

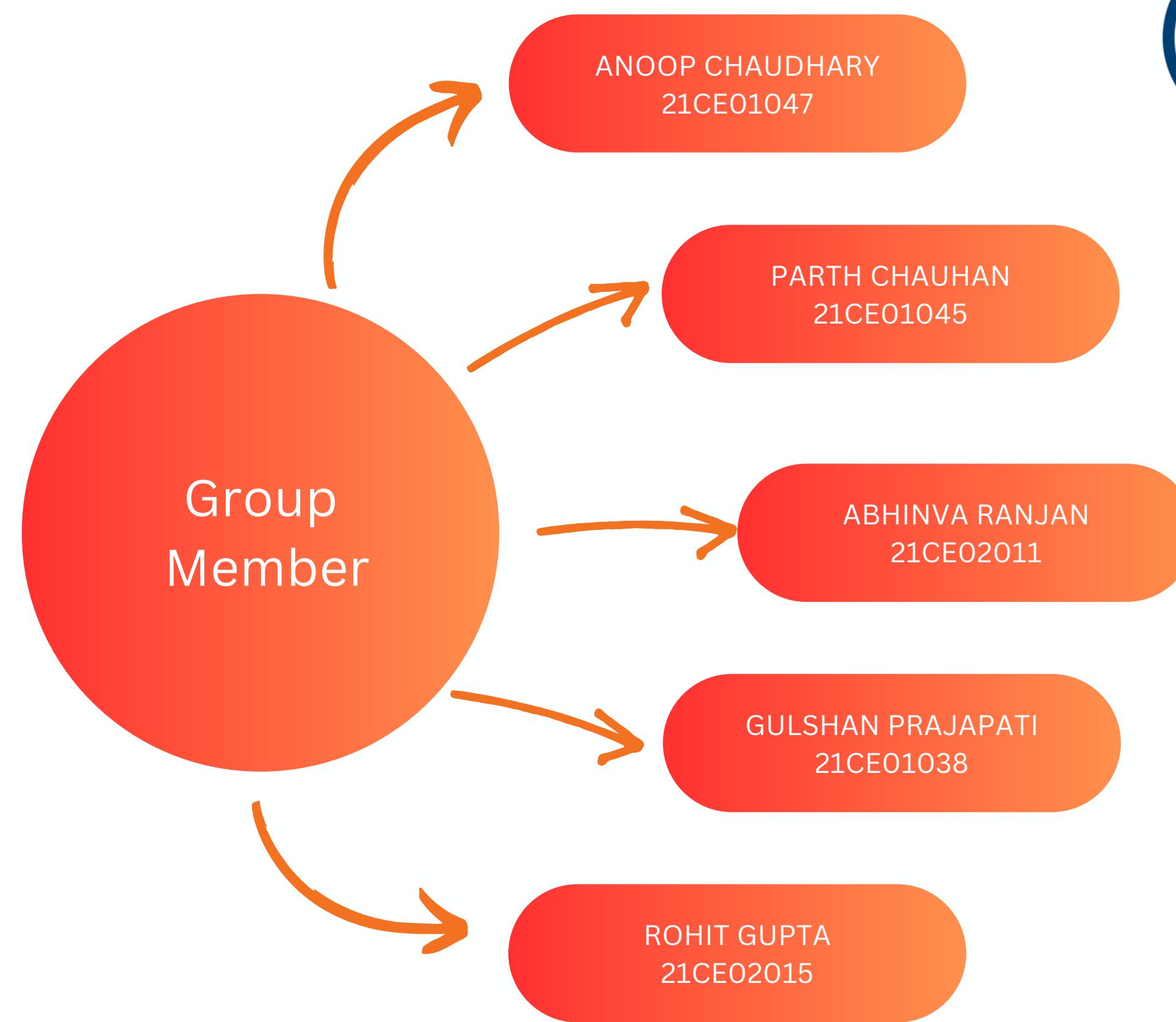
Industrial Engineering & Management



**Larsen &
Toubro**

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Teaching Assistance - Mr. Abhinav Singh,
Mr. Chandan Kumar Sethi**

Group 12





Overview

1. Introduction
2. Significance and Product Range
3. Product design and Planning strategy
4. Process and Technology
5. Material Requirement Planning
6. Inventory Management
7. Forecasting Techniques
8. Plant Location and Layout
9. Supply Chain Management
10. Conclusion & References





Introduction

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- L&T was founded in 1938 in Bombay by Danish engineers **Henning Holck-Larsen** and **Søren Kristian Toubro**.
- Larsen & Toubro Limited, abbreviated as L&T, is an Indian multinational conglomerate, with interests in construction, manufacturing, information technology, military and financial services. It is headquartered in Mumbai, Maharashtra.
- As of March 31, 2023, the L&T Group comprises 93 subsidiaries, 5 associate companies, 27 joint ventures and 35 jointly held operations, operating across basic and heavy engineering, construction, manufacturing of capital goods, information technology, and financial services.

History



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- 1938: Founded in Mumbai by Henning Holck-Larsen and Søren Kristian Toubro, initially representing Danish dairy equipment manufacturers .
- 1939-1940: World War II disrupts trade, prompting L&T to shift from representing to undertaking jobs and providing services.
- 1946: L&T becomes a legally incorporated company .
- 1948: Transforms into a public limited company and acquires a major shareholding in Engineering Construction Corporation (ECC) to focus on building key industrial facilities for India's development.
- 1950: Becomes a public company and establishes its headquarters in Bombay .
- 1960s: Sets up multiple manufacturing facilities across India
- 1970s: Contributes critical machinery for India's nuclear power and space research programs through partnerships with DRDO .
- 2000s: Expands globally, operating in the Middle East, Africa, and Asia-Pacific regions .



Subsidiaries

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Construction:

L&T Construction: India's largest construction organization and one of the top ranking contractors globally. They specialize in executing complex infrastructure projects including buildings, transportation networks, power plants, and more

Engineering, Procurement & Construction (EPC) Projects:

L&T Hydrocarbon Engineering (LTHE): Offers integrated design-to-build solutions for onshore and offshore hydrocarbon projects across the globe

Technology:

LTI Mindtree: A global IT consulting and digital transformation company formed by the merger of L&T Infotech and Mindtree in 2023

L&T Technology Services: Provides engineering and R&D services across various industries



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Information Technology:

L&T Infotech (Merged with Mindtree to form LTIMindtree): Offered IT consulting services and digital solutions before the merger.

Manufacturing:

L&T Electrical & Automation: Manufactures electrical equipment and systems for various industries

Finance:

L&T Financial Services: Provides a wide range of financial products and services including infrastructure financing, rural financing, and investment management.

Real Estate:

L&T Realty: A leading real estate developer specializing in residential, commercial, and mixed-use projects

Defense:

L&T Defense: Designs, develops, manufactures, and integrates advanced defense technologies and systems for the Indian armed forces

Market Performance of FY : 2022-23



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Revenue and Profit Growth: Larsen & Toubro (L&T) reported notable growth in recent quarters. Revenue rose 19% year-on-year in the December quarter, with profit increasing by 15%.

Mixed Margin Performance: While revenue grew, profit margins fell short of expectations in the December quarter. The EBITDA margin dropped slightly, leading to some profit booking by investors and a stock price decline.

Strong Order Book: L&T's order book has grown significantly, reaching nearly ₹4.7 trillion as of December 2023. This 22% increase is driven by a surge in international orders, particularly from the Middle East.

Stock Price Performance: Over the past year, L&T's share price increased by around 46.5%, outperforming the broader capital goods index but roughly matching the Sensex's growth .

Product Range



01

Infrastructure
and Construction

02

Financial Services

03

Machinery and
Industrial Product

04

Power

05

Electrical and
Electronics

06

IT &
Communication

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- **L & T Business Infrastructure**

- Buildings and Factories
- Heavy Civil Infrastructure
- Transportation Infrastructure
- Smart World & Communication
- Geo-Structure
- Water & Effluent Treatment
- Infrastructure - Concessions

- **Power**

- Coal & Gas Power Plants
- Nuclear Power Plants
- Renewable Energy
- Power Transmission & Distribution
- Power Development Projects



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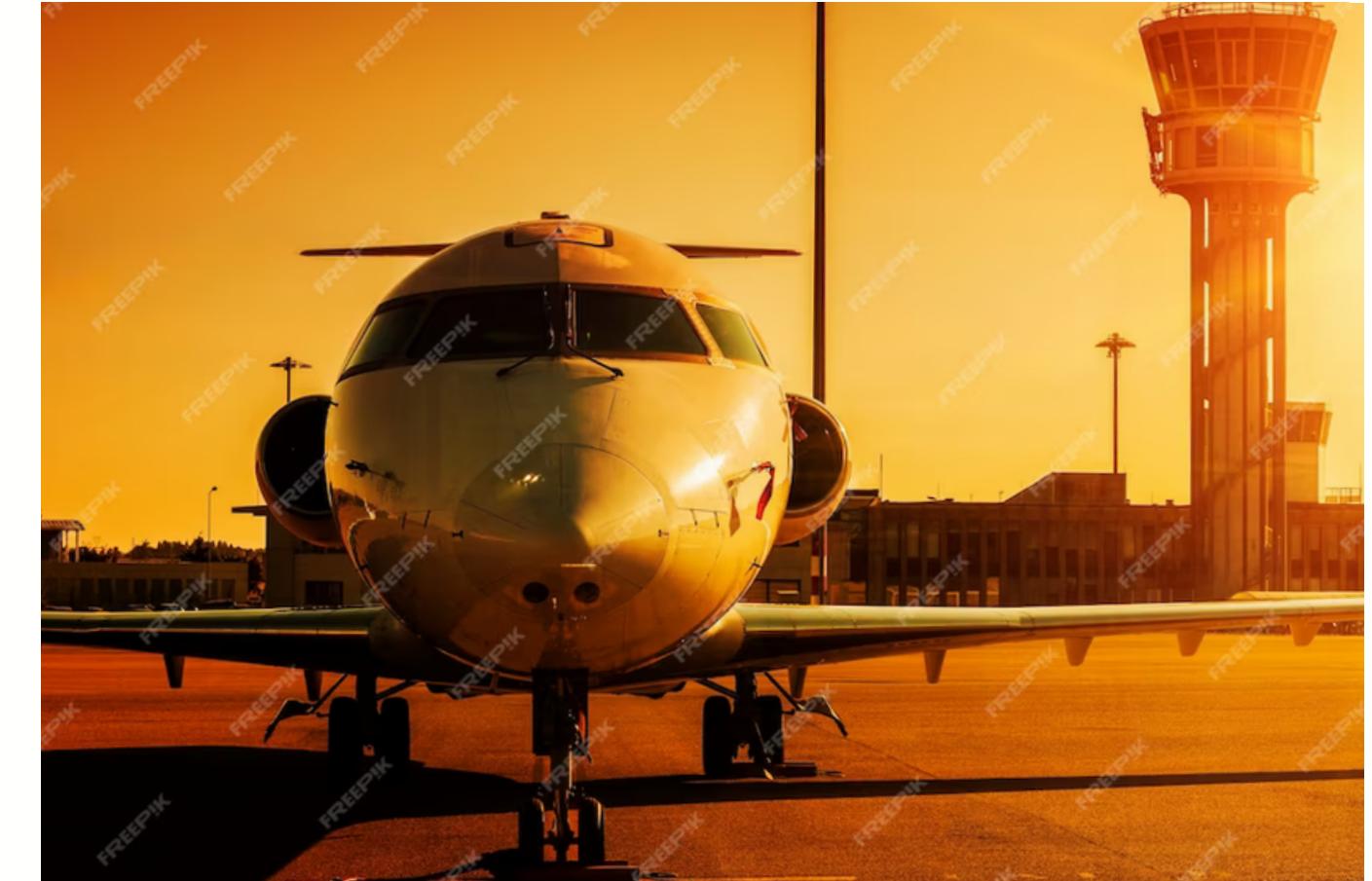
- **Defence**
 - Shipbuilding
 - Defence Systems
 - Aerospace
- **Process Industry**
 - Process Plant Equipment
 - Metallurgical & Material Handling
 - Valves
- **Hydrocarbon**
 - Upstream
 - Mid & Downstream
 - Construction & Pipelines



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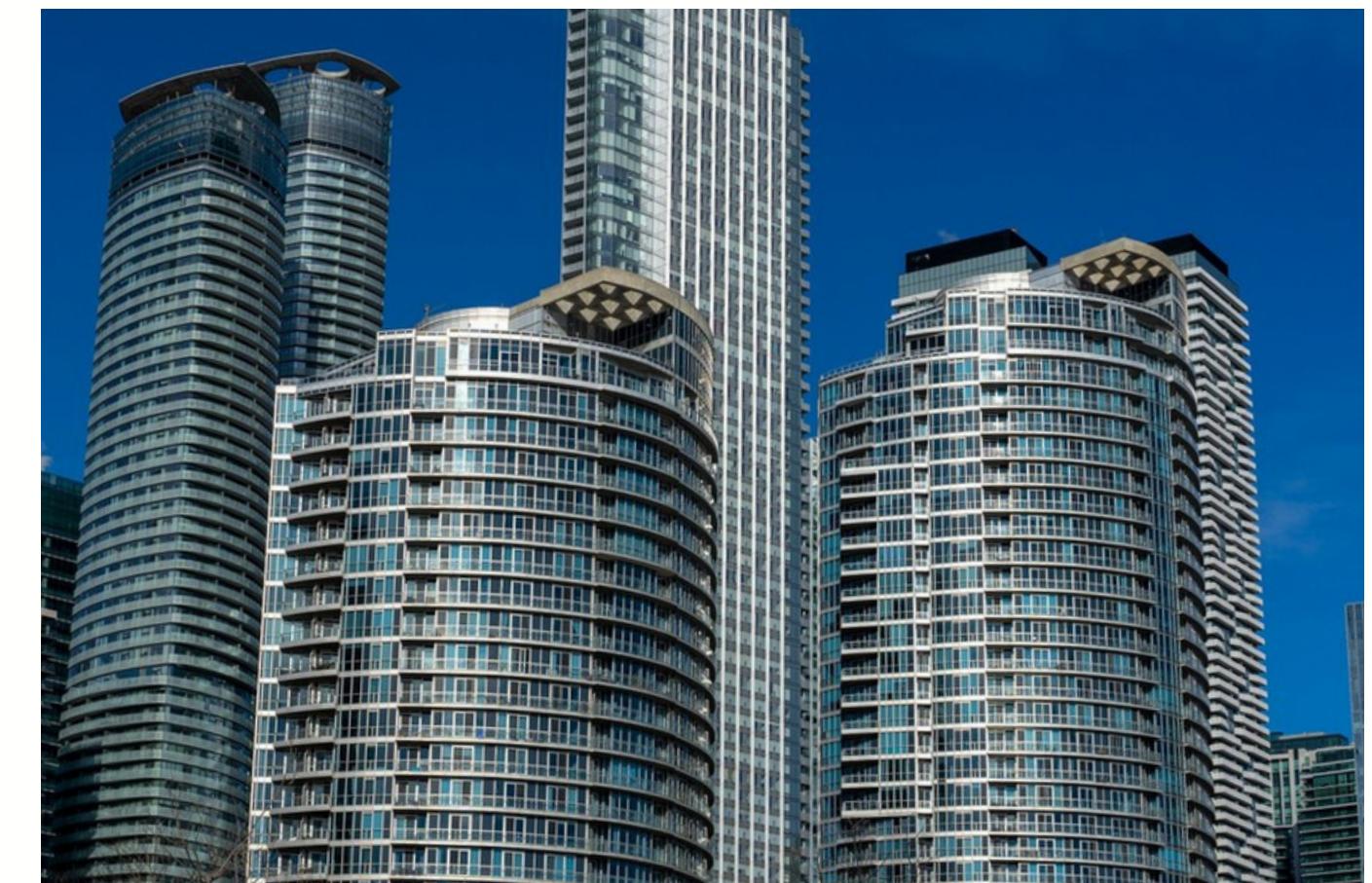
- **Airport**

L&T undertakes responsibilities for the design of major airports and its all associated facilities.



- **IT and Institutional Space**

L&T provides concept to commissioning solutions for IT parks, office spaces including high rise towers and green buildings etc .





- **Health & Leisure:**

L&T possesses the capability for the design and construction of hospitals including procurement, installation and commissioning of medical equipment.

- **Factories:**

L&T offers turnkey design and construction services for factories under two segments - Cement and Heavy & Light Engineering Plants.

- **Health Care facilities**

L&T possesses the capability for the design and construction of hospitals including procurement, installation and commissioning of medical equipment.

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Product Design & Planning Strategy



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- **Market Research:**

Understand the specific needs and pain points of L&T's target markets. This could involve conducting surveys, interviews, and market analysis to identify gaps and opportunities.

- **Identify Needs:**

Engage with L&T's construction experts and clients to understand their pain points and requirements for better project management and site supervision.

- **Concept Development:**

Develop a concept for a Smart Construction Site Management System that integrates IoT (Internet of Things) sensors, AI (Artificial Intelligence), and cloud-based analytics to optimize various aspects of construction project execution.



• Features and Functionality:

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- **Real-time Monitoring:** Provide live updates on project progress, equipment utilization, and workforce activities through IoT sensors deployed across the construction site.
- **Predictive Analytics:** Utilize AI algorithms to analyze data streams and predict potential delays, safety hazards, or quality issues, allowing proactive interventions.
- **Resource Optimization:** Optimize the allocation of manpower, machinery, and materials based on real-time insights to improve efficiency and reduce costs.
- **Safety Management:** Implement safety protocols and alerts to mitigate risks and ensure compliance with regulatory standards.
- **Collaboration Tools:** Facilitate communication and collaboration among project stakeholders through a centralized platform accessible via mobile devices and desktops.
- **Documentation and Reporting:** Automate the generation of project reports, progress updates, and documentation to streamline administrative tasks.

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- **Integration with L&T Ecosystem:**

Ensure seamless integration with L&T's existing construction management software, project planning tools, and enterprise systems to leverage synergies and maximize value for clients.



- **Prototyping and Testing:**

Develop prototypes and conduct extensive testing in simulated construction environments to validate the system's functionality, reliability, and usability.





- **Compliance and Standards:**

Ensure compliance with industry standards, data privacy regulations, and cybersecurity protocols to safeguard sensitive information and maintain trust among stakeholders.

- **Deployment and Support:**

Provide comprehensive deployment support, training programs, and ongoing maintenance services to facilitate smooth adoption and utilization of the Smart Construction Site Management System.

- **Continuous Improvement:**

Establish mechanisms for gathering feedback from users and incorporating enhancements and updates to address evolving needs and market dynamics.

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PROCESS AND TECHNOLOGY



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PROCESS:

A process refers to a series of steps or activities that are performed in a systematic manner to transform inputs into outputs.

TECHNOLOGY :

A technology refers to use of advanced design software for accurate project visualization,

- Clearing the land
- Building the walls.
- Installing the roof.
- Adding doors and windows.
- Finishing the interior.

- Use of 3D printing technology.
- Use of Building lifecycle management software.

Different fields of application



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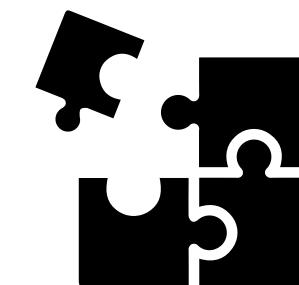
Project Planning and Design

Process :

- Feasibility Studies
- Risk assessments
- Stakeholder Engagement

Technology :

- Simulation Tools
- Advanced Design Software
- Virtual Reality (VR) and Augmented Reality (AR)



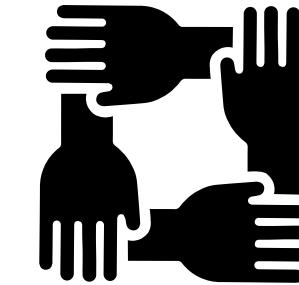
Construction and Execution

Process :

- Site Mobilization
- Resource Deployment
- Project Scheduling

Technology :

- Building Information Modeling (BIM)
- IoT Sensors
- Construction Management Software



Project Lifecycle Management

Process :

- Work Breakdown Structure (WBS)
- Final Inspections
- Project Charter

Technology :

- Real-Time Monitoring Systems
- IoT Sensors (Data Analytics)
- Drones and Aerial Imaging

Material Requirement Planning(MRP)

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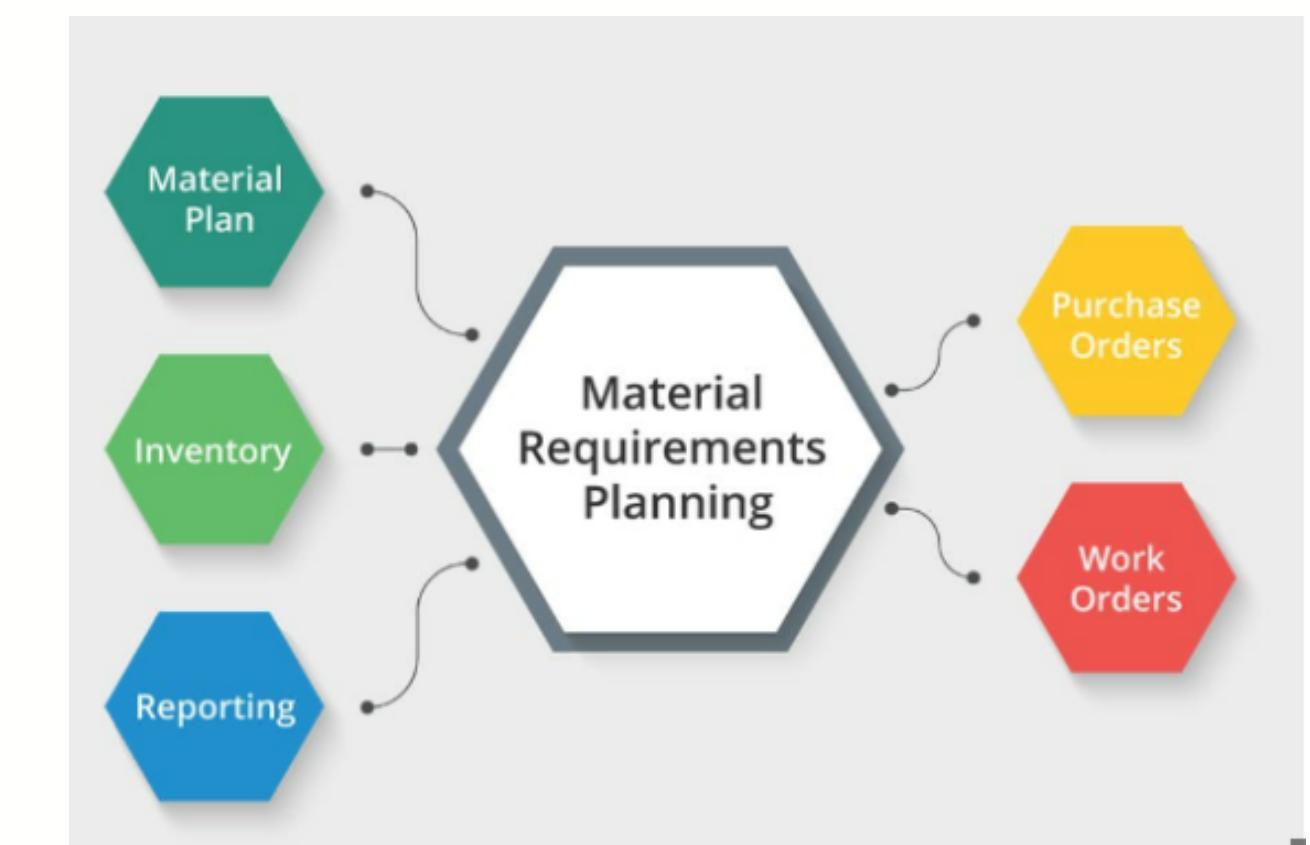
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Material Requirement Planning (MRP) and scheduling are crucial aspects of managing the supply chain and production processes in any organization, including a large company like Larsen & Toubro (L&T) Infrastructure.

- **Project Analysis and Planning:**

- Analyze project specifications, timelines, and resource requirements.
- Collaborate with project managers, engineers, and procurement teams to understand the scope of work and material needs.
- Develop a comprehensive project plan that outlines the sequence of tasks, dependencies, and critical milestones.





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- **Material Requirement Planning (MRP):**

- Utilize sophisticated MRP software or ERP systems tailored to the construction industry to generate material requirements.
- Input project BOMs, production schedules, and lead times into the MRP system to calculate material needs at various stages of construction.
- Consider factors such as supplier lead times, transportation logistics, and inventory levels to optimize material procurement and scheduling.

- **Procurement and Supplier Management:**

- Initiate procurement activities based on MRP recommendations, issuing purchase orders to approved suppliers.
- Implement vendor management strategies to maintain strong relationships with key suppliers and ensure timely deliveries.
- Monitor supplier performance, track order statuses, and proactively address any issues or delays that may impact project timelines.



- **Bill of Materials (BOM) Generation:**

- Create a detailed bill of materials (BOM) for each project, listing all the required materials, components, and equipment.
- Incorporate data from project designs, specifications, and historical usage patterns to accurately estimate material quantities.
- Validate BOMs with relevant stakeholders to ensure alignment with project requirements and regulatory standards.

- **Production Scheduling and Control:**

- Develop detailed production schedules aligned with the project plan and material availability.
- Assign resources, manpower, and equipment efficiently to optimize productivity and minimize downtime.
- Implement robust project controls and monitoring mechanisms to track progress, identify deviations from the schedule, and implement corrective measures promptly.

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Inventory Management

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Inventory :

- Inventory is a resource that any company holds in stock with the intention of selling or converting it into a more valuable state.
- A large amount of finance is required for managing the inventory.
- So there is a continuous supervision of the management and managers to control and supervise the various aspects of inventory management.

Problem :

- Developing individual forecasting models for each part would be incredibly time-consuming and expensive.
- A scalable solution applicable across India was essential.

ABC Analysis of Statue of Unity under Larsen & Toubro Limited



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ABC Analysis:

- The ABC analysis provides a mechanism for identifying items that will have a significant impact on overall inventory cost while also providing a mechanism for identifying different categories of stock that will require different management and controls.
- The ABC analysis suggests that inventories of an organization are not of equal value. Thus, the inventory is grouped into three categories (**A, B, and C**) in order of their estimated importance.
- After collecting the inventory data of **Statue of Unity** Project, of the year 2018, we observe that there are **799 items in the Project** and Machinery Department of Larsen & Toubro, which would be difficult under study. Hence we select random **sample of 100 items from list of inventories as a sample under study.**

The Table 1, shows the standard with which we'll compare the actual results after doing the ABC Analysis of the Stock available in the data.

As per ABC Analysis, the data collected should match these following standard conditions-

-60 % of the total value of stock should be equal to 20% of total number of stock available. This would represent the items under 'Class A'.

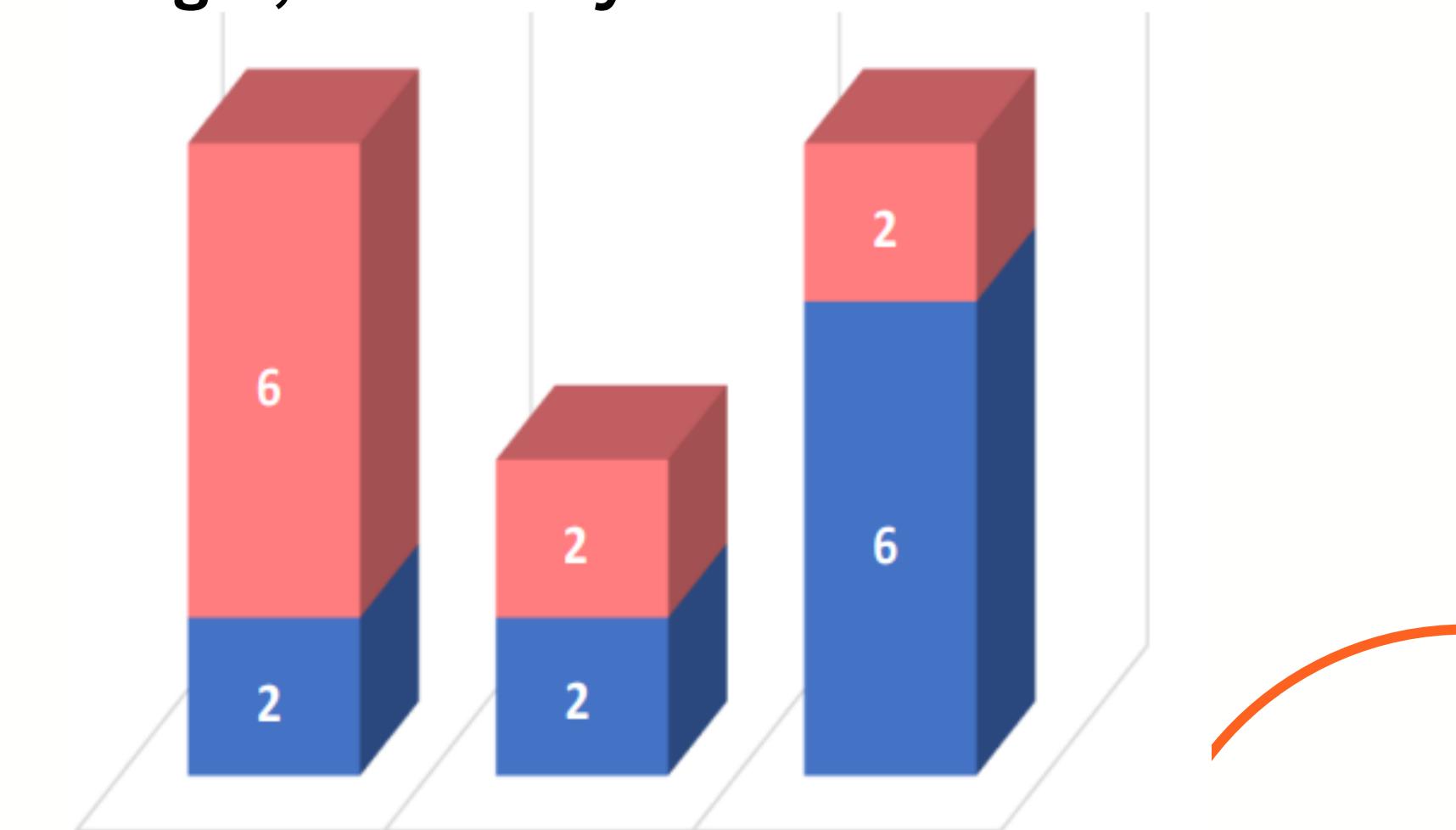
-20 % of the total value of stock should be equal to 20% of the total number of stock available. This would represent the items under 'Class B'.

-20 % of the value of stock should be equal to 20% of the total number of stock available. This would represent the items under 'Class C'.

Table 1- ABC Analysis Class

ABC Class	Number of Items	Total amount required
A	20%	60%
B	20%	20%
C	60%	20%
TOTAL	100%	100%

Fig. 1, ABC Analysis Class



The following chart represent the various levels of classes under which the stocks are categorized according to their value contribution in the total value of stock.

SI no.	Material Code	Material Name	Stock (Nos.)	Stock %	Rate (INR)	Value (INR)	Value %	Class
1	9N1U20261	FINISH COUPLING NIB / /FC00050000 /	22	0.64%	3504.55	77100.10	12.47%	A
2	9CL350003	DELIVERY TUBE / /10171207 /DN 125 745MM	19	0.56%	2605.43	49503.17	8.00%	A
3	9NJ410049	UPPER BALL GRIP /908 /908/	13	0.38%	2651.00	34463.00	5.57%	A
4	9MT680191	Gear Oil Tivela S 150 /Hoist winch gear box /H6103287 /	40	1.17%	857.20	34288.00	5.54%	A
5	9UA320120	OIL FILTER KIT /FILTER ASSY /010440229 /	6	870.63	5223.81	31342.86	5.07%	A
6	9NJ410026	UPPER BALL GRIP /708 /708/	15	0.44%	1687.00	25305.00	4.09%	A
7	9CB610214	SPRING//60029754/	18	0.53%	1375.96	24767.28	4.00%	A
8	9CB610275	WEARING PACKING//60073424/	16	0.47%	1472.72	23563.52	3.81%	A
9	9N1U20226	HARDEN PLATE -FIXED BLADE/FIXED BLADE /320133000000 /	15	0.44%	1514.50	22717.50	3.67%	A
10	9QC810018	RUBBER COVER FOR V.SCREENB380 T 700006230F LT1100	75	2.19%	266.68	20001.00	3.23%	A
11	9CB611118	COUNTER SMALE SCREW 60101636	31	0.91%	596.33	18486.23	2.99%	A
12	9Y2130282	*Lug Stowage//6944432/	36	10.95	394.20	14191.20	2.29%	A
13	9UC330009	COPPER BRAZING ROD /COMPRESSOR /1011 /	19	35.6	676.46	12852.74	2.08%	B
14	9CB614890	PU Tube /Pneumatic System /80201286M /12mm	74	2.16%	143.84	10644.16	1.72%	B
15	9CB610851	COUNTER SUNK SCREW / /60005661/ 60005661/	64	1.87%	160.40	10265.60	1.66%	B

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16	9MHN60094	Screw M6S 16x60 -8.8-fz /TIE/3000071632/	80	2.34%	120.60	9648.00	1.56%	B
17	9NJ410027	BAR FOR SCREW /710 /710/	50	1.46%	192.80	9640.00	1.56%	B
18	9CL340844	TUBE SUPPORT DN 125//10038880/	26	0.76%	309.96	8058.96	1.30%	B
19	9NJ410021	PROTECT.SLEEVE / /702/702	15	0.44%	530.20	7953.00	1.29%	B
20	9CL340166	SEALING 5 1/2"///10002526/	55	1.61%	134.43	7393.65	1.20%	B
21	9N1U20278	GALVANIZED C'SNK HD.SCREW//FNBL0301 /	88	2.57%	77.71	6838.48	1.11%	B
22	9NJ410057	SEALING RING //920/ 920	50	1.46%	132.55	6627.50	1.07%	B
23	9NJ410059	SCRAPER RING //922/ 922	48	1.40%	132.55	6362.40	1.03%	B
24	9NJ410054	INTMDTE RING /915 /915/	25	0.73%	253.05	6326.25	1.02%	B
25	9NJ410070	T-PIECE //939/939	30	0.88%	183.16	5494.80	0.89%	B
26	9CL340048	CHEESE HEAD SCREW DIN 912/ M 12 x 45 - 8.8 - A2C/10001193/	56	1.64%	91.13	5103.28	0.83%	B
27	9N1U20381	Coupling Return Spring /Bar cutting /FC00220000 /	21	0.61%	236.13	4958.73	0.80%	B
28	9CB611117	COUNTER SMALE SCREW 60101635	94	2.75%	52.10	4897.40	0.79%	B
29	9NJ410037	SEALING RING //720/ 720	50	1.46%	96.40	4820.00	0.78%	B
30	9HT471507	REAR WHEEL BRAKE CAM BUSH 257342303404	33	0.97%	141.97	4685.01	0.76%	C
31	9MHN60095	Nut Mutter M6M 20 -8.-fz	56	1.64%	80.40	4502.40	0.73%	C
32	9CL350660	COMCERTINA WALLS SDS 100 /OUTRIGGER/10202596/	20	0.58%	216.48	4329.60	0.70%	C
33	9NJ410041	BALL RETAINER /725 /725/	50	1.46%	84.35	4217.50	0.68%	C
34	9N1U20476	CSK.HD.SCREW (BLIND PLATE)/ /FNBL031800 /	92	2.69%	43.70	4020.40	0.65%	C
35	9NJ410020	ADJUSTING SCREW //701/701	15	0.44%	265.10	3976.50	0.64%	C
36	9N1U20536	Soc. HD. Cap Screw /Moving Blade/2030101GRLHLO/	25	0.73%	154.38	3859.50	0.62%	C
37	9MHN60050	Screw /Passenger hoist support /3000071545/	20	0.58%	160.80	3216.00	0.52%	C
38	9N1U20280	SOCKET HD. CAP SCREW / /FNBL0041 /	24	0.70%	133.75	3210.00	0.52%	C
39	9NJ410029	VALVE COMPLETE //712/712	20	0.58%	156.65	3133.00	0.51%	C
40	9CB611365	Hex Screw /Mixing arm cpl. T 1000 /10000978 /	26	0.76%	116.89	3039.14	0.49%	C
41	9N1U20524	Conn.rod set. plate screw//FNBL0044/	26	0.76%	116.50	3029.00	0.49%	C
42	9N1U20484	Screw //FNBL0032 /	15	0.44%	187.50	2812.50	0.45%	C
43	9NJ410035	SEAL //718/ 718	50	1.46%	54.22	2711.00	0.44%	C
44	9N1U20277	COUPLING NIB THRUSTSPRING//FC00060000 /	16	0.47%	167.18	2674.88	0.43%	C
45	9HT111623	Fuel Filter 0.5 ltrs. Dual/ Mico/F3952100/	14	0.41%	189.24	2649.36	0.43%	C
46	9CB640105	PU tube dia 8 //80201320 /	40	1.17%	65.00	2600.00	0.42%	C
47	9CB611551	Counter Shunk Screw //60080342 /	16	0.47%	145.64	2330.24	0.38%	C
48	9N1U20059	SOC.HD.CAP SCREW MOV.BLAD//030101GRLHLO /	15	0.44%	149.38	2240.70	0.36%	C

49	9NJ410031	STEEL ELBOW //713/ 713	20	0.58%	108.45	2169.00	0.35%	C
50	9NJ410023	BALL RETAINER //705/705	25	0.73%	84.35	2108.75	0.34%	C
51	9CL210107	SEALING DN125 1/2" //10002526 /	14	0.41%	145.09	2031.26	0.33%	C
52	9NJ410034	SCRAPER RING //717/ 717	50	1.46%	38.56	1928.00	0.31%	C
53	9NJ410055	SCRAPER RING //918/ 918	25	0.73%	74.71	1867.75	0.30%	C
54	9HT161081	HALOGEN BULB 12V 60/55W//F2344900/	15	0.44%	121.72	1825.80	0.30%	C
55	9CB610419	COUNTER SUNK SCREW M 12x /35 DIN 7991/60094620/	19	0.56%	94.54	1796.26	0.29%	C
56	9MHN60092	Tension pin FRP 5x32 -fz2/TIE /3000134314/	92	2.69%	19.10	1757.20	0.28%	C
57	9NJ410050	SPRING //909/ 909	90	2.63%	19.28	1735.20	0.28%	C
58	9HR131435	TERMINAL CAP R.H.//GT455712/	41	1.20%	42.00	1722.00	0.28%	C
59	9HR131438	TERMINAL CAP L.H.//GT455779/	41	1.20%	42.00	1722.00	0.28%	C
60	9NJ410052	UPPER WASHER //912/ 912	26	0.76%	65.07	1691.82	0.27%	C
61	9G1310020	HOSE CLIP 1 1/2" ID//DD100054/	38	1.11%	41.75	1586.50	0.26%	C
62	9FDH10826	PIPE - WATER RETURN /Engine /16241-7337-0 /	13	0.38%	117.60	1528.80	0.25%	C
63	9NJ410040	PISTON WASHER //723/ 723/	20	0.58%	72.30	1446.00	0.23%	C
64	9NJ410048	SPRING PLUG //907/ 907	90	2.63%	14.46	1301.40	0.21%	C
65	9CL220460	Cheese headscrew M16X40 /Discharge support /042657000/	13	0.38%	99.01	1287.13	0.21%	C
66	9N1U20362	SOC HD CAP SCREW //FNBL0030 /	20	0.58%	62.50	1250.00	0.20%	C
67	9N1U20269	GALVANIZED C'SNK HD.SCREW//FNBL0319 /	19	0.56%	60.99	1158.81	0.19%	C
68	9NJ410056	O-RING //919/ 919	50	1.46%	21.69	1084.50	0.18%	C
69	9G1310021	HOSE CLIP 2 3/4" ID//DD100056/	38	1.11%	26.77	1017.26	0.16%	C
70	9MT620593	SCREW//M0632925/	25	0.73%	40.56	1014.00	0.16%	C
71	9UC330056	Gauge Adaptor /chiller plant /990000007/	16	0.47%	63.00	1008.00	0.16%	C
72	9NJ410032	VALVE SCREW //714/ 714	20	0.58%	48.20	964.00	0.16%	C
73	9NJ410036	O-RING/CYLINDER //719/ 719	50	1.46%	18.08	904.00	0.15%	C
74	9FD231104	TERMINAL COVER//81577079/	20	0.58%	42.00	840.00	0.14%	C
75	9FD231107	TERMINAL COVER//81577082/	20	0.58%	42.00	840.00	0.14%	C
76	9CB610583	RUBBER WASHER M12//80150065/	68	1.99%	12.30	836.40	0.06%	C
77	9HT710002	WHEEL HUB NUTS //040064/040064	28	0.82%	25.91	725.48	0.06%	C
78	9NJ410039	O-RING //7212/ 7212	50	1.46%	14.46	723.00	0.12%	C
79	9NJ410058	O-RING //921/ 921	50	1.46%	14.46	723.00	0.12%	C
80	9FD113072	METER BULB 24V //NULL112/	56	1.64%	12.26	686.56	0.12%	C



1	81	9UC330009	COPPER BRAZING ROD /COMPRESSOR /1011 /	19	0.56%	35.60	676.40	0.11%	C
2	82	9CB610387	GREASE NIPPLE DIN 71412//60091470/	21	0.61%	28.70	602.70	0.11%	C
3	83	9NJ410030	O-RING //7122/7122	50	1.46%	12.05	602.50	0.10%	C
4	84	9HT180006	Shim /FRONT AXLE /F4454010/	50	1.46%	10.50	525.00	0.10%	C
5	85	9CP310581	SCREW RETAINER SKM 10 DT /320/10129841/	49	1.43%	10.33	506.17	0.08%	C
6	86	9HV113473	1141 BULB 12V / CODE CHANGE REF.93890014/NULL47/1	30	0.88%	16.03	480.90	0.08%	C
7	87	9CB610010	HEX. NUT//10001209/	20	0.58%	23.78	475.60	0.08%	C
8	88	9NJ410068	AIR VALVE //935/ 935	20	0.58%	21.69	433.80	0.08%	C
9	89	9NJ410022	SCREW //703/ 703	50	1.46%	8.44	422.00	0.07%	C
6	90	9NJ410046	SCREW //905/ 905	50	1.46%	8.44	422.00	0.07%	C
7	91	9NJ410060	STO SCREW //923/923	50	1.46%	8.44	422.00	0.07%	C
8	92	9Y2130282	*Lug Stowage//6944432/	36	1.05%	10.95	394.20	0.07%	C
9	93	9NJ410044	CYLINDER NUT //732/ 732	20	0.58%	18.08	361.60	0.06%	C
6	94	9CB610034	PLAIN WASHER//10001512/	20	0.58%	16.40	328.00	0.06%	C
7	95	9CB640230	Dome Nut / 010001274 /	16	0.47%	19.68	314.88	0.06%	C
8	97	9CB610097	SPRING WASHER//10033552/	20	0.58%	14.76	295.20	0.06%	C
9	98	9CB610016	HEXAGON NUT DIN 934 M 12 /8 - A2C/10001254/	20	0.58%	13.12	262.40	0.06%	C
6	99	9HT470394	AXLE PACKING //25733560530/25733560530	17	0.50%	14.70	249.90	0.06%	C
7	100	9CB640157	LOCK WASHER S12 //60083300 /	17	0.50%	13.12	223.04	0.06%	C

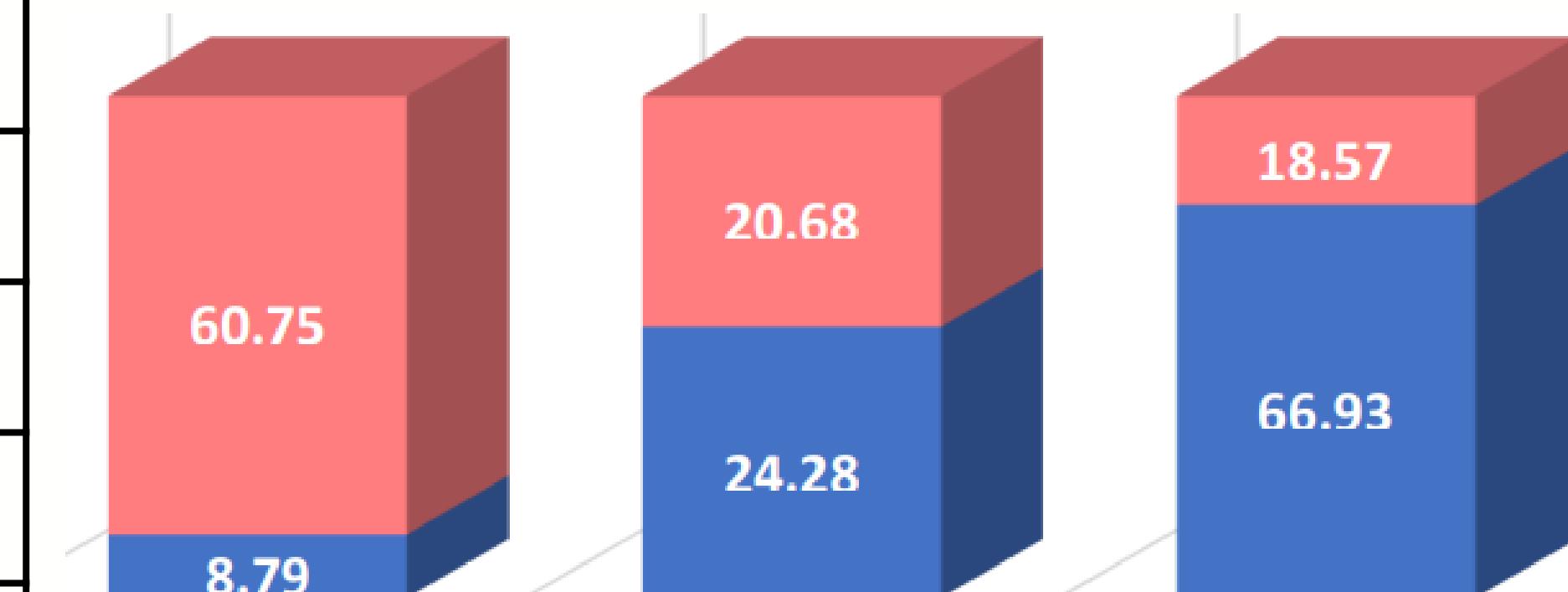
Result of ABC analysis

- After analyzing table 2, we can see that about 306 items constitute about Rs. 3,75,728 which means about 8.79% of the stock in Project & Machineries of L&T is categorized under the Class A.
- About 845 items constitute about Rs.1,27,884.95 which means about 24.28 % of the stock is categorized under the Class B.
- About 2329 items constitute about Rs.1,14,828.40 which means about 66.93% items is categorized under the class C.

Table 2- ABC Analysis Result

ABC Class	Number of Items	Total amount required
A	8.79%	60.75%
B	24.28%	20.68%
C	66.93%	18.57%
TOTAL	100%	100%

Fig 2- ABC Analysis Result

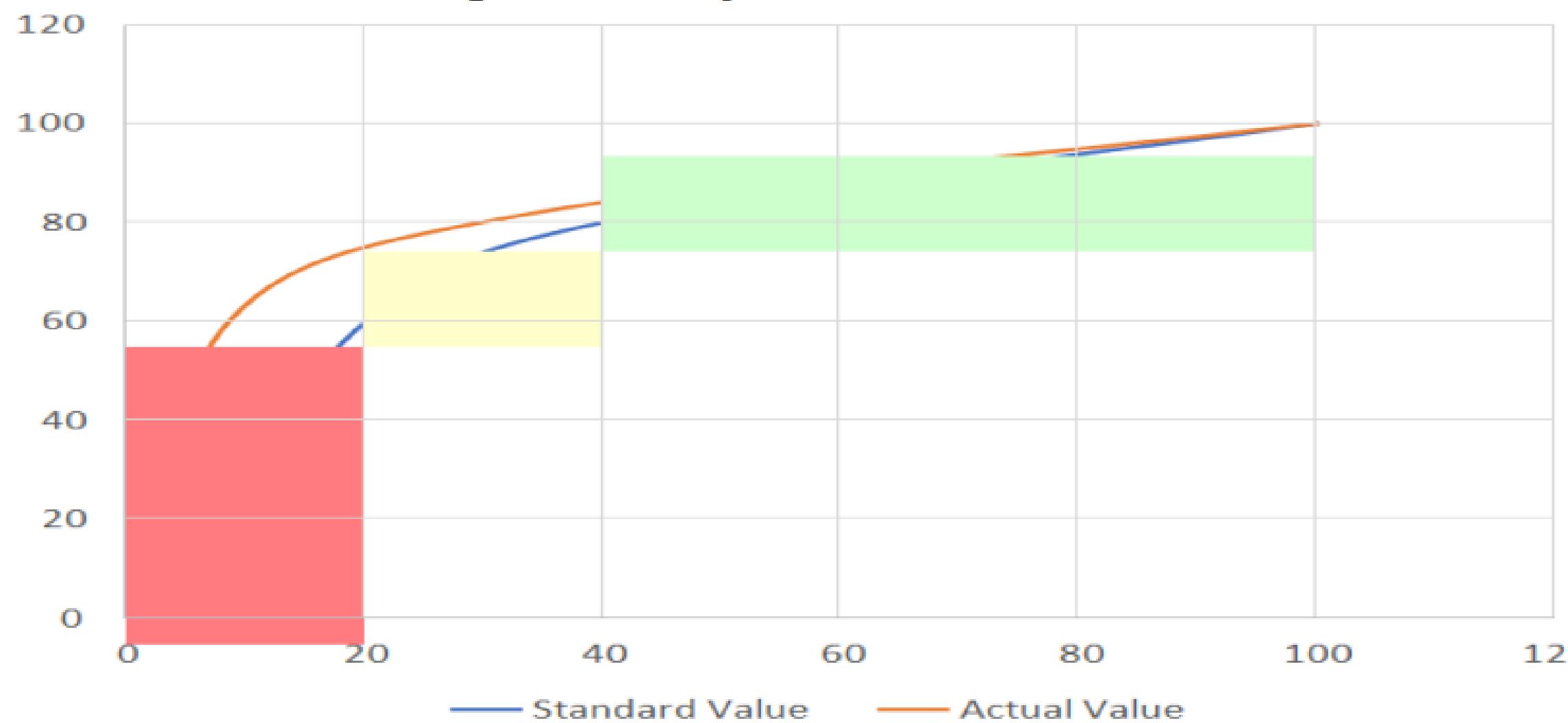


Interpretations



- In Class A, there is about 11% deviation from the actual to standard values. Only 8% of the company's inventory is making up 60% of the total value of inventory, which means there is either a mismanagement of inventory, or very special items having very high cost have been used in the Statue of Unity Project.
- Class B and Class C have minimal deviation, and hence we can say that these items have been properly classified and managed.

Fig 3- ABC Analysis Actual vs. Standard





Forecasting : Optimizing Spare Parts Inventory

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Challenge :

- L&T's CMB relies on readily available spare parts to minimize customer downtime and maximize revenue.
- Managing over **20,000 spare parts** and a wide value range (₹ 10 million - ₹80 million) with significant value necessitates accurate forecasting.
- The current method, based on experience, lacked **precision and scalability**.

Problem :

- Developing individual forecasting models for each part would be incredibly **time-consuming and expensive**.
- A scalable solution applicable across all of India was essential.



Proposed Solutions:

ABC Analysis:

- This method categorizes parts based on annual usage value (**A- High, B-Medium, C- Low**).
- L&T could initially focus on high-value (A) parts, which have the greatest impact on revenue and downtime.

Statistical Forecasting Techniques:

- Techniques like **moving averages**, exponential smoothing, **Croston's method**, and ARIMA can be used to predict demand patterns.
- The most suitable technique will depend on the specific part's historical data (e.g., trends, seasonality).

Safety Stock:

- Maintaining a buffer of critical parts helps mitigate unexpected demand surges.

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Chosen Solution:

ABC Analysis:

ABC Analysis is a classification method commonly used in inventory forecasting and management to prioritize items based on their annual dollar usage value. Here's a breakdown of how it could be applied to L&T's spare parts-

- **A-items** are goods which annual consumption value is the highest; the top 70-80% of the annual consumption value of the company typically accounts for only 10-20% of total inventory items.
- **B-items** are the interclass items, with a medium consumption value; those 15-25% of annual consumption value typically accounts for 30% of total inventory items.
- **C-items** are, on the contrary, items with the lowest consumption value; the lower 10-15% of the annual consumption value typically accounts for 50% of total inventory items.

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CLASSIFICATION OF MATERIALS :

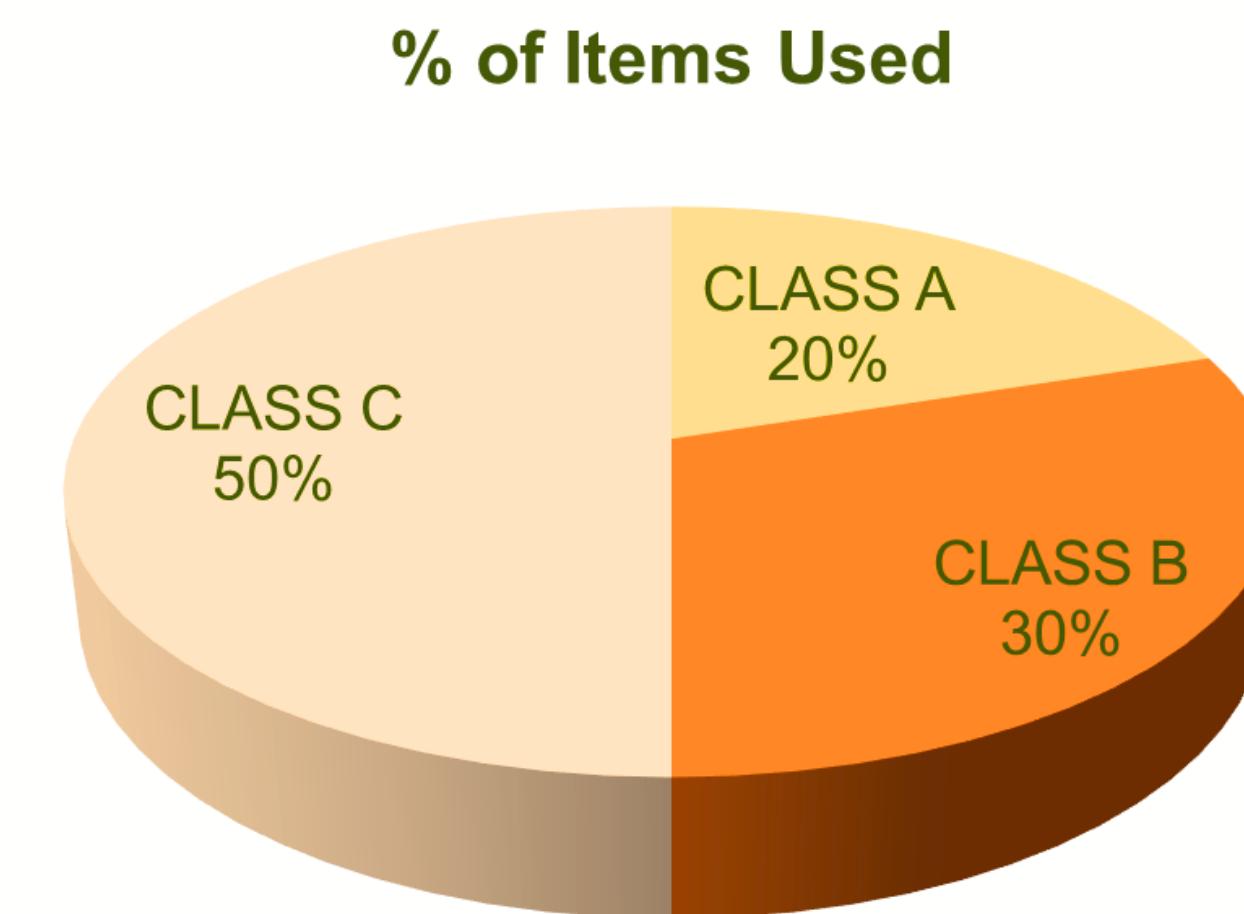
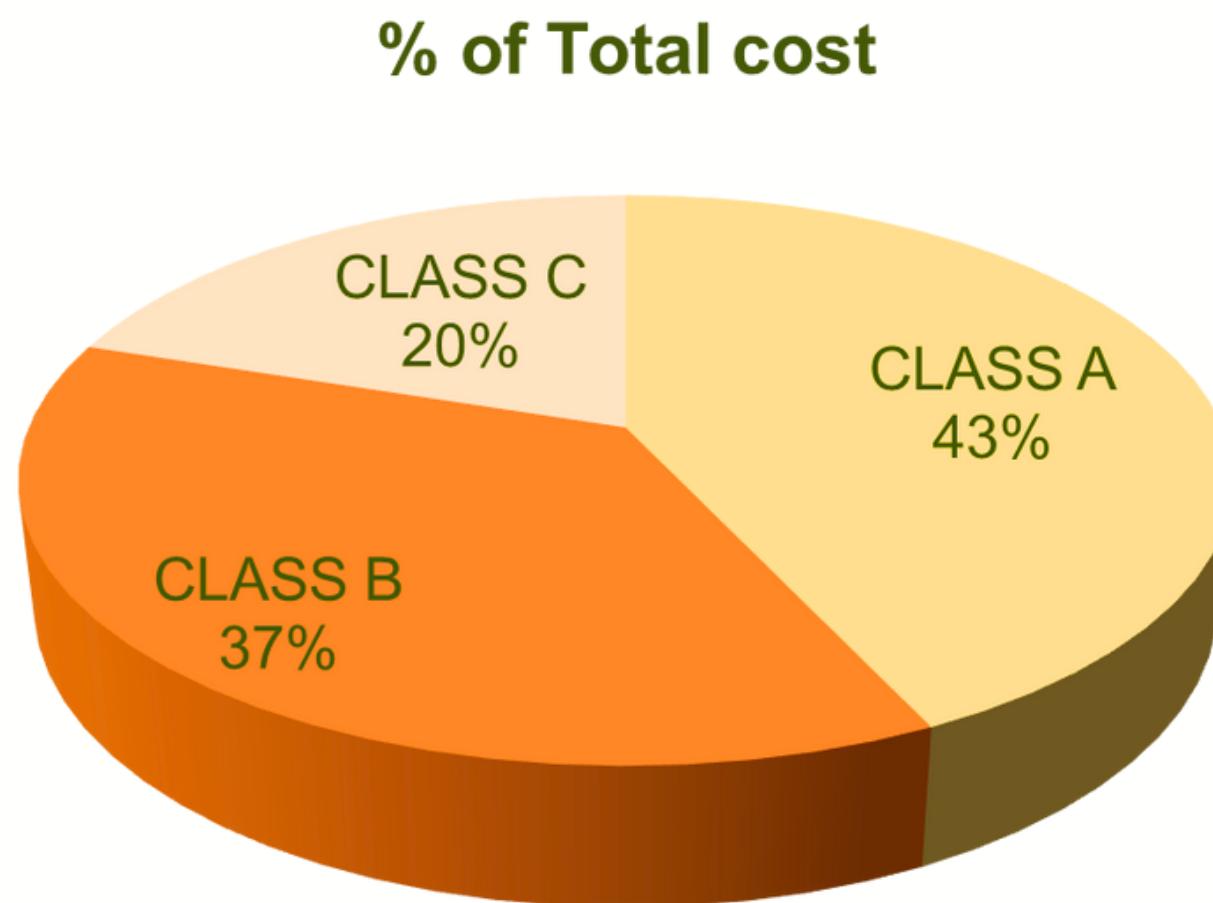
	CATEGORY	ITEMS	% OF ITEMS	% OF TOTAL COST	ACTION
1	CLASS - A	SAND, STEEL,FLOORIN G	20%	60%	CLOSE CONTROL
2	CLASS - B	BLOCKS, CEMENT, PAINTING, DOOR, BATHROOM FITTINGS	30%	28%	REGULAR REVIEW
3	CLASS - C	AGGREGATES, WINDOWS, FORMWORK, ELECTRICAL FITTINGS, GLASS RAILING, KITCHEN PLATFORMS	58%	20%	REGULAR REVIEW
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A Data-Driven Approach to the Rescue:

Implementing a data-driven forecasting system with techniques like ABC Analysis and statistical modeling provided significant benefits:

- Improved Customer Satisfaction
- Increased Revenue
- Optimized Inventory Levels
- Reduced Obsolescence Risk

Below is the cost and impact of items in class A , B , C :



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Plant Location and Layout

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Larsen and Toubro have many plants in India few are:

- Powai, Maharashtra
- L&T Knowledge City, Gujarat
- Chennai, Tamil Nadu
- Bengaluru, Karnataka
- Faridabad, Haryana

Key features of these locations :

- Developing individual forecasting models for each part would be incredibly time-consuming and expensive.
- A scalable solution applicable across all of India was essential.

Powai, Maharashtra:

- **Location:** The Powai campus is situated in Mumbai.
- **Affiliation:** It belongs to L&T (Larsen & Toubro).
- **Significance:** It is L&T's oldest facility.
- **Diversity:** The campus is diverse in terms of employee strength and operations.
- **Facilities:** Alongside the L&T Hydrocarbon Engineering, Heavy Engineering, and Construction business offices, the Powai campus houses world-class Design and R&D labs and an Experience Centre.

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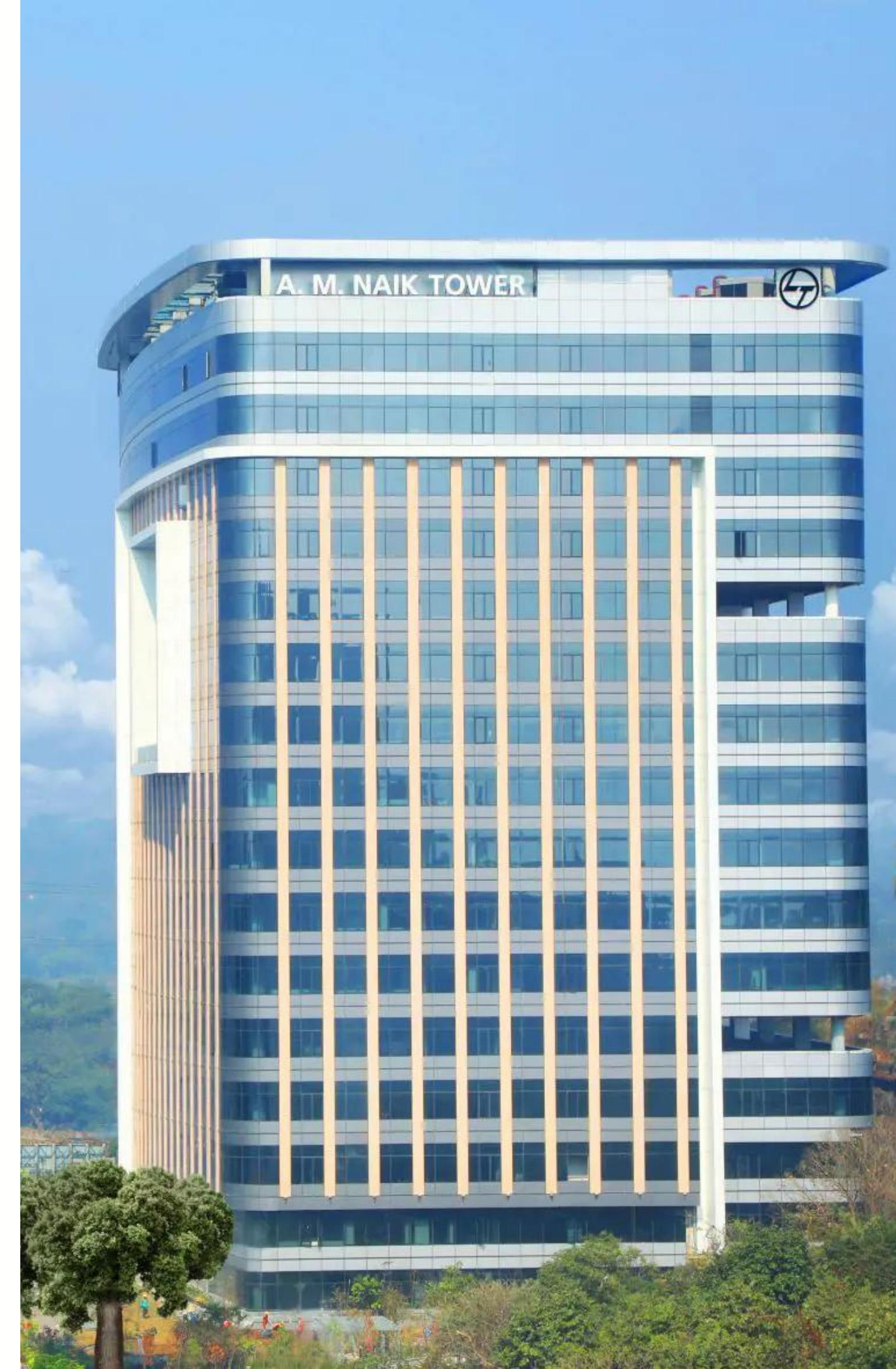
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L&T Knowledge City, Gujarat:

- **Location:** The L&T Knowledge City is situated in Vadodara, Gujarat.
- **Affiliation:** It is a hub for several key businesses of the L&T Group.
- **Businesses Operating There:**
 - Power Business
 - Mid & Downstream Hydrocarbon
 - L&T Technology Services
 - Engineering Joint Venture L&T-Sargent
- **Focus Area:** The campus provides single point design engineering and development solutions for core sector industries.
- **Green Initiatives:** The L&T Knowledge City takes a lead in green initiatives and is recognized for its sustainability efforts.



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Chennai, Tamil Nadu:

- **Location:** The headquarters is situated in Manapakkam, Chennai, Tamil Nadu.
- **Recognition:** It is acknowledged as an ‘Outstanding Corporate Green Campus’.
- **Size and Scenery:** The campus spans 27 acres and is surrounded by scenic eco-friendly surroundings with abundant greenery.
- **Awards and Features:** Almost every concrete structure within the campus has won prestigious awards for excellence in construction.
- The campus incorporates green features, enhancing its aesthetic value.
- **Built-Up Area:** Currently, the campus accommodates 1.4 lakh sq.m of built-up area.
- **Environmental Impact:** It boasts a significant tree carbon sequestering capacity.



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Plant Layout



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Some of the things that must be considered while designing the plant layout for construction projects are :

1. Initial Site Assessment and Analysis:

- Before construction begins, a thorough site assessment is crucial.
- Factors considered include topography, soil conditions, environmental aspects, and access points.
- This analysis informs decisions during the planning phase.

2. Zoning and Functional Zones:

- Divide the construction site into functional zones to prevent interference between different activities.
- Zones may include material storage areas, equipment staging zones, work areas, and temporary facilities.

3. Optimal Space Utilization:

- Efficiently organize structures, pathways, and equipment to maximize available space.
- Use modular and vertical construction techniques to optimize the site's footprint.



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4. Access and Circulation:

- Well-designed access points, roads, and pathways ensure smooth movement of workers, equipment, and materials.
- Minimize congestion and bottlenecks to enhance productivity.

5. Safety and Compliance:

- Consider safety aspects, emergency exits, evacuation routes, and safety equipment placement.
- Comply with local regulations and industry standards.

6. Material Management:

- Organize material storage areas efficiently.
- Implement clear inventory systems and just-in-time delivery practices.

7. Temporary Facilities:

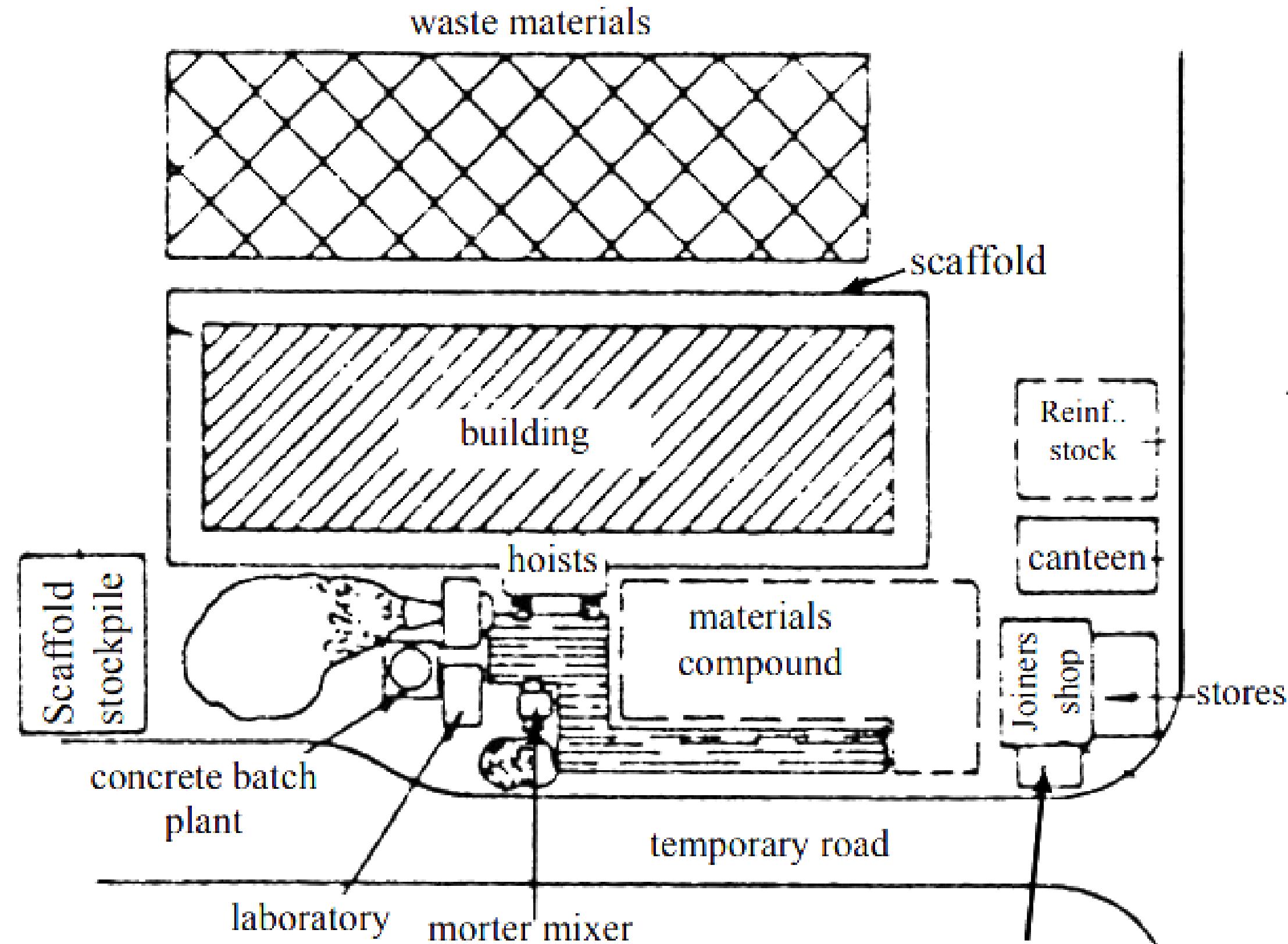
- Properly position on-site facilities such as offices, break areas, and sanitation facilities.
- Minimize downtime due to long commutes or inconvenient access.

(LARSEN AND TOUBRO follows all the above guidelines while developing the plant layout for the construction activities)

Plant Layout



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Supply Chain Management



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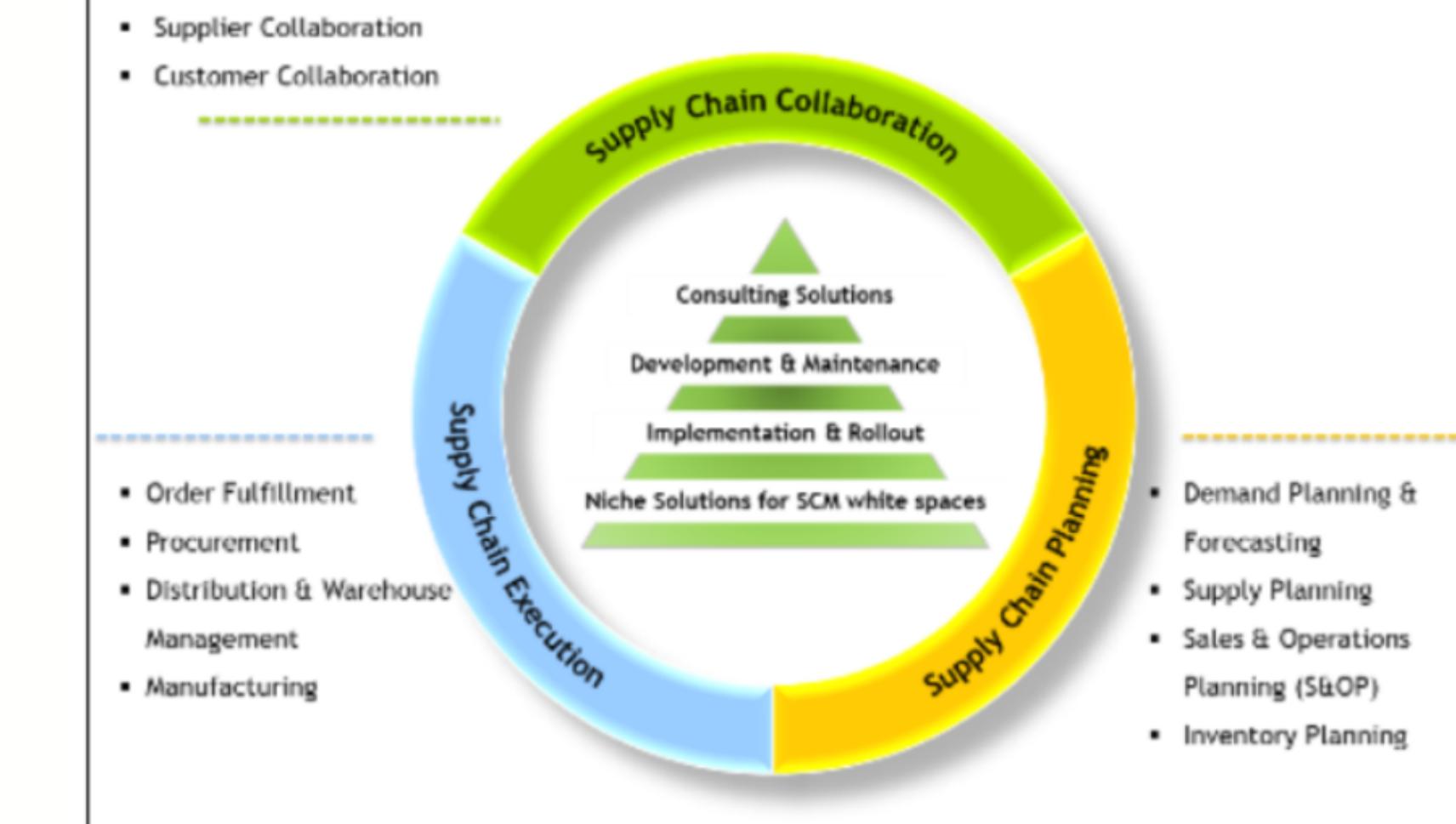
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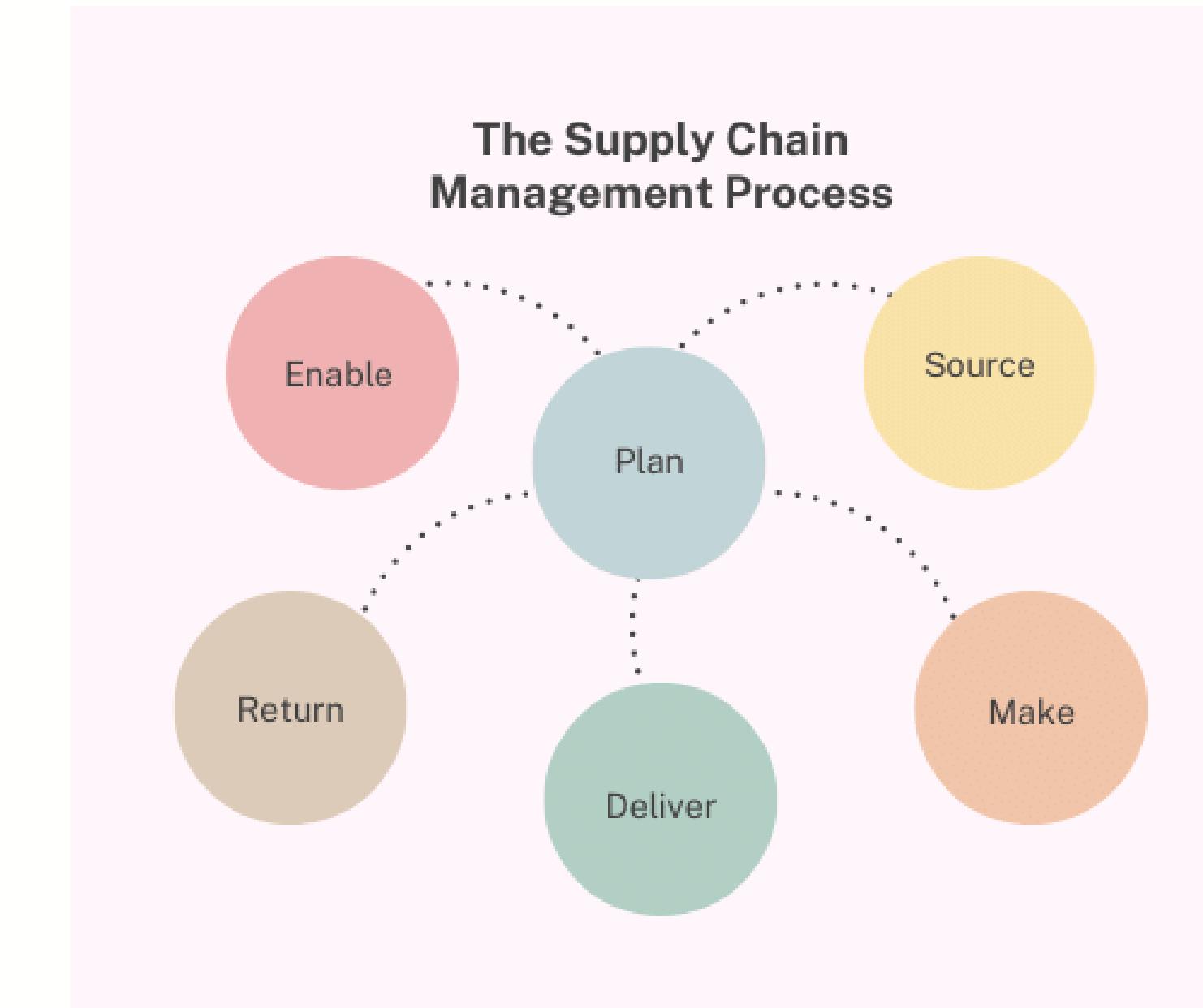
A supply chain refers to the network of organizations, individuals, activities, information, and resources involved in the creation and delivery of a product or service to the end customer. It encompasses all the stages from the sourcing of raw materials to the delivery of the final product or service to the consumer.





The Supply Chain Management Process

- Plan
- Source
- Make
- Deliver
- Return
- Enable



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- **Plan:** Develop a strategic plan to meet customer demand efficiently through forecasting, inventory management, and resource allocation.
- **Source:** Identify and select reliable suppliers who can provide materials and services at the right quality, price, and delivery terms.
- **Make:** Transform raw materials and components into finished products or services efficiently while maintaining quality and minimizing waste.
- **Deliver:** Ensure timely and cost-effective delivery of finished products to customers through effective logistics, transportation, and order fulfillment processes.

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- **Return:** Manage product returns, exchanges, and repairs efficiently through reverse logistics processes while minimizing costs and maximizing value recovery.
- **Monitor and Improve Or Enable:** Continuously monitor performance, analyze data, and implement process improvements to optimize supply chain efficiency, flexibility, and responsiveness.

Conclusion



Larsen & Toubro (L&T) has established itself as a leader in the construction field by excelling in various industrial engineering and management (IEM) practices.

- **Forecasting:** L&T's ability to accurately predict project needs ensures efficient resource allocation and minimizes disruptions.
- **Supply Chain Management:** A well-oiled supply chain guarantees timely delivery of materials, keeping construction projects on schedule.
- **Product Design & Planning Strategy:** L&T's focus on designing and planning construction projects meticulously reduces waste and ensures quality.
- **Material Requirement Planning (MRP):** By effectively planning material needs, L&T optimizes inventory levels and avoids stockouts or excessive storage costs.
- **Inventory Management:** L&T's inventory management practices ensure they have the right materials at the right time, minimizing delays and keeping projects running smoothly.

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Thank
you!