, bureaucracy, unused talent and skill mismatch are in the source group whereas motion and transportation waste are in effect group. Concentration on sources of waste group will lead to minimizing the waste in the education environment (Yigit K.,2019).

The lean method should be applied while implementing lean in the education system. Lean training interjectsmany major success factors to the workforce and adds value to the existing business process, that helps to be more efficient and prudent. Lean training influences employee, who further motivates others to follow and abide by the lean thinking in the process. Training about the lean must be imparted at all levels and to all employees of the organization and stakeholders. The schedule of training must also be in a continuous way to unearth the hidden concepts of lean thinking. Lean is like total quality management where everyone needs to be trained about the lean concepts and should start from starting to end. Stakeholders like alumni, trainers, parents, advisors will also to be trained for enhanced education process.Lean factory (Abele E., 2016) is a very effective tool to improve the lean training in the education process facilitates people to understand the problem and get action-oriented learning, along with other tools like lean games and simulations to capture the lean concepts better(Jose D. et. al, 2021).

Identification of waste is the first method towards improvement. Priority should be decided for improvement process in presence of all stakeholders' leaders, students, academics and non-academic staff. (Mulyana IJ, 2023). LEFI Method (Lean evaluation and future improvement) applied to students, teachers and technicians, analysed services processes and result obtained through value stream mapping for elimination of waste and significant improvement in the process. (Eduardo de Souza Lima et.al., 2023). Ishikawa and Pareto diagrams can also be applied to analyse and ascertain Muda in the admission process, and lowering time delays in the admission and its allied subprocess. (Peralta-Abarca et.al., 2023).During Covid-19 pandemic certain evaluation techniques has changed and introduced app-based training for improve assessment process through DMAIC process of lean philosophy to optimize examiner and students' time conflict, supervisor time conflict, grade statistics and other exam related process and subprocess. (Yuan W. 2023). Waste in the process may autonomous, dependent, linkage or drivers for other types of waste. Independent waste are weak driver and dependent power and closed to origin, dependent waste due to previous waste sequence or result of the activities done earlier. Linkage determinant of waste unstable and having the feedback effect on the other waste modes whereas drivers are the waste leads to many more waste in the system. (Hartanti, L.P.S. et. Al., 2022)
There are curriculum development and flexibility in course selection and adjustment with capacity changes every year as per students' course options. Lean relationship where leadership support is proved to be positive effect on continuous improvement as compared to without support. (Klein, L. L.,2023).This has estimated with Mote-Carlo simulation using random numbers for best possible scenario. Simulation is an effective tool to implement lean into curriculum planning and development. (Mohsen, O.et. Al., 2022). Another tool is value chain analysis and value stream mapping for review eliminates the waste and improve process continuously. (Monserrat, M., 2023)

Material and Methods

Systematic Literature for the lean optimization process has done for selected research article qualitative analysis. The keyword has taken for search engine are Optimization, Process, Lean, Admission, Higher Studies and Institute applied with AND operator. There were thirty-three research articles are found to be more pertinent for qualitative analysis and presented below in the form of PRISMA diagram.

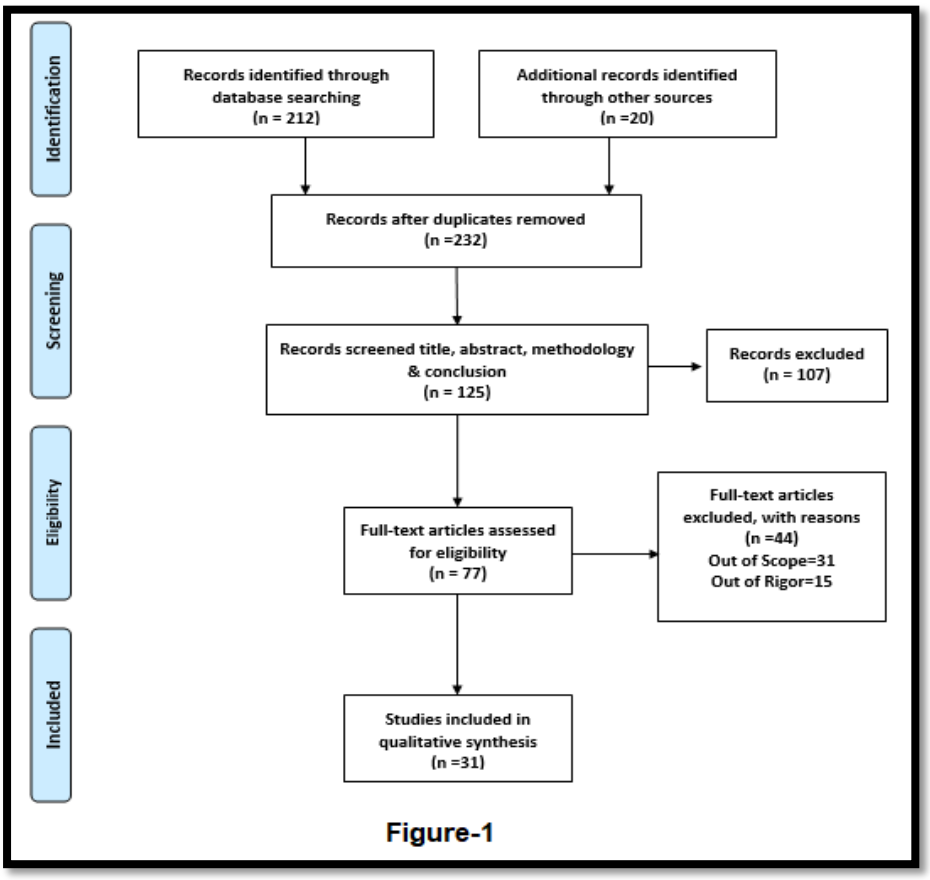

Figure-1

Articles are reviewed to understand the process and quality parameter for identifying the waste available in the admission process of the institute. Lean principles are applied to identify the non-value adding activities of the system. Muda applied for identifying waste in the overall admission process and allied activities that are not adding value or consuming excessive resources of the institute. The primary data is collected from an autonomous College, which is running a similar program of business management where the delivery of the education along with improvement in the admission process is taken. A sample of ten colleges of business management is considered. 3M model of lean management is implemented to identify waste and its treatments. Muda use to identifying the waste in the system and implemented it in the admission and teaching learning process. The basic objective of Muda in the admission process is to identify wastage at various levels. The duration of admission process is two and half month. The schedule is defined by the Department of Technical Education (DTE) and needs to be equipped with facilities to get the maximum admission made during the specified period of time. The common admission process is there for all the ten colleges and students fills the choices as per their preferences and once allotted, the college needs to take the admission within the date specified by DTE. At the time of allotment candidate need to accept the allotment, need to pay the required fees to DTE and report to allotted college for taking admission. If he fails to make the admission during the

specified time, the candidate will no longer take part in the admission process this current year. Similarly, for the institute also needs to take the admission of all students allotted and reported within the specified period of time mentioned in the DTE schedule. The following tables describe the process, its nature and constraints.

- Muda
  - Scrutiny of documents for Admission
  - Document submission
  - Quota Sources of Admission
  - Waiting for registration process
  - Delay in Payment process
  - Employees training for scrutiny
  - Entering data in MIS
  - Distribution of pre-requisites
  - Movement among various departments
- Mura
  - Unevenness in Process scheduling and document variations
  - Unevenness in CGPA calculation to find the eligibility conditions
  - Payment Unevenness due to various payment mode
  - Unevenness due to issuing authority
  - Non-Uniformity in Documents Verification Process
  - Non-Uniformity in Eligibility Fulfilment
  - Irregularity in Admission Confirmation
- Muri
  - Overburden
    - Document verification Process
    - Student Section
    - Payment Receipt Process
  - Excessiveness
    - Student Form Filling
  - Unreasonable
    - Department Communication Gap
    - Document Discrepancy
    - Admission Cancellation and Refund

Identifying the non-value-adding activities of the admission process and, after elimination of waste, analysing the process improvement to make it significantly. Some of the processes are not interlinked with various other colleges and departments where removing waste is not possible without the help of respective documents.

Study and Analysis

The study of sub-process forthe admission process at an educational institute is more or less the same for the MBA/PGDM programme. The complexity of the process may vary based on various factors, like Intake Capacity, Various exams accepted for admission, applying for loan, applying for scholarship of various states and varieties of documents involved. This needs to produce documents in a prescribed format especially when Govt. scholarship is involved. Student needs to produce various types of documents to various other agencies, like university, State Govt, AICTE, DTE etc. The variation is identified in various sub processes and defines the unit of measurement. After discussion with the management and working executives at various levels, the process is refined at existing one. Some of the processes have been newly introduced and some have been

completely reengineered to improve the parameters of performance. The performance improvement percentage after changes is indicated in the following table.

	3D Models	Admission Process	Remark	Unit of Measurement	Action	Previous	After	Improvement
MUDA	Defects	Scrutiny of Right Papers	Eligibility for MBA Program	Defects of document /Student	Arrange regular Awareness program for the new changes and format in the documents and things to be checked in particular document)	4	1	75.00%
	Overproduction	Application of Candidates	Preferences of Application	Selection of Student/ Time (In Hours)	Selection on inter se merit basis after applying specific quotas Gender wise, Source wise	16	6	62.50%
	Waiting	Time for registration in the MIS, Payment through MIS	Time for Payment	Student/ Time (In Hours)	Student need to fill the form and then the same need to be entered in the MIS, has been reduced by directly entering the details in the MIS by the students. Arrange Lab of 30-Computers	2	1	50.00%
	Non-used Talent	Resource constraints especially, Accountant, Student Section executive, IT persons etc.		Document Verification/Time (In Minutes)	Process flow: Utilizing the resource person to only check the documents having discrepancy Stage 1: Checking the document at initial level Stage 2: Checking the document at 2ND Level Stage 3(Expert) : Check only the document where discrepancies are found	60	30	50.00%
	Transport	Movement for Fees and Its reflection in the account section	Request for Less fees deposits, Bringing the document from the home town	Approval /Time(Hours)	Management approval related to payment takes time therefore Management Presentative sits here during the admission time to reqsolve te issues within an hour or two	48	4	91.67%
	Inventories	Stock of required books and reading materials for the admitted students, Discrepancies due to more number of admission cancellations	Time to Replenish the S	Stock Arrival/ Days	Allocation of 15% more funds for immediate purchase of books	15	10	33.33%

	Motion and Excess	Movement among various Department like student, accound, admission section		Section/Student (In Hours)	Executive of student, account and admissions are sit togather in a big hall to smoothen the process during the admission process	5	2	60.00%
MURA	Unevenness	Scheduling	Services centers to be more for proper scheduling	Bottleneck / Resources person	Distributing token to students for student, account and admission confirmation section			
		Fulfillment of Papers		Correct Documents/Students (%)	Prepared Checklist for all mandatory document to verify	80	100	25.00%
		Variation in the documents		Variety/batch (%)	Samples of document formats of various states/ departments for reference	40	35	12.50%
		Variations in the calculation of CGPA		Variety/batch (%)	Made a formula available for percentage conversion of all universities in Excel	40	35	12.50%
		Fluctuations due to cancel the admission		Re-arrangement/Batch	Separate panel of 4 members for cancellation process	15	10	33.33%
		Unevenness due to cancellation of admission		Cancellation/Day	Provisions for 15% of student's cancellations	4	2	50.00%
		Third party delay in issuing the certificate		Delayed Submission/Student	Early detection of mandatory documents and follow up resolve 50% of the issues	65	40	50.00%
	Non-Uniformity	Documents Verification Process	Domicile, Birth, College Leaving, Caste Certificates are not uniform	Average Document /Student	Repository created for all the Formats issued by District Authority, State Authority	4	2	100%
	Irregularity	Time of Admission Confirmation	Duration of Admission reporting to the institute is defined for 3-4 days, Candidates come only on Last one and half days only.	Confirm Students/ day	Try to find out the mobile number and aware them for the admissions and time	14	20	42.86%
MURI	Overburden	Document verification Process	Overcrowded to Expert of Doc. Verification	students/ hour	Created 3- Layers of check whereby Expert will check only documents of discrepancy after filter	5	2	150.00%

	Excessive ness	Students form Filling	Too much time to take by student to fill the form	Time/For m	All entries made online in the ERP and very few entries are there in the form	3	1	200.00%
	Unreason able	Department Gap	Issuing authority not co-ordinating with DTE Dates	Students/ Batch	Some of the Department issuing the caste and domicile within time frame but still lagging in issuing caste validity certificate	10	6	66.67%
					Overall Average			**64.74%**

The overall improvement of all the subprocessesis 64.74% whereas some of the processes are like document verification, student form filling is improved more than 100% and the rest of the process is improved especially range from 12.50 to 75%. The solution to all the problems is achievable except a few documents, like release of caste validity, domicile document, Birth Certificate, Prescribed format which documents have the dependency on multiple Govt. Department.

Conclusion

This study primarily took the admission process which is the core for any educational institute where planning needs to be done for the whole year whereas the span of admission is less especially after covid-19. The Institute will not be able to afford the lost admission due to the procedural delay or any other obstacle. We mainly focused on time-consuming process like students-form filling, document verification process, admission confirmation, fluctuations due to cancel the admission, Bottleneck / Resources person for document check, motion and excess (Movement among various Department i.e. student section, account section and admission confirmation section), Time for registration in the MIS, Payment through MIS etc whereas other process where load has to be distributed rationally for the process like scrutiny of documents, Scheduling and services offered to candidates, difficulty in documents check due to various formats and its recent changes, variation in CGPA calculations, Third party delay in producing the documents etc. to take the alternative routes. The average improvement in the system is above 64% after 1st implementation and this can also be improved to achieve the 100% target. There needs to continuously assess the process because of the changes in the system as per requirement and technological changes. One fine process may be obsolete in 2-3 years' time.

Bibliography:

1. Tisch, M., Hertle, C., Abele, E., Metternich, J. and Tenberg, R., 2016. Learning factory design: a competency-oriented approach integrating three design levels. International journal of computer integrated manufacturing, 29(12), pp.1355-1375.
2. Thomas, A., Antony, J., Francis, M. and Fisher, R., 2015. A comparative study of Lean implementation in higher and further education institutions in the UK. International Journal of Quality & Reliability Management, 32(9), pp.982-996.
3. Calero, L., Maccasi, A. and Raymundo, C., 2020. Lean model of services for the improvement in the times of attention of the emergency areas of the health sector. In Human Interaction and Emerging Technologies: Proceedings of the 1st International Conference on Human Interaction and Emerging Technologies (IHIET 2019), August 22-24, 2019, Nice, France (pp. 924-930). Springer International Publishing.

4. Cudney, E.A., Venuthurumilli, S.S.J., Materla, T. and Antony, J., 2020. Systematic review of Lean and Six Sigma approaches in higher education. Total Quality Management & Business Excellence, 31(3-4), pp.231-244.
5. Narayanamurthy, G., Gurumurthy, A. and Chockalingam, R., 2017. Applying lean thinking in an educational institute–an action research. International Journal of Productivity and Performance Management, 66(5), pp.598-629.
6. Antony, J., Ghadge, A., Ashby, S.A. and Cudney, E.A., 2018. Lean Six Sigma journey in a UK higher education institute: a case study. International Journal of Quality & Reliability Management, 35(2), pp.510-526.
7. Jin, K. and Kachroo, M., 2009. Making the university admission decision making process lean. In Technological Developments in Education and Automation (pp. 259-263). Dordrecht: Springer Netherlands.
8. Dinis-Carvalho, J., 2021. The role of lean training in lean implementation. Production Planning & Control, 32(6), pp.441-442.
9. Kloos, E. and Furterer, S.L., 2019, June. Designing an Undergraduate Engineering Mentoring Program to Enhance Gender Diversity through Application of Lean Six Sigma Methods and Tools. In 2019 ASEE Annual Conference & Exposition.
10. Landscheidt, S. and Kans, M., 2016. Automation practices in wood product industries: Lessons learned, current practices and future perspectives. In The 7th Swedish Production Symposium SPS, 25-27 October, 2016, Lund, Sweden. Lund University.
11. Murugesan, V.S., Jauhar, S.K. and Sequeira, A.H., 2021. Applying simulation in lean service to enhance the operational system in Indian postal service industry. Annals of Operations Research, pp.1-25.
12. Oko, A. and Kang, P.S., 2015. Lean six sigma approach to improve the admissions process for a Nigerian HE Institute.
13. Pagliosa, M., Tortorella, G. and Ferreira, J.C.E., 2021. Industry 4.0 and Lean Manufacturing: A systematic literature review and future research directions. Journal of Manufacturing Technology Management, 32(3), pp.543-569.
14. LeMahieu, P.G., Nordstrum, L.E. and Greco, P., 2017. Lean for education. Quality Assurance in Education, 25(1), pp.74-90.
15. Vukadinovic, S., Djapan, M. and Macuzic, I., 2017. Education for lean & lean for education: A literature review. International Journal for Quality Research, 11(1), p.35.
16. Saxby, R., Cano-Kourouklis, M. and Viza, E., 2020. An initial assessment of Lean Management methods for Industry 4.0. The TQM Journal, 32(4), pp.587-601.
17. Shamsuzzaman, M., Alzeraif, M., Alsyouf, I. and Khoo, M.B.C., 2018. Using Lean Six Sigma to improve mobile order fulfilment process in a telecom service sector. Production Planning & Control, 29(4), pp.301-314.
18. Sunder M, V. and Mahalingam, S., 2018. An empirical investigation of implementing lean six sigma in higher education institutions. International Journal of Quality & Reliability Management, 35(10), pp.2157-2180.
19. Sunder, M., V., Mahalingam, S. and Krishna M, SN, 2019. Improving patients' satisfaction in a mobile hospital using Lean Six Sigma–a design-thinking intervention. Production Planning & Control, pp.1-15.
20. Sunder M, V., Mahalingam, S. and Krishna M, S.N., 2020. Improving patients' satisfaction in a mobile hospital using Lean Six Sigma–a design-thinking intervention. Production Planning & Control, 31(6), pp.512-526.

21. Balzer, W.K., Brodke, M.H. and Thomas Kizhakethalackal, E., 2015. Lean higher education: successes, challenges, and realizing potential. International Journal of Quality & Reliability Management, 32(9), pp.924-933.
22. Balzer, W.K., Francis, D.E., Krehbiel, T.C. and Shea, N., 2016. A review and perspective on Lean in higher education. Quality Assurance in Education, 24(4), pp.442-462.
23. Kazancoglu, Y. and Ozkan-Ozen, Y.D., 2019. Lean in higher education: A proposed model for lean transformation in a business school with MCDM application. Quality Assurance in Education, 27(1), pp.82-102.
24. Mulyana, I.J., Singgih, M.L., Partiwi, S.G. and Hermanto, Y.B., 2023. Identification and Prioritization of Lean Waste in Higher Education Institutions (HEI): A Proposed Framework. Education Sciences, 13(2), p.137.
25. de Souza Lima, E., de Oliveira, U.R., de Carvalho Costa, M., Fernandes, V.A. and Teodoro, P., 2023. Sustainability in Public Universities through lean evaluation and future improvement for administrative processes. Journal of Cleaner Production, 382, p.135318.
26. Peralta-Abarca, J.D.C., Moreno-Bernal, P. and León-Hernández, V.A., 2022, November. Lean Office Approach for muda Identification in the Admission Process of University Students. In Ibero-American Congress of Smart Cities (pp. 143-157). Cham: Springer Nature Switzerland.
27. Yuan, W., Li, Z., Han, J., Chu, H., Lu, S., Gu, S. and Shen, N., 2023. Improving the resident assessment process: application of App-based e-training platform and lean thinking. BMC Medical Education, 23(1), p.134.
28. Hartanti, L.P.S., Gunawan, I., Mulyana, I.J. and Herwinarso, H., 2022. Identification of waste based on lean principles as the way towards sustainability of a higher education institution: A case study from Indonesia. Sustainability, 14(7), p.4348.
29. Mohsen, O., Naumets, S. and Hamzeh, F., Lean Thinking To Improve Curriculum Delivery In Civil Engineering Using Monte Carlo Simulation.
30. Klein, L.L., Naranjo, F., Douglas, J.A., Schwantz, P.I. and Garcia, G.A., 2023. Assessing internal organizational pathways to reduce knowledge waste: a Lean thinking perspective. Business Process Management Journal.
31. Monserrat, M., Mas, A., Calafat, A.L.M. and Clarke, P., 2023. Applying Lean to Improve Software Project Management Education. IEEE Transactions on Engineering Management.

Annexure -1

Chart 1: Admission Flow