

ISSN 2320-0758

PRICE ₹ 50/-

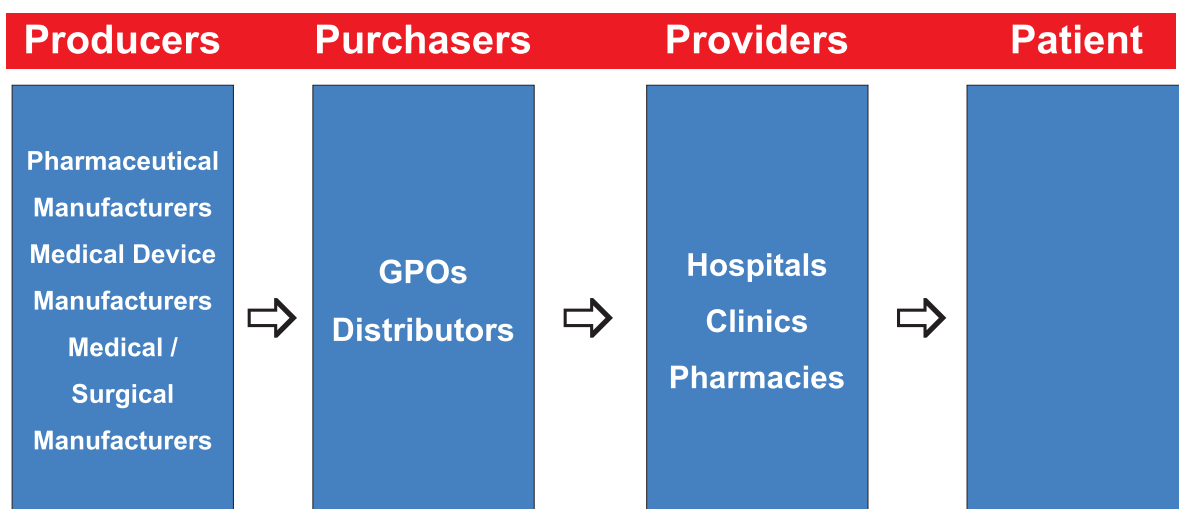
MATERIALS MANAGEMENT REVIEW



Volume 19 - Issue 1 Date of Publication: 1-11-2022 No. of Pages 1-60 November 2022

Special Issue on **HEALTHCARE SUPPLY CHAIN**

Emerging Trends in Healthcare Supply Chain Management



NATIONAL LOGISTICS POLICY 2022

inside



Indian Institute of Materials Management

IN PURSUIT OF EXCELLENCE IN SUPPLY CHAIN AND LOGISTICS MANAGEMENT

NATCOM 2022

RE-INVENTING & FUTURE
PROOFING GLOBAL
SUPPLY CHAIN
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From the Desk of Chief Editor & National President



The health care supply chains have always remained important for human beings as the end user itself is human suffering from some severe accident or critical illness. Health care supply chain is way more different and complex in nature as compared to the standard supply chain because of the presence of essential and nonessential medical items. The principle task of Healthcare supply chain is to provide reliable healthcare services that are easy to access, safe, of high quality and are people oriented.

As we have talked of reliable healthcare system, it should have features like comprehensiveness, accessibility, coverage, continuity, quality, person-centeredness, coordination, accountability and efficiency besides ensuring right healthcare is delivered at the right time, responding to the needs and preferences of service users, while minimizing environmental damages from bio-waste and waste of resources.

Prominence of Healthcare Supply Chain was realized even more when COVID-19 pandemic began, and it took all by surprise despite their best efforts to quickly adapt to the situation. Health care organizations suffered severe fluctuations in the supply and demand of medical commodities, equipment, and essential medicines.

Disruptions have played a critical role in evolution of Healthcare Supply Chain from time to time. With the advent of new innovative technologies like AI, Machine Learning, Block Chain, real time tracking, big data analytics etc., healthcare supply chains have shown a steady rise in combating the unexpected as can be seen during 2nd wave of Covid 19. However, it has also resulted in inducing a new urgency of Resilient Healthcare Supply Chain. The conventional approach of managing the complex supply chain processes including people, operations, information, and resources that supply products and services to consumers has left many organizations scrambling. The organizations have started focusing on digitalization of supply chains for bringing in resilience.

Integrating concept of lean supply chain in healthcare supply chain can be highly efficient and effective, however, at the same time minimizing costs can reduce the healthcare supply chain resilience in a significant manner thereby making it brittle & fragile during unplanned and disruptive events. According to Harvard Business Review, "The search for supply chain efficiency has come at the cost of resilience, with hospitals and health care providers now dependent on fragile global supply chains vulnerable to disruptions from 'black swan' events like COVID-19." Regardless of the severity of the disruptive events, organizations need to take unprecedented measures for preventing or mitigating the risk caused by disruptive events. Digitalization and adoption of new technologies along with trained personnel in use of these technologies for resilient supply chain appears the future of healthcare supply chain.

Given the critical role of healthcare supply chain to society, emphasis should be on to build an organization's flexibility & responsiveness to respond to unexpected and unprecedented supply chain failures thereby supporting the industry's mission to provide care to those in need and enable prevention and wellness.

IIMM is organizing its prestigious annual event 'NATCOM 2022' on the theme 'Re-inventing & Future Proofing Global Supply Chain Management' at Chennai on 2nd & 3rd December 2022 and includes one technical session especially dedicated to healthcare supply chain. I request the readers to participate and encourage their organizations to participate in the above convention to take advantage of deliberations on what is latest in Supply Chain Management.

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International Federation of
Purchasing & Supply Management*

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Printed at :

Power Printers,

4249/82, 2 Ansari Road, Daryaganj,

New Delhi - 110002



MATERIALS MANAGEMENT REVIEW

Volume 19 - Issue 1

(November 2022)

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Edited, Printed & Published by :

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(Published material has been compiled from several sources, IIMM disowns any responsibility for the use of any information from the Magazine if published anywhere by anyone.)

NATIONAL LOGISTICS POLICY 2022

Logistics efficiency is a function of infrastructure, services (digital systems/processes/ regulatory framework) and human resource. The PM GatiShakti National Master Plan (NMP) for multimodal connectivity infrastructure to various economic zones, has been launched. PM GatiShakti National Master Plan is a transformative approach for improving logistics efficiency and reducing logistics cost, with focus on integration of existing and proposed infrastructure development initiatives of different agencies, to ensure first and last mile connectivity, for seamless movement of people and goods.

While development of integrated infrastructure and network planning is envisaged to be addressed through the PM GatiShakti National Master Plan, for efficiency in services (processes, digital systems, regulatory framework) and human resource, the National Logistics Policy is the logical next step. This will provide a comprehensive agenda for development of entire logistics ecosystem.

2. Definition : ‘Logistics’ means Transportation & handling of goods between points of production and consumption, storage, value addition and allied services. The logistics infrastructure comprises of nodes and connections, more recognizable as ports, stations, Multimodal Logistics Parks (MMLPs), warehouses, and other business premises, connected by roads, railways, shipping, inland waterways, air routes, pipelines, etc., that are used by a wide range of carriers. This system is operated under a framework through a workforce with a wide range of knowledge of skills and technologies.

3. Vision and Objectives : The vision of the National Logistics Policy is “To develop a technologically enabled, integrated, cost- efficient, resilient, sustainable and trusted logistics ecosystem in the country for accelerated and inclusive growth.”

Accordingly, the key objectives of the policy are:

- a) **Integration:** to promote inter-modality, multi-modality through seamless integration of processes, digital systems, policies/plans and legislative requirements.
- b) **Optimization:** to promote and ensure optimal utilization of logistics infrastructure/assets/facilities through synergetic usage.
- c) **Standardization:** of physical assets, processes, taxonomy, benchmarking of service quality standards, in the logistics sector.
- d) **Modernization:** to promote greater adoption of information communication technology, upgraded

infrastructure, use of drones, automation, innovation, green logistics, international best practices and facilitate integration with global value chain.

- e) **Formalisation:** to reduce fragmentation in the sector, promote excellence, mainstream logistics in higher education, upskilling and re-skilling of existing workforce.
 - f) **Democratization:** to promote inclusivity by addressing needs of logistics supply and user side (agriculture and manufacturing sector and internal and external trade) and encourage public-private participation.
- 4. Targets :** Targets for achieving the vision of the National Logistics Policy are to (i) Reduce cost of logistics in India to be comparable to global benchmarks by 2030; (ii) improve the Logistics Performance Index ranking – endeavor is to be among top 25 countries by 2030; and (iii) create data driven decision support mechanism for an efficient logistics ecosystem.
- 5. Strategies for achieving the targets:**

Reduction in logistics costs is planned to be attained through measures that improve efficiency in transport, warehousing, inventory management, and regulatory matters and order processing.

Improvement in transportation through migration towards relatively more efficient, economical and environmentally sustainable modal mix; improvement in efficiency of transport systems through promoting development of multimodal interconnected infrastructure; and Sectoral Plans for Efficient Logistics thereby addressing the issues of first and last mile, innovations in the design of rolling and floating stock and associated material handling, collaborative usage of logistics infrastructure and smart enforcement for minimizing detentions. The policy would provide road map for assessment of requirements of capacities and potentials of ports/multimodal logistics hubs, parks/cargo terminals, etc., logistics for efficient harnessing of natural resources, promote use of drones, automation, new technologies for logistics, among others.

Improvement in warehousing through (a) enabling adequate development of warehouses with optimal spatial planning using the PM GatiShakti NMP and facilitating private investments in warehouses;

- (b) facilitating improvement in efficiency, productivity

and quality services in warehousing through promotion of standards, rewarding excellence and promoting digitization (use of Artificial Intelligence (AI)/Machine Learning (ML)/warehouse automation); (c) development of a framework guideline for Logistics Parks to streamline approval processes, facilitate investments and allow optimal utilization.

Improvement in Inventory management through improvements in reliability of supply chains by promotion of digitalisation to facilitate tracking, improved predictability and visibility of replenishment orders, improvements in speed of transit by adoption of smarter enforcement, and de-risking of supply chains through resilient infrastructure planning and implementation.

Improved efficiency in regulatory matters and order processing is envisaged to facilitate development of a regulatory and policy environment wherein government policies would not act as an impediment to infrastructure development in the country, and also to promote and support investments by all stakeholders including the private sector. This is intended to be achieved by (a) facilitating simplification of regulatory processes, promoting standardization and digitalization for greater integration and interoperability, (b) easing interface between industry and government, (c) facilitating addressing of gaps in the existing policies, liability regimes, etc., and (d) promoting a robust ecosystem of innovative digital solutions, development of digital solutions, integrating logistics related digital systems through a unified digital platform.

Logistics Performance Index (LPI): To improve India's ranking in LPI, facilitate identification and resolution of issues related to logistics capacity, last-mile connectivity gaps, ground level operation and infrastructure. In addition, develop a compendium of reforms, in consultation with stakeholders and based on periodic reviews, to act upon, for improvement of India's ranking,

Development of data driven systems for monitoring various components of the logistics ecosystem to enable higher logistics efficiency is envisaged through (a) the PM GatiShakti National Master Plan; (b) the Unified Logistics Interface Platform (ULIP); (c) the 'Logistics Ease Across Different States' (LEADS) study for monitoring logistics performance across states, and; (d) development of a robust standardized methodology for calculating logistics costs and institutionalizing regular national assessment of logistic costs in the economy.

6. Monitoring and Coordination

PM GatiShakti establishes an institutional framework to bring into action the whole of government approach for implementing its vision. Accordingly, the apex body – an Empowered Group of Secretaries (EGoS) has been setup and mandated inter alia, to review and monitor implementation

of the National Master Plan, adopt framework and norms for undertaking any amendments in the NMP, align various initiatives on development of a common integrated portal which serves the needs of all stakeholders, issue appropriate directions for achieving the objectives for compliance to guiding principles of the NMP. The Network Planning Group (NPG) with heads of network planning divisions of infrastructure ministries for unified planning and integration of the proposals has been constituted, which will be supported by a Technical Support Unit (TSU).

Utilize the existing institutional framework i.e., Empowered Group of Secretaries (EGoS) created under the PM GatiShakti National Master Plan for monitoring implementation of the policy and action plan. EGoS will set up a "Services Improvement Group" (SIG) on the pattern of Network Planning Group (NPG) for monitoring of improvements pertaining to processes, regulatory and digital improvements in logistics sector. The SIG will comprise of officers nominated from concerned Ministries/Departments in addition to the relevant members of the Network Planning Group (NPG) such as Ministry of Housing and Urban Affairs (MOHUA), Department of Revenue, Department of Commerce.

7. Implementation of the National Logistics Policy

The Policy will be implemented through a **Comprehensive Logistics Action Plan (CLAP)**. The interventions under the CLAP are divided into specific key action areas, including (i) Integrated Digital Logistics Systems, (ii) Standardization of physical assets & benchmarking service quality standards, (iii) Logistics Human Resources Development and Capacity Building, (iv) State Engagement, (v) EXIM (Export- Import) Logistics, (vi) Service Improvement framework, (vii) Sectoral Plan for Efficient Logistics and (viii) Facilitation of Development of Logistics Parks. A detailed overview is at **Appendix-A**.

Effective implementation of interventions would be achieved by framing and vetting of the planned interventions by concerned line ministries and stakeholders.

Financial and fiscal incentives, by way of review of GST rates, and regulatory interventions to promote multimodal transportation, optimal modal mix, higher throughputs, energy efficiency through adoption of technologies, etc. would be developed through the relevant line ministries and will be invoked when feasible and necessary. In areas where immediate mandatory interventions are not advisable, methods such as development of comprehensive recommendatory guidelines, awards to promote best practices, certification of excellence based on pre-decided benchmarks, and digital systems, will be adopted.

Given the dynamic nature of this sector, the revised set of priorities and rules/processes/procedures

adopted during the course of implementation of the Policy would be reviewed and suitably taken into account.

Appendix-A

Comprehensive Logistics Action Plan (CLAP)

The Comprehensive Logistics Action Plan (CLAP) under the National Logistics Policy 2022 is divided into specific key action areas. Details are given below.

1: Integrated Digital Logistics Systems:

The Problem

Digital systems and interfaces of line ministries/departments exist in silos, no common interface for data sharing and use, and no digital tool to provide a means for performance monitoring and network planning, which utilizes multiple data streams.

Proposed Solution

Develop a system of unified logistics interface to link multiple data sources and develop cross sectoral use cases for logistics stakeholders.

Implementation, Monitoring and Feedback based Review

Action for Digital Integration across Ministries / Departments: Logistics Division, DPIIT to:

- i. Engage different MSPs for development, operation, and maintenance of Unified Logistics Interface Platform (ULIP) – to integrate all logistics-related digital portals and IT solutions.
- ii. Coordinate with concerned line ministries for data sharing.
- iii. Soft Launch of the initiative in 6 (six) months

Action for Digital Gap Areas:

Logistics Division, DPIIT will arrange development of Proof of Concept (PoC) for cross sectoral use cases for logistics stakeholders to address gap areas including Secured Logistics Document Exchange (SLDE) platform (launch in 6 months), digital dashboard to improve container information and availability, Truck Visibility and Positioning Platform (TVPP), Electronic Logging Device (ELD), Import Clearance System for PGAs, Smart Road Enforcement app, etc.

Action by

Ministry of Railways, Ministry of Road Transport and Highways, Ministry of Ports, Shipping and Waterways, Ministry of Civil Aviation, Central Board of Indirect Taxes, Department of Revenue, Ministry of Finance, BISAG-N, Department of Telecommunications, Department of Food & Public Distribution, Department of Commerce, Logistics Division, DPIIT, Ministry of Commerce and Industry.

General list of digital/IT systems/ individual platforms is placed at Appendix – A1.

2: Standardization of physical assets and benchmarking of service quality standards:

The Problem

Lack of Standardization of physical assets and benchmarking of service quality standards used in logistics operations impedes inter-operability, predictability in service levels and efficient multi-modal logistics.

Proposed Solution

Enhance interoperability, minimize handling risks, undertake process optimization, and improve ease of doing business, through standardization of physical assets and benchmarking of service quality standards in logistics including transportation infrastructure (fixed and rolling), terminal handling, warehousing, temperature- controlled logistics, packaging, etc.

Implementation Roadmap and Monitoring

- i. Logistics Division, DPIIT will in coordination with the relevant standard setting agencies (Bureau of Indian Standards, Institute of Packaging, Food Safety Standards Authority of India, Telecom Regulatory Authority of India, Telecommunications Standards Development Society, India (TSDSI), Telecommunications Engineering Centre (TEC), etc.) develop standards for physical assets (containers, trucks, warehousing including temperature-controlled storages; transportation, terminals, etc.), and service benchmarking (service levels and design standards for sustainable packaging) with due regard to existing international recommendations to ensure inter-operability across modes/asset classes, increase in containerization, reduction in logistics costs, improved logistics efficiency, etc. The necessary standards to be collated and compiled in 6 (six) months.
- ii. To facilitate adoption, nodal ministries will devise light touch methods within 9 (nine) months including financial incentives, a system of grading, rating, and certification of excellence through awards for logistics service providers, etc., along with regulatory action, wherever necessary.

Impact Assessment and Feedback based review

Half yearly reports to be submitted to EGoS for review and suitable changes in standards to be made by relevant standard setting agencies in consultation with nodal Ministries/Departments.

Action by

Ministry of Railways, Ministry of Road Transport and Highways, Ministry of Ports, Shipping and Waterways, Ministry of Civil Aviation, Bureau of Indian Standards, Department of Food and Public Distribution, Logistics Division, DPIIT, Ministry of Commerce and Industry, Indian Institute of Packaging, Ministry of Commerce and Industry.

3: Logistics Human Resource Development and

Capacity Building

The Problem

- i. Insufficient courses and programmes in logistics and supply chain management in higher education, at graduate and post-graduate levels.
- ii. Lack of skilled manpower.
- iii. Inadequate system for job role identification, competency mapping, curriculum approval, quality audit, and use of technology.
- iv. Inadequate capacity in relevant ministries and departments handling logistics related infrastructure or policy issues, at the central and state level, for better coordination, execution and implementation of projects, policies, and regulations.

Proposed Solution

Develop an overarching logistics human resource strategy and under its guiding principles, line ministries to develop action plans to address skill development related and internal capacity building challenges in the respective sector.

Implementation Roadmap and Monitoring

- i. A study on gap assessment in job roles and existing skilling ecosystem may be undertaken by MSDE by constituting a Task force with a mandate to identify actions areas (requirement of new courses, programs for skilling and re-skilling, etc.). Spread of logistics sector training institutes across states may also be assessed.
- ii. Based on stakeholder consultation, Logistics Sector-Skill Council (LSSC) ((under guidance of MSDE and Department of Higher Education) will pursue development of an overarching National Logistics Human Resource Strategy including mapping of each logistics sector job role to a nodal line Ministry/ Department. The strategy will also provide a roadmap for promoting uniform presence of training institutes across the country. It may be developed within 6 months.
- iii. Nodal line Ministries/Departments, in coordination with MSDE may pursue development of action plans within 9 (nine) months to address skill development related and internal capacity building challenges in the respective sector. KPIs, timelines and milestones to be specified in the action plan.
- iv. (Department of Higher Education may identify 2-3 universities in each state to analyse the global scenario in terms of institutions and courses for capacity development. Mainstreaming logistics in higher education will be pursued by the Department of Higher Education/ Ministry of Skill Development and Entrepreneurship (MSDE), through inclusion of additional courses of logistics and supply chain at graduate and post graduate level. The courses may be developed within 6 (six) months.

- v. Development of training programs for integrated capacity building and technical support unit under PM GatiShakti may be facilitated by the Capacity Building Commission in collaboration with concerned line Ministries for integrated capacity building and leveraging shared learnings across sectors. Online content/training programmes/ courses may be hosted on the iGOT platform.
- vi. Mandatory certificate courses with exams may be designed using IGoT platform for relevant levels in the state and central governments. In addition, online training courses pertaining to this PM GatiShakti and National logistics policy, also covering sensitization of country's legal and financial systems, developed by Ministry/ Department concerned may be uploaded on iGOT Karmayogi platform as per procedure. GatiShakti and NLP related course content is suggested to be added to training curriculum of government training institutes, under infrastructure ministries and other related ministries.
- vii. Development of a Digital dashboard for tracking action taken under the logistics human resource strategy by concerned stakeholders to be pursued.

Impact Assessment and Feedback based review

- i. LSSC (under guidance of MSDE) to conduct Annual State of Logistics Human Resource Survey for assessment of continuing skill gaps in the logistics sector (perception/data-based surveys involving user industry, logistics sector associations; ministries engaged in the PM GatiShakti NMP); employment in the sector, State Logistics Cells, internal capacities in ministries, impact of steps taken, etc.
- ii. Modification in plan(s) to be done based on overall feedback.

Action by

Ministry of Skill Development and Entrepreneurship, Logistics Sector Skill Council, Department of Higher Education, Ministry of Railways, Ministry of Road Transport and Highways, Ministry of Ports, Shipping and Waterways, Ministry of Civil Aviation, Department of Food & Public Distribution, Capacity Building Commission, Logistics Division, DPIIT, Ministry of Commerce and Industry.

4: State Engagement:

The Problem

Lack of a system for continuous measurement of state-level logistics performance and provide support for improvement.

Proposed Solution

Provide support for development of state/city level logistics plans, set up institutional framework to take action at city/state level, measure and monitor action by states and rank them.

Implementation, Monitoring and Feedback based Review

- i. State governments to pursue development of State / UT and City logistics plans/policy. Plans/policy may provide a roadmap for development of intermodal infrastructure, improvement in logistics services, processes and regulatory regime, digital systems and capacity, along with institutionalizing a system of monitoring user perspective (through a set of cross-sectoral KPIs and clearly defined timelines and milestones) to improve logistics planning, provide necessary inputs for PM GatiShakti NMP. These plans are expected to improve efficiency of city logistics while reducing congestion/pollution and creating opportunities for accelerated economic growth.
- ii. The Logistics Division, DPIIT will conduct annual process of performance assessment of states through an indigenous Logistics Ease Across Different States (LEADS) index, along with handholding states/UTs in the development of their logistics ecosystems and provide a roadmap for improving logistics efficiency. This index is an indigenous data driven system, which practicality captures our country's requirements.
- iii. For monitoring changes in the logistics cost, Logistics Division in consultation with the stakeholders develop suitable framework for assessment of logistics cost at the national level. Also, based on the agreed framework conduct studies to assess the sectoral and overall logistics cost at National and sub-national levels on periodic basis.
- iv. To promote healthy competition, spread information about the inter-state rankings and create awareness on importance of efficient logistics, an Information, Education and Communication strategy under LEADS may be developed, which may inter alia cover appointment of public relation agency for information dissemination, developing a system of grading, rating, certification and excellence (GRACE) of logistics assets and their comparing performance across states.
- v. Future iterations of the scope of LEADS will recognize State / UT Governments for enabling holistic development of connectivity infrastructure through the PM GatiShakti.

Action by

State/UT Governments and City Administration, Logistics Division, DPIIT, Ministry of Commerce and Industry.

5. EXIM Logistics:

The Problem

- i. Infrastructure challenges, including last mile connectivity gaps between key gateway ports and relatively high transport costs between ports and hinterland.

- ii. Incomplete digitalization and procedural inefficiencies leading to suboptimal utilization and high cargo dwell time, inadequate legal and administrative mechanisms to drive transparency of freight charges and eliminate anti-competitive practices.
- iii. Lack of effective coordination to expedite development of strategic trade corridors.

Proposed Solution

Addressing infrastructure and procedural gaps in India's EXIM connectivity and create efficient and reliable logistics network, with transparent and streamlined cross-border trade facilitation, for improved trade competitiveness and greater integration of India with regional and global value chains.

Implementation, Monitoring and Feedback based Review

- i. Logistics Division, DPIIT through the mandate of Working Group on Infrastructure under National Committee of Trade Facilitation (NCTF) will identify critical EXIM infrastructure related issues. This will be done through stakeholder's consultations and a digital tool for monitoring operational performance of gateway infrastructure, assessments of procedural efficiency, etc.
- ii. Based on the above, develop a National Trade Facilitation Action Plan (NTFAP), including mapping of issues to concerned line ministries / departments will be developed.
- iii. Working Group through an independent agency will develop a digital dashboard for constant monitoring of resolution and identification of necessary reforms.
- iv. Relevant issues emanating from the action plan will be taken up by the NPG/SIG to achieve the mandate of PM GatiShakti.

Action by

Central Board of Indirect Taxes, Department of Revenue, Ministry of Finance, Ministry of Railways, Ministry of Road Transport and Highways, Ministry of Ports, Shipping and Waterways, Ministry of Civil Aviation, Logistics Division, DPIIT, Ministry of Commerce and Industry.

6. Services Improvement Framework

The Problem

- i. Improvements needed in customer facing regulatory regime including laws, policies, rules and procedures, associated documentation and approval processes.
- ii. Complex processes, excessive documentation, fragmented regulatory environment and liability regimes across modes; lack of legislative framework for standard practices for digitalization, standardization.

Proposed Solution

Improving regulatory interface to enable seamless between sectors, promote standardization, formalization, inter-operability; eliminate fragmentation in documentation, formats, processes and liability regimes; reduce gaps in regulatory architecture.

Implementation, Monitoring and Feedback based Review

- i. The Proposed mechanism for user interactions inter alia, will cover:
 - a. Existing institutional mechanism of SCOPE (Standing committee for promotion of export) and Inter-Ministerial committee (IMC) for Logistics.
 - b. Logistics Ease Across Different States (LEADS) survey.
 - c. Interactions with industry associations.
 - d. Interactions with ministries, states/UTs.
- ii. It is proposed to form a Service Improvement Group (SIG), comprising of officers nominated from nodal ministries (MOHUA, CBIC, etc. and infrastructure ministries /departments notified as members of NPG) on lines of NPG. Unresolved user issues pertaining to services, documentation, processes, policy, etc. may be resolved through the SIG, along with identification of interventions for improving user interface (to promote inter-operability; eliminate fragmentation in documentation, formats, processes and liability regimes; reduce gaps in regulatory architecture).
- iii. Concerned line Ministries/Departments may develop digital system for registering and monitoring resolution of user industry issues /grievances. These systems may have pre-defined service-level agreements/SOPs indicating inter-ministerial and inter-departmental hierarchy for escalation and resolving issues, action parameters for evaluating efficiency and time taken in issue resolution/management.
- iv. For harmonization of legal requirements and streamline liability regime and dispute resolution in the logistics sector, the Logistics Division, DPIIT will constitute an Inter-Ministerial Drafting Committee to assess the need for legislative changes in the sector. The mandate of the Inter-Ministerial Drafting Committee will inter alia, include analysis of existing laws to explore specific gaps or lack of coverage, identify appropriate administrative or legislative measures needed to close the gap to achieve the following:
 - a. Simplified documentation with common terminology wherever possible in existing carriage acts.
 - b. Regulatory provisions for transparency in freight charges, other fees and levies to ensure fair and reasonable competition, in consultation with

relevant agencies, and using existing regulatory architecture, wherever possible.

- c. Guidelines for development of digital systems and maintaining digital data across ministries / departments in a standardized manner, so that the technical architecture of different digital systems are compatible and enable integrations and data sharing.

Action by

Ministry of Railways, Ministry of Road Transport and Highways, Ministry of Ports, Shipping and Waterways, Ministry of Civil Aviation, Ministry of Power, Department of Telecommunications, MNRE, Ministry of Power, Department of Telecommunications, Ministry of New and Renewable Energy (MNRE), Central Board of Indirect Taxes, Department of Revenue, Ministry of Finance, Centre for Trade and Investment Law, Indian Institute of Foreign Trade.

7: Sectoral Plans for Efficient Logistics (SPEL)

The Problem:

While individual ministries have their respective overall long-term infrastructure plans (like National Rail plan, Bharatmala, Sagarmala, etc.), a sharp focus on addressing demand and supply side logistics issues and priorities (processes, digital improvements, policies regulatory framework and capacity building) is needed to improve efficiency.

Proposed Solution:

Sectoral Plans for Efficient Logistics (SPEL) aligned with PM GatiShakti, will be developed for each sector with underlying philosophies of inter-operability, resiliency, sustainability, and innovation. Specifically, SPEL would

- (i) address logistics issues pertaining to infrastructure, processes, digital improvements, policies and regulatory reforms, and capacity building for better workforce, and
- ii) prioritize cross-sectoral cooperation to complement and not duplicate efforts and focus on optimization of modal mix.

Implementation Roadmap and Monitoring

- i. Each line ministry may pursue development of Sectoral Plans for Efficient Logistics (SPEL) in consultation with user industry, private stakeholders, academia and other ministries, within 6 months.
- ii. Promoting innovation in the sector and enabling a resilient and sustainable logistics ecosystem, shall be the underlying philosophies for each SPEL.
- iii. SPEL may inter alia include action items for moving towards optimum modal mix (estimates for which shall be obtained through independent studies); address specific requirements of user sectors.
- iv. Various sectors will be assessed from the point of view of logistics cost-competitiveness with global benchmarks/international best practices to identify sector-specific interventions that would help reduce

logistics costs. Specific interventions will be identified first for sectors with high logistics cost as a part of overall production cost, with the objective of enhancing their cost competitiveness. While adopting global best practices and fixing targets and timelines, practicality and our country's requirements may be kept in view.

- v. Logistics issues on supply and demand side may be identified and their resolution monitored through a digital system. This mechanism may also be useful for necessary feedback / inputs for identification of critical multimodal connectivity projects for the PM GatiShakti NMP.
- vi. Milestones, timelines, KPIs for different action items may be defined by line ministries and monitored through a digital dashboard.
- vii. SPEL of Ministries/Departments may be put up for approval of EGoS.

Parameters for Assessment and Review

- i. Line ministries may institutionalize a system of annual independent sectoral Ease of Logistics Surveys (perception / objective data based). Survey to assess on-ground impact of reforms / interventions.
- ii. Logistics Division, DPIIT through an independent agency(s) may conduct Total Transport Studies every two years for estimation of modal share for each transport mode and right modal mix and develop a digital system for constant monitoring of modal mix.
- iii. Relevant objective feedback on cost, congestion, modal mix, redressal of user issues, etc. from integrated digital systems for logistics also to be collated by line ministries.
- iv. Impact assessment and modifications / recalibration of the plans (SPEL) may be done by line Ministry/Department – based on all obtained feedback.
- v. Each line Ministry /Department may submit an annual report of sectoral plans, their impact and planned next steps to be presented to EGoS.

Action by:

Ministry of Railways, Ministry of Road Transport and Highways, Ministry of Ports, Shipping and Waterways, Ministry of Civil Aviation, M/o Food Processing Industries, M/o Power, M/o Chemicals and Fertilizers, Department of Telecommunications, Ministry of Coal, Ministry of Steel, Ministry of Petroleum and Natural Gas, Ministry of Housing and Urban Affairs, Ministry of Power.

General explanation/information and scope of Sectoral Plans for Efficient Logistics (SPEL) is placed at

Appendix – A2.

8: Facilitation of development of Logistics Parks:

The Problem

- i. Inadequate availability of logistics parks due to suboptimal use and lack of capacity sharing, high business risk due to low agility in operations, lack of integrated master planning, etc.
- ii. Challenges in developments of new Logistics Parks due to complex regulatory regime, fragmented clearance, absence of comprehensive and harmonized system standards and approval processes.
- iii. Lack of integration in the existing logistics network / connectivity nodes, impeding operational efficiency in handling systems, multimodal connectivity to economic zones.

Proposed Solution

Logistics parks (eg. Multi Modal Logistics Parks, Air Freight Stations, Inland Container Depots, Container Freight Stations, cargo terminals, etc.) are hubs for intermediary activities (storage, handling, value addition, inter-modal transfers, etc.) in the supply chain connected by a transportation network. It is envisaged to take following steps to facilitate development of logistics parks:

- i. Draft framework guidelines to facilitate development of Logistics Parks in the country with focus on encouraging private investment.
- ii. Create a network of logistics parks by mapping them on the PM GatiShakti NMP, for enhanced visibility, improved logistics efficiency, optimum utilisation and connectivity.

Implementation, Monitoring and Feedback based Review

- i. Logistics Division, DPIIT in consultation with concerned line Ministries /Departments, domain experts and other stakeholders, will develop framework guidelines for development of Logistics Parks within 2 (two) months.
- ii. Framework guidelines for development of Logistics Parks will be put up to EGoS for approval.
- iii. Logistics Parks will be mapped on the PM GatiShakti NMP, to increase visibility, optimize network use, greater connectivity and enable holistic planning for removing imbalanced distribution of logistics services and traffic across geographies.

Action by

Ministry of Railways, Ministry of Road Transport and Highways, Ministry of Ports, Shipping and Waterways, Ministry of Civil Aviation, Central Board of Indirect Taxes, Department of Revenue, Ministry of Finance, Logistics Division, DPIIT, Ministry of Commerce and Industry.

General information, scope and mandate of Framework guidelines for Logistics Parks and Terminals is placed at

Appendix – A3.

Appendix – A1

General list of digital/IT systems/ individual platforms include:

- i. Unified Interface Logistics Platform (ULIP) and use cases in gap areas** is a common data stack platform (ULIP) for integrating (through APIs) all relevant digital/IT systems/individual platforms, along with use cases in critical gap areas such as:
 - i. Secured Logistics Document Exchange (SLDE) platform** to replace physical exchange of documents in domestic and EXIM trade and facilitate secure, seamless, digital transfer of various trade-related negotiable and other documents.
 - ii. A digital dashboard to improve container availability** in the country by reducing turnaround time through effective monitoring of container dwell times at CFSs, ICDs, ports, etc.
 - iii. Import Clearance System for PGAs** based on risk management principles to allow officers to perform all the background/internal activities online, leading up to issuance of NOC.
 - iv. GHG Calculator** to calculate carbon emission data per shipment basis on the mode of transport.
 - v. Comparative Freight Index** and framework for comparing freights between road and rail.
 - vi. Promote development and adoption of Smart Road Enforcement app** for states and central enforcement agencies using risk management principles to help minimize the physical inspection of offences and reduce compliance burden and delays on road.

Other digital initiatives including visibility and track-and-trace for trucks, electronic proof of delivery, a digital address system for each destination across the country to reduce delays in last mile delivery, etc.

Appendix – A2 General explanation/information and scope of Sectoral Plans for Efficient Logistics (SPEL) includes:

- i. Strategy for development of rolling and floating stock infra** inter alia covering steps to promote local manufacturing of containers and use of technology and innovations in rolling and floating stock design, material handling systems (like warehouse automation, robotic process automation, etc.), pricing strategy, production plans (including increasing scope for capacity sharing), suite of digital solutions to track and trace, reduce empty trips, etc.
- ii. Digital system for monitoring transportation throughput** in each sector, capturing data streams for evaluation and comparison of congestion and costs across modes, etc. (GPS/ RFID with command-and-control centres, etc.).
- iii. Strategy for integration with other modes** to avoid duplication, provide end-to-end connectivity. Promote intermodal shift from road to rail by identifying ODs on which (Ro-Ro) movement is

technically and commercially viable. Digital tools for identification of most competitive freight rates across OD pairs, promote sustainable modes of transportation by developing GHG emissions calculator.

- iv. Action items to improve regulatory interface** between sectors, reduce gaps in regulatory architecture, promote standardization, formalization, inter-operability; eliminate fragmentation in documentation, formats, processes and liability regime.
- v. For supply chain of individual demand side logistics sectors**, action items for connectivity requirements with relevant production and consumption clusters and aggregation centres with focus on sectoral priorities. Focus needs to be on promoting sustainability in the supply chain through use of renewable power, provision of recycling units, sustainable packaging, waste flow management and material flow optimization, based on global best practices.
- vi. Include in sectoral plans for MoR, MoRTH and MoPSW** a compendium on safe, efficient and sustainable logistics related to dangerous goods covering the aspects of legal and statutory compliance requirements, standards available, standard operating procedures, guidelines, best practices and case examples, management systems, personnel and skills required etc. This will help as a reference document for the relevant agencies and stakeholders in public and private agencies including the industry, managers and supervisors responsible to ensure provisioning of appropriate infrastructure and its safe operations & maintenance. This will also help standard setting organisations such as BIS to develop new or additional standards wherever required.
- vii. Strategy for improving resilience of logistics supply chain**, measures to promote sustainability and innovation and capacity building and empowerment of nodal officers.
- viii. Resiliency planning** to be based on pre-identified conflicts (such as accidents, emergencies, hostilities, trade disruptions, etc.), essential supply chains (for food, fuel, oxygen, coal, etc.), critical cargo, resiliency gaps, etc., along with roadmap for maintenance of buffer stock, identification of alternate sources, development of strategic reserves of key commodities, etc.
- ix. To improve sustainability across logistics sector**, plans to include measures to promote adoption, address issues of energy efficiency and environmental footprint and circular economy through a system of financial incentives, regulatory interventions, where necessary, etc.
- x. Provisions for development of efficient storage and handling facilities** for commodities such as silo-based compact vertical storage of bulk grains, pulses, etc. strategically located near farms, at key cross-docking points such as ports, airports and rail

terminals.

- xi. To promote the innovation/start-up ecosystem in the logistics sector, Invest India, DPIIT to develop and institutionalize a system of identification of start-up ideas, organizing contests, provide incubation / acceleration support, start-up awards, etc. to promote start-ups in the logistics sector.

II. In addition to general items, specific items inter alia to be covered in the Sectoral Plans for Efficient Logistics (SPEL):

- i. **Ministry of Railways** may lay down action items for improving service reliability through time-tabled / scheduled freight services and competitiveness of rail freight services; reducing cost of rail-based supply chains through steps such as Rail Side Logistics Parks developed in a collaborative manner in line with PM GatiShakti principles and delays in granting approvals for and setting up private terminals on railway network; dedicated freight corridors, enhancing coordinated logistics planning along with city / state governments, end-to-end solutions including first and last mile connectivity, complete transparency, streamlining processes.
- ii. **Ministry of Road Transport and Highways** may lay down action items for development of digital systems for track and trace and complete visibility of cargo, reducing compliance burden on roads, and measure reliability of truck movement, strategy to address truck drivers' shortage including pit-stops, social security, digital system to monitor work/rest hours.
- iii. **Ministry of Ports, Shipping and Waterways (MoPSW)** may lay down strategies that promote evacuation by other modes, smart and risk-based system for enforcement (import clearance system for PGAs / online system for laboratory testing process flow), holding capacity at ICDs / CFS clusters and systems for trade buffering, improve ship turnaround time and reduce dwell time, promotion of modal shift to waterways (through dedicated coastal shipping and inland waterway freight corridors in line with PM GatiShakti objectives). Facilitative financing schemes/programs for vessels, concessions on vessel and cargo related charges, and dedicated coastal freight corridors including last mile rail and road connectivity to be developed.
- iv. **Ministry of Civil Aviation (MoCA)** may lay down strategies that support development of Air Freight Stations (AFS) co-located with facilities like Multimodal Logistics Parks (MMLPs); strategy to utilize unused airstrips for air freight with a specific focus on storage, promote drone delivery, etc.; institutionalise robust mechanism (oversight committee) to monitor service level performance of air cargo terminals.
- v. **Ministry of Petroleum and Natural Gas (MoPNG)** may lay down principles and norms for identifying streams of traffic to be shifted from other modes to pipelines, strategy and action plan for the targeted modal shift; technical guidelines for Right

of Way (RoW) approvals, development of pipeline / infrastructure in a coordinated manner with other linear transportation networks (running parallel to / or under railway tracks/ highways, etc.).

- vi. **Ministry of Communications & IT** may lay down strategy for utilising the India post infrastructure and human resources for aggregation and disaggregation centres, first mile and last-mile connectivity.

- vii. **Central Board of Indirect Taxes and Customs** may lay down plan for implementing smart enforcement, import clearance system, policy for promoting investment in logistics parks (ICDs/CFS/AFS, etc.), supporting development of digital data-based systems for efficient logistics and integration of NCTF/NTFAP agenda and addressing the issue of taxation in multimodal transport.

Appendix – A3 General information, scope and mandate of Framework Guidelines for Logistics Parks includes:

- (i) Logistics Parks (eg. Multi Modal Logistics Parks, Air Freight Stations, Inland Container Depots, Container Freight Stations, cargo terminals, etc.) are nodes on the transportation network where cargo can 'dwell' to fulfil one or several functions such as aggregation, storage, transshipment, distribution, and value-added services. Hence, Logistics Parks are an integral part of the logistics network.
- (ii) Framework Guidelines for development of Logistics Parks are integral for enhancing multimodal connectivity envisioned under the PM GatiShakti. It is envisaged that the guidelines will promote investments in greenfield Logistics Parks including MMLPs, ICDs, CFS, AFS, etc. through Model Concession Agreements specifically to facilitate PPP; robust institutional mechanism for coordinated development (with multiple state and government departments) and monitoring; creation of a common taxonomy / nomenclature, definitions, size requirement for all nodes and other technical details; develop SOPs and digitally enabled process for approvals of Logistics Parks, etc. In addition, focus will be to facilitate optimal utilization of brownfield Logistics Parks by encouraging alternative use at the same facilities, developing standards to drive interoperability, etc.
- (iii) These guidelines will aim to enable private and public investments in logistics parks, promote and empower efficiency, agility, resilience and cost effectiveness in operations through optimal use of infrastructure and to create information transparency.

To increase visibility, optimize network use, and enable holistic planning for removing imbalanced distribution of logistics services and traffic across geographies, a network of logistics parks will be created by mapping these facilities on the PM GatiShakti NMP

Source : DPIIT

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COLD CHAIN LOGISTICS CRITICAL CHALLENGES & CONSTRAINTS

CASE STUDY : COVID VACCINE COLD CHAIN DISTRIBUTION NETWORK IN INDIA

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Introduction : Cold Chain Logistics is the Movement and Safe Transport of Temperature-Controlled and Temperature-Sensitive Goods, such as Fresh Agri-Goods, Food Items, Beverages, Medical Supply, Vaccines, Pharmaceuticals and other Perishable Goods from the origin to the point of consumption with the Objective of Preserving & Extending Shelf Life of Products and to Prevent Spoilage.

Cold Chain has a variety of Challenges throughout the Chain of Supplies.

In this Article Let's Discuss the Critical Challenges & Constraints of Cold Chain Logistics.

Further Covid – 19 Exposed the Vulnerabilities and Surged the Demand for Cold Chain Logistics to support effective Vaccine Production, Transport, Storage and Last Mile Reach and Continuous Temperature Monitoring and Maintenance.

Therefore, we also discuss here as a Case Study, How Covid Vaccine Cold Chain Distribution Network in India, successfully met the daunting challenge of universal immunization program.

Keywords : Logistics, Logistic Management, Cold Chain Logistics, Cold Chain Logistics Constraints & Challenges, Covid Vaccine Distribution Network.

Logistics : Logistics is a Subset of Supply Chain involved in Flow of Goods, their Storage & Movement & the Related Service Functions across the Supply Chain.

Logistics Management : Logistics Management* refers to the Integrated Process of Planning, Designing, Co-ordinating, Monitoring, Executing, Optimizing and Managing of all logistics activities like Order Processing, Acquiring Resources & Services, Inventory Management, Materials Planning, Warehousing & Storing, Material Handling, Network Design, Inbound & Outbound Routing & Transportation, Fleet Management, Production & Operations Planning, Packaging and other Associated Functions, Activities & Documentations to provide Timely, Cost-Effectively and Efficiently Customer Services from the Point of Origin to the Point of Consumption by Adoption &

Integration of Relevant Activities, Systems, Technologies and Communications in order to meet Customers' Requirements. (*As Defined by the Author in his Article "LOGISTICS 10 R's© MODEL" Published in May'2022 issue of MMR).

Logistics Management also involves in identifying prospective Distributors, Suppliers and other Service Providers and Engaging them in Transactions and Tracking of Storage Goods and their Movements, Determining their Efficiency, Effectiveness and Accessibility.

Cold Chain Logistics : A Cold Chain Logistics is a Special type of Logistics involved in Temperature-Controlled, Uninterrupted series of Logistic Chain Comprising Refrigerated & Temperature Sensitive Goods and their Receipt, Production, Packaging, Storage, Transportation, Distribution and arranging other Facilities from the Point of Origin to the Point of Consumption by ensuring Constantly Maintaining the Prescribed Low-Temperature Range throughout the Chain of Supplies.

It is used to preserve and to extend and ensure the shelf life of products and to Prevent Spoilage, such as Fresh Agri-Goods, Food Items, Beverages, Medical Supply, Vaccines, Pharmaceuticals and other Perishable Goods etc.

Cold Chain Logistics Management is a Process of Planning, Executing, Co-ordinating the Network of Flow of Cold Chain Logistics Movements Effectively & Efficiently with the Least Cost and Best Services and Managing all other Associated Functions.

It impacts every stage of the supply chain, from purchase to transportation, storage, and last-mile delivery. Cold Chain Logistics Network of Stakeholders include:

- Ø Suppliers
- Ø Production & Manufacturing
- Ø Packaging
- Ø Storing
- Ø Distribution
- Ø Customers



Cold Chain Logistics Market Size

According to **Allied Market Research**, the global cold chain logistics market size was valued at \$159.99 Billion in 2018 and \$202.17 in 2020 and is projected to reach \$782.27 Billion by 2030, registering a CAGR of 14.6% from 2021 to 2030.

As per another Report from **Vantage Market Research**, the Global Market revenue was valued at USD 209.2 Million in 2021.

The Global Cold Chain Logistics Market Size, is forecast to reach USD 464.0 Million by 2028 and is expected to grow to exhibit a CAGR (Compound Annual Growth Rate) of 14.2% during the forecast period.

The Indian cold chain market reached a value of INR 1585.1 Billion in 2021. As per Report by **Research and Markets** the market is expected to reach INR 3637.4 Billion by 2027, exhibiting a CAGR of 14.72% during 2022-2027.

According to **Renub Research** new report, India Cold Chain Market Size was US\$ 24.62 Billion in 2021 and the Market is expected to reach **US\$ 53.07 Billion** by 2027.

As per another Report **ISHRAE – Indian Cold Chain Industry Outlook 2024 SHRAE**, the Indian cold chain market was estimated to be worth USD 19.6 Billion in 2020 and is further projected to reach USD 36 Billion by 2024, growing at a CAGR of 16%.

Cold Chain Logistics Witnessing Significant Growth

Indian cold chain market traditionally has seen limited infrastructure investments due to multiple factors including a fragmented distribution approach, low compliance and lack of awareness in handling perishables and lack of multi-commodity/multi-temperature storage facilities.

Based on the product, the Indian cold chain market can be segmented into fruits and vegetables, meat and fish, dairy products, and healthcare products. Currently, fruits and vegetables segment represent the largest segment by usage of cold storage facilities in India. Cold Chain Market in Indian is primarily dominated by unorganized segment.

However, at present the cold chain logistics market is anticipated to witness significant growth and the trend is now shifting towards establishing multipurpose cold storage and providing end-to-end services across the value chain with growth of organized 3PLs, QSR, Retail, e-commerce and food service industries due to changing consumption patterns and Increasing Demands and also due to adoption of new technologies and Government Incentives. RFID technology for cold chain applications for Tracking and the adoption of Advanced Technologies Temperature Controls and Monitoring, Development of Software and Cloud Computing Applications for cold chain logistics provide growth opportunities for the market players.

India houses the world's third largest pharmaceutical industry. Pharmaceutical products are also highly susceptible to temperature and time constraints, making cold chain a key requirement for this industry. **In 2021, Pharmaceutical Products took up more than two-thirds of the cold chain storage in India.** In the present scenario where safe delivery of vaccines for mass immunization against COVID-19 is an absolute priority, the cold chain is in huge demand.

Critical Factors Influencing Cold Chain Logistics

Cold Chain Logistics is the Process that allows – Production, Packing, Storage, Transport & Distribution of Temperature-Sensitive Goods and Products such as fresh agricultural products, seafood, frozen food, photographic film, chemicals, Vaccines and pharmaceutical drugs along with the supply chain. Following are some of the Determining Factors for Selection of Right Type of Cold Chain Logistics. Mode of Cold Chain Transport can be by Road, Rail, Air, Waterways, Conveyors or Pipelines.



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Challenges & Constraints of Cold Chain System

Cold Chain System consists of a series of Storage and Transport links, all designed to keep the Goods within an Acceptable Temperature range until it Reaches the users. Cold Chain Management Weaknesses or Flaws are often observed during Production, Transportation and Storage of the Goods, despite even Best Efforts and Adoption of Best Practices and Latest Technology. The Cold Chain remains a Highly Vulnerable considering

various Risks and Threats and some of the Factors Contributing to these are:

- ❖ **Poor or Inadequate Temperature Controls during Production, Storage, In-transit and Distribution Down the line.**
- ❖ **Lack of Uniform Standards or Practices Globally.**
- ❖ **Increased Regulations and their Compliance Requirements.**
- ❖ **Sudden Spurs in Demand & Supply Constraints.**
- ❖ **Too Long Storage at Certain Storage Stations due to Sluggish Demand.**
- ❖ **Requirement of High Quality of Refrigerators to Maintain Consistently Longer Time Cooled Temperature Conditions Maintaining Hygiene - Any Temperature that is Higher than the Set Temperature can affect a Product's Quality.**
- ❖ **Challenges of Tracking & Monitoring Temperature throughout the Cold Chain – Temperature Fluctuations - Potential Threats of Product Exposed to a Temperature Variance.**
- ❖ **Lack of Proper Cold Chain Infrastructure– Lack of other Supporting Systems throughout the entire Chain.**
- ❖ **Limited or Insufficient Visibility - Inadequate Data Management Capability they need to make Better & Intelligent Decisions – Limited Auto-access & Collaboration with Channel Partners.**
- ❖ **Limited availability of 3PL / 4PL Service Providers - Unprofessional Approach.**
- ❖ **Limited availability of Temperature-Controlled Shipping Capacity - Reefer Trailers – Transit Storage & Handling Facilities.**
- ❖ **Improper use of Equipment's, Equipment Failures, Malfunction or Breakdowns of Refrigerators or Supporting System Failures (Eg. Power Fluctuations / Power Cut or Coolant Failures and Poor Cooling Circulations or Temperature Sensors and Freezer doors Damaged. or other Critical Supply Interruptions).**
- ❖ **Transportation Breaks Down – Difficulties of Finding Immediate Alternative Arrangements.**
- ❖ **Human Element in Cold Chain Risk Management – Human Errors, Defects - Lack of Efficiency and Experience - Lack of Talented and Trained Personnel Capable of Managing the Cold Chain and their Commitments.**
- ❖ **Pressure to Meet Cost Efficiencies in Cold Chain Management - Certain Times Compromising Quality to Trade off with Cost.**
- ❖ **Supplier Risks – Non-Supply or Delay in Supply or**

Supply Rejections or Low-Quality supply.

- ❖ **Heat Exposure during Loading & Unloading may Damage the Goods - Poor Handling.**
- ❖ **Packaging Problems - If the Packaging isn't done Correctly or gets Damaged, there is Chances of Goods may Lose their Intended Character.**
- ❖ **High Investments & Costs in getting the Right Equipment, Cold Storage and Fleet Management - Cost & Quality Trade-off and Compromising many lead to Deterioration of Goods.**
- ❖ **Safety & Security Risks in Cold Chain.**
- ❖ **Environmental Impacts of Cold Chain.**

Temperature Range

Maintaining Temperature Range is vital to the integrity of Cold Chain.

Though there are various Norms & Practices are there, the most Common Temperature Standard generally categorized into the following Temperature Ranges and each related to specific product groups :

- ❖ **(-28 °C to -30 °C) Deep Freeze** — seafood, meat exports.
- ❖ **(-16 °C to -20 °C) Frozen** — meat, certain types of produce.
- ❖ **(2 °C to 4 °C) Chill** — fruit & vegetables, fresh meat, certain dairy products.
- ❖ **(2 °C to 8 °C) Pharma** — medicines, vaccines.
- ❖ **(12 °C to 14 °C) Cool-Chain** — fresh produce, processed food, over-the-counter drugs.

WHO Temperature Guidance:

- Store frozen: transported within a cold chain and stored at -20°C (4°F).
- Store at 2°-8°C (36°-46°F): for heat sensitive products that must not be frozen.
- Cool: Store between 8°-15°C (45°-59°F).
- Room temperature: Store at 15°-25°C (59°-77°F).
- Ambient temperature: Store at the surrounding temperature. This term is not widely used due to significant variation in ambient temperatures. It means "room temperature" or normal storage conditions, which means storage in a dry, clean, well ventilated area at room temperatures between 15° to 25°C (59°-77°F) or up to 30°C, depending on climatic conditions.

How do Vaccines Move along the Cold Chain?

From early beginnings in China, the Covid-19 pandemic has **spread** rapidly across the globe, necessitated immediate measures Vaccinate the citizens. This posed

biggest challenge, especially for the country like India, to arrange the Vaccines to every Luke and Corner of the nation – the challenge is to cold chain storage and safe, efficient **transportation** of **vaccines** through different modes of Transport, especially in remote areas, away from major transport links and refrigeration facilities, and places with unstable power supply. This proved to be a daunting task, where such infrastructure is severely limited.

Delivering vaccines to all corners of the world is a complex undertaking. It requires careful planning and chain of precisely coordinated events in temperature-controlled environments to store, manage and transport these life-saving products and specific skills, and in-depth knowledge at every step of the way.

Storage and transport equipment such as cold rooms, refrigerators, freezers, cold boxes and vaccine carriers must comply with performance standards defined by the World Health Organization (WHO). Stock management procedures must also follow WHO Guidelines specific to each type of vaccine.

India's Vaccine Distribution Network

India, as the largest global supplier of drugs and producer of 60 per cent of the world's vaccines, is known as the “**pharmacy of the world**”. Today, the country is playing an increasingly important role in the development, manufacturing and, possibly, the distribution of this all-important vaccine.

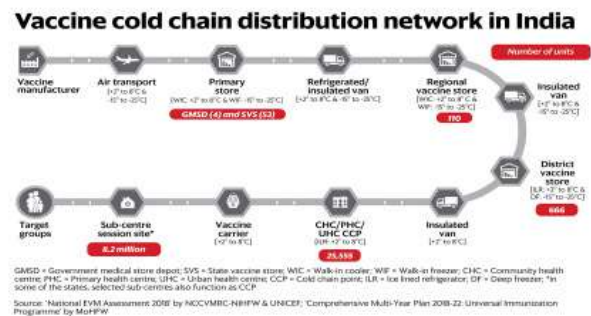
India's vaccine distribution network is operated through four government medical store depots (GMSDs) in Karnal, Mumbai, Chennai and Kolkata, which procure vaccines from the manufacturers. About 53 state vaccine stores get their supplies either from these GMSDs or directly from manufacturers. The state vaccine stores then distribute the vaccines to regional, district and sub-district level cold chain points via insulated vans. India has a 28,000-unit cold storage network that is used for the government's universal immunization program. The medical refrigerators used for storing vaccines help keep the vials (small glass container holding vaccine doses) at an optimum temperature so that it is effective for disease control. Normally, a 225-litre medical refrigerator can store 40,000-60,000 vials.

Covid vaccines need to be distributed via temperature-controlled cold chain, as they are highly sensitive and require constant quality checks. Cold-chain logistics are particularly difficult in countries with warmer climates like India.

Vaccines need to be monitored at every step, right from shipment, during transport and storage, which could include multiple hubs, and the final administrative section where the vaccine would be injected to the individual.

Vaccine Cold Chain Distribution Network in India is

shown below:



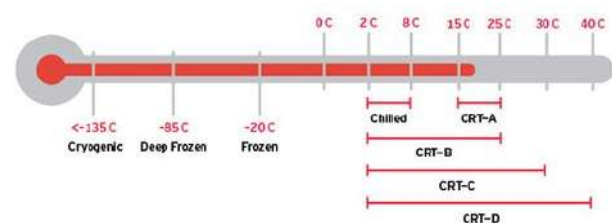
Transporting and Storing of Vaccines @ Prescribed Temperature Range

Vaccines must be continuously stored in a limited temperature range – from the time they are manufactured until the moment of vaccination. This is because temperatures that are too high or too low can cause the vaccine to lose its potency (its ability to protect against disease). Once a vaccine loses its potency, it cannot be regained or restored.

At every point in the Cold Chain, Specific Temperature conditions need to be monitored and is maintained. The cold chain begins when vaccine is manufactured, moves through to the state distribution center and ends with the local immunization provider at the time of administration.

The recommended temperature range for most of the vaccine is from **35°F (2°C) to 45°F (8°C)**, however the range varies for the storage and transport, even long storage and short storage temperature also varies. Few vaccines are stored at a frozen state.

For instance, Moderna vaccines should be stored at -25 to -15 degree Celsius. Pfizer vaccines should be maintained at -70 degree Celsius. The AstraZeneca-Oxford vaccine (Covishield), which was distributed by Serum Institute of India, Bharat BioTech's 'Covaxin' and Russia's Sputnik V could be stored at fridge temperature at 2-8 degrees Celsius.



Real-time Digital Tracking of Vaccination

COVID-19 vaccines require special end-to-end supply cold chain requirements, from manufacture, and transportation to warehouses and healthcare facilities. To sustain production, minimize wastage, and for vaccines to reach target populations, a highly efficient and resilient vaccine Cold Chain was deployed assisted

by temperature monitoring technologies and Real-time Digital Tracking, Digitized Records, Monitoring of vaccine supply chains.

A Real-time track and trace system, originally developed to monitor the movement and storage of vaccines, has been adapted to help with the massive task of deploying COVID – 19 Vaccines to India's population of 1.3 billion people, and ensure that no one misses out.

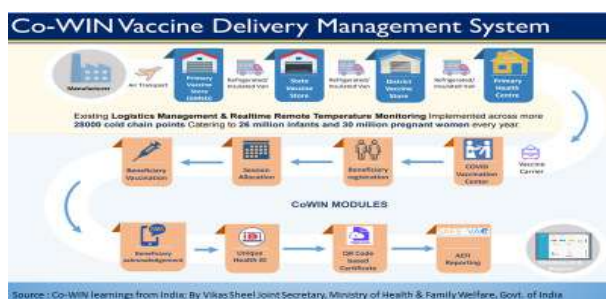
The Electronic Vaccine Intelligence Network (eVIN) which was Originally developed in 2015 repurposed and enhanced to **COVID Vaccine Intelligence Network (CoWIN)** to address some of the challenges of transporting, storing and deploying the vaccines used in India's Universal Immunization Program.

COVID Vaccine Intelligence Network (CoWIN) system

COVID Vaccine Intelligence Network (CoWIN) system is a comprehensive **cloud-based IT solution** for planning, implementation, monitoring, and evaluation of COVID-19 vaccination in India. It will **provide real time information of vaccine stocks, their storage temperature and individualized tracking of beneficiaries of the COVID-19 vaccine.**

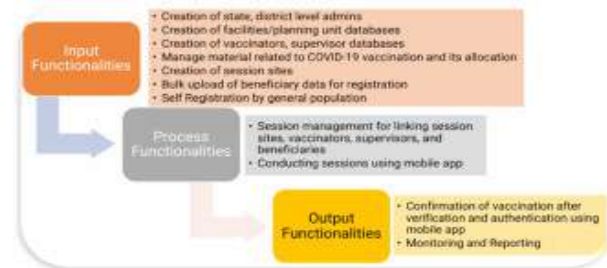
This platform assisted the program managers across all levels through automated session allocation for pre-registered beneficiaries, their verification and for generating a **digital certificate upon successful completion of the vaccine schedule.**

Co-WIN system is an end-to-end solution that has utilities for the entire public health system from national up to the vaccinator level. The system allows for creation of users (admins, supervisors, vaccinators), registration of beneficiaries (bulk upload and individual registration), facilities / planning unit and session sites followed by planning and scheduling sessions and implementation of vaccination process.



Co-WIN system provide **Real-time monitoring of the entire network to cover the entire journey of each vaccine dose and it's tracking** not only the beneficiaries but also the vaccines, at national, state and district level. This will allow the system to monitor the utilization, wastage, coverage of COVID-19 vaccination at National, State, District and Sub-District level **including critical cold chain equipment and sending alerts to staff when, for example, there are problems with refrigeration units.**

Process Flow of Co-WIN System



Conclusion

Cold Chain Logistics is the Movement and Safe Transport of Temperature-Controlled and Temperature-Sensitive Goods, such as Fresh Agri-Goods, Food Items, Beverages, Medical Supply, Vaccines, Pharmaceuticals and other Perishable Goods from the origin to the point of consumption with the Objective of Preserving & Extending Shelf Life of Products and to Prevent Spoilage.

Cold Chain has a variety of Challenges throughout the Chain of Supplies. Despite the Challenges, the cold chain logistics market is anticipated to witness significant growth, both from the Demand side and Supply side. Adoption of Advanced Technologies for cold chain logistics further boosted the growth opportunities.

COVID – 19 Vaccination is an Excellent Success Story Exemplifying, how the Mission Objectives were met despite daunting challenges.

As per latest data from Ministry of Health & Family Welfare (MoHFW), COVID-19, Total Vaccination as on: **21 October 2022: 2,19,50,97,574.** Overall, Co-WIN and Covid Vaccination System has been a tremendous success story for India, thanks to the collaborative efforts between the Government of India and various other concerned agencies.

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India's vaccine distribution challenge, explained in five charts –Mint

“LOGISTICS 10 R's© MODEL” By SN Panigrahi, Published in May'2022 issue of MMR

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A PATIENT-CENTRIC APPROACH TO HEALTH CARE SUPPLY CHAIN

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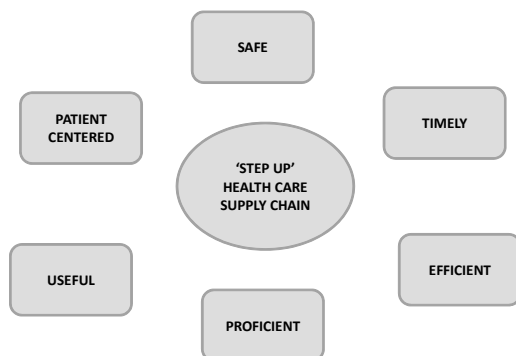
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Competence of any Supply Chain can be measured by the effectiveness of the same to the end user. This is all the more pertinent in the case of Health Care Supply Chain. A patient centric Supply Chain should be aimed for making the realm of health care more accomplished.

Health care has become the most terrifying subject matter of modern man. Even with all sorts of insurance covers accessible, treatment expenses have become so prohibitive that one would abhor thinking of going to a hospital. Average Life expectancy has increased to 73 in the current year in comparison to 66 in 2000 and 47 in 1900. More people have to be catered to in health care than during the past periods. Hence it goes without saying that the entire health care system has to work as a well oiled machine so as to provide best services to the end user.

Public Health Foundation of India (PHFI) has conducted a study and revealed that out-of-pocket (OOP) health expenses are very high in India. Just because of this, more than 65 million Indians were pushed into poverty during last year. This is more than the population of three countries put together- South Korea, Spain or Kenya!!.

A whopping Rs 5.30 lakhs crore is spent in India for total healthcare. Out of this, Indian households spent Rs3.2 lakhs crore entirely on their own from their earnings. This works out to 60 % of the total spending on health. This is a great opportunity for Health care Supply chain to play a major role to mitigate the burden of our citizens.



An ABC analysis reveals that almost 67% of medical expenses of a common man go on medicines alone. Other payments go towards fees of the doctor, hospitalization, laboratory tests, injectables, vitamin supplements and other OTC drugs. This is regardless of several public health schemes rolled out by the government.

Specific goals for improving the healthcare supply chain system can be stated in the acronym: "STEP UP". 1) Safe, 2) Timely 3) Effective, 4) Proficient, 5) Useful, and 6) Patient-centered.

"STEP UP" Health Care Supply Chain System

Achieving these goals would certainly benefit both current and future patients by providing more targeted, affordable, and efficient care.

Efficiency and effectiveness of supply chain influence every aspect of an organization and therefore it plays a central role. Modern demand-driven supply chain processes and tools are supporting hospitals to slash their supply costs considerably and improve healthcare outcomes. Introduction of emerging technologies like data analytics, the Internet of Things, blockchain distributed ledger networks, and Artificial Intelligence help health organizations get closer to their goal of providing patient-centered care.

1) Safe delivery of medical items

Covid 19 has taught the magnitude of safe delivery of life saving medicines. Clamor for Oxygen & other emergency medicines during the pandemic are still live in everyone's minds. From medicines to X Ray & MRI scanner machines, there's a wide range of products that rely on secure and safe transportation. Some have strict regulations to adhere to, and some simply have best practices. Deployment of drones for delivery of vaccines to remote areas helped save many precious lives.

Medicines need storing and shipping in a specific, consistent environment. No compromise on external factors, like temperature and humidity can be allowed as their chemical balance will go awry. This may cause the drug less effective, and also could cause harmful effects. A fool proof cold chain system will ensure constant refrigeration of pharmaceutical products from the time of its production through its transportation, handling, storage, and delivery.

2) Time is the essence

'A stitch in time saves nine'. A patient cannot wait incessantly for medicines to be available, whatever be the reasons. Timely delivery of materials, especially life saving drugs and medicines are quite critical. Healthcare Supply chain has to be agile in any given situation to take up this particular challenge. Concurrent tracking of goods throughout the supply chain provides one of the major opportunities for improving patient service. Real-time information on delivery time supports Just-in-Time (JIT) manufacturing, retailing & logistics, enabling organizations to make strategic decisions.

Earlier, a lot of time was washed out on performing scans, tests etc on the patient. Now, through the practice of tele-radiology, a radiologist from any location can examine the image and create their diagnosis in a digital format without

physically having to travel. This creates a momentous timesaving for the specialist who would otherwise need to commute between one or many hospitals. And they can use the time saved to make a greater number of diagnoses.

3) An Effective Supply Chain required

An urgent need for more effective supply chain management in the healthcare sector is felt now, especially after the pandemic. COVID-19 has really exposed serious weaknesses in dealing with availability of essentials like PPE kits, ventilators, oxygen, critical medications etc in hospitals. Healthcare organizations are now under mounting pressure to improve profitability and tackle rising supply chain costs.

The major activities concerned in healthcare supply chain management encompass monitoring and supporting the flow of medicines, medical supplies and equipment, and medical services from manufacturer to patient. Digital tools and technology have to be widely implemented to carry out healthcare SCM. This will help to obtain actionable insights from multi-sourced data to continuously fine-tune and optimize supply chain systems and processes. By linking supply chain and clinical data, more accurate forecast of demand, optimizing inventory planning and management, and respond more effectively to changing market conditions are possible. By fostering increased communication and collaboration across the healthcare supply chain, digital SCM tools can also help boost productivity and speed time to market. Thus, an effective supply chain will help hospitals and invariably the patients to trim down the costs involved in treatment.

4) Need for a Proficient system

Proficiency in handling movement of patient related items is highly essential. Data-driven solutions are now the order of the day, not just for hospitals, but for all participants, including healthcare providers, pharmaceutical companies and especially the supply chain. Now a day, laboratories have to perform complex material handling, tracking and pricing for thousands of items, including blood samples. As patients' lives depend on their capability to test and deliver results quickly and efficiently, their support systems need the ability to order at the right price from the right organization, receive stock into warehouses, and they must enable batch tracking and expiry date tracking in real time.

IIMM has a major role to play in equipping the personnel in the field of healthcare supply chain by providing excellent world class training for making them more proficient in this field. Pandemics like Covid, Omicron, Monkey Pox, dengue, anthrax etc are still not totally contained and can erupt any time again. We have to be always vigilant to avoid one more catastrophe to learn lessons in the hard way.

5) Need for Useful Supply chains

Research data by Deloitte shows most health care organizations fall into one of the four categories.

- a) 'Reactive' category with low organizational commitment and low spending where they are focused on day-to-day operations and deal with disruptions after they occur.

- b) 'Inefficient' category are with low organizational commitment and high spending. Building supply chain resilience and mature capabilities are not their priorities, but only operational continuity that too with expensive manual workarounds.
- c) 'Point-solution' category are with high organizational commitment and low spending. Organizations in this category are agile and resourceful. They invest in niche solutions to digitize aspects of the supply chain but lack the funding to layer innovative capabilities into comprehensive solutions to make the supply chain fully resilient.
- d) 'Resilient' category are with high organizational commitment and high spending. These organizations view supply chain resilience as a competitive advantage that's foundational to organizational success. Organizations that build highly resilient supply chains invest in holistic solutions to digitize their supply chains and spend wisely on people, operations, and technology.

Thus health care Supply chains should strive to be in the 'resilient' category so as to be useful from the perspective of an end user.

6) Patient-centered health care system

Public Health Foundation of India (PHFI) studies on inpatients and outpatients reveal that 29% of inpatient and 61% of outpatient spent on medicines alone are from their own pocket. (OOPE). Other nonmedical costs like travel, lodging, and food, accounted for 24% of inpatient and 15% of outpatient OOPE; share of OOPE from doctor consultation and diagnostic test charges increased with socioeconomic status; and annual outpatient costs were a greater proportion of annual income of households than annual inpatient costs. These findings suggest that governments may need to focus on nonmedical costs and regulate the drug and diagnostic market.

Recent statistics says 26% is living below the poverty line in the rural parts of India. As per a report by United Nations the urban concentration of healthcare infrastructure and medical specialists stands at 73% against only 27% in the rural segment. As per 2021 World Bank reports, 65 % of total population of India resides in rural areas. There are currently more than 6 lakhs villages in the country. Thus, in order to have a decent medical attention, the ordeal of a person residing in rural India needs no elucidation.

A glance through the above statistics will show that even after all the developments taken place in medical management, more than half of our population is still devoid of getting good health care. Hence there is tremendous scope for improvement for providing medical care to our rural brethren. Healthcare supply chain needs to be geared up to serve the majority still living in rural India. Each life is precious whether they are rich or poor.

Having the right supplies in the right places helps to ensure patients receive attentive care, without delays caused by a poorly managed supply system. We need to "STEP UP" our actions in this direction so that the end user will get the ultimate pay off.

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HOW CAN THE LATEST TECHNOLOGY MAKE SUPPLY CHAIN MORE SUSTAINABLE?

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Introduction: Supply chain management has been a part of the core principles of sustainability ever since its foundational manifestos like the 1987 Brundtland report. The depletion of natural resources has for a long time been seen as a primary danger. A range of other parameters, such as the energy consumed in harvesting natural resources started to be considered, and sustainability became more of an integral vision of the supply chain. The impending costs of globalization made self-reliance an important criterion in sustainability evaluation. In the pandemic scenario, however, self-reliance was no longer an option for many industries. Sustainability adoption was thus more often an operational obligation than a strategic initiative during the pandemic because of the trade and logistical transport failures of the globalization model. Sustainability has become a global corporate command with implementation impacted by two key trends. The first is the recognition that global supply chains have a reflective impact on sustainability which requires “greening” the entire supply chain. The second is technology—digitization, artificial intelligence (AI), and “big data”—which have become ubiquitous. These technologies are impacting every aspect of how companies organize and manage their supply chains and have a powerful impact on sustainability.

Sustainable supply chain management: Supply chain sustainability refers to companies’ efforts to consider the environmental and human impact of their product’s journey through the supply chain, from raw materials sourcing to production, storage, delivery, and every transportation link in between. Digital transformation and the growing sophistication of digital supply chain technologies are playing a major part in the evolution of supply chain sustainability. Big Data management, advanced analytics, artificial intelligence (AI), and security tools, such as blockchain and RFID sensors, have brought unprecedented visibility and accountability to modern supply chains. Companies now have a much greater ability – and obligation – to demonstrate corporate social responsibility and to share best practices for green supply chains and sustainable logistics.

Supply chain sustainability rests on three main pillars:

- **Economic sustainability:** This relates to the company’s long-term profitability and how the sustainability of the supply chain supports that.

- **Environmental sustainability:** This focuses on the impact a business has on the environment and how sustainability can help turn that into a positive.
- **Social sustainability:** This pertains to how a company supports stakeholders like employees, suppliers, customers, shareholders, regulators, and the community at large, and how supply chain sustainability plays into that.

The business case for building a sustainable supply chain for any specific company depends on many factors, including industry sector, supply chain footprint, business strategy, organizational culture, and stakeholder expectations. That said, the most common business drivers for sustainability include:

1. Managing business risks: A sustainable supply chain helps manage business risks by:

- Minimizing business disruption from environmental, social, and economic factors
- Protecting and bolstering the company’s reputation and brand value

2. Realizing efficiencies: A sustainable supply chain helps realize efficiencies by:

- Reducing the cost of material inputs, transportation, and energy
- Increasing the productivity of labor
- Boosting and fostering efficiency across the entire supply chain

3. Creating sustainable products: By committing to sustainability, a business can:

- Meet evolving customer and business stakeholder requirements for more sustainable products
- Innovate fast enough and efficiently enough to meet the demands of a changing market

There are enough benefits that supply chain sustainability management practices can maximize value to the business. For example, unless a business is ready, willing, and able to track the history of its products (including material and labor inputs), the brand cannot make a compelling claim of being sustainable — a risky proposition in today’s culture of

conscious consumerism.



Source:<https://research.aimultiple.com/supply-chain-sustainability/>

The formula for carbon footprint is multiplying units of business operations by certain emission variables. Assume your field sales team uses 13,500 gallons of oil this month. To calculate the carbon footprint of the sales team's fuel use, you have to know how much greenhouse gas (GHG) is produced by consuming 1 gallon of oil (which is equivalent to 8,887 times 0,001 metric tons CO₂/gallon, according to EPA).

Top 7 carbon footprint software for businesses:

- **SAP/product carbon footprint analytics:** Through the value chain, SAP's product carbon footprint calculator assists firms in measuring their GHG emissions. Investigations of product carbon footprints can be integrated with SAP S4HANA's ERP system that keeps track of different business processes. As a result, it becomes reasonably simple to collect data for a diverse set of business activities and supplier operations .
- **Boston Consulting Group/CO2 AI:** CO2 AI is the AI-powered carbon footprint software developed by consulting company BCG. Despite taking into account the carbon footprint of the organizations, CO2AI is able to simulate the effects of intended actions on the GHG emission of businesses.
- **Carbon Trust/carbon foot printing software:** Carbon Trust, a sustainability consulting firm, created carbon foot printing software. It is a cloud-based solution that can connect to your organization's corporate network. Carbon foot printing software assists companies in evaluating their circularity by supporting them in evaluating their water and waste footprints.
- **Sphera/GaBi Software:** Sphera produces ESG solution tools for businesses. GaBi software is their carbon footprint calculator. GaBi software can: Measure organizations' carbon footprint. Utilize hotspot analysis to map risks and identify weak

areas to help businesses to prioritize their actions.

- **Climatiq/Climatiq API:** You can integrate Climatiq API into your devices and data centre. By doing so, you can benefit from their solution that collects specific emission factors from different databases. Thus they help organizations to calculate their carbon footprint.
- **Co2nsensus/Co2nnectorPro:** Co2nnectorPro is a cloud-based software that is designed to measure the carbon footprint of firms and individuals. Their carbon calculator supports the measurement of all scope 1, scope 2 and scope 3 GHG emissions.
- **Carbon Footprint/Sustrax :** Sustrax is another cloud-based option for handling your environmental reporting needs. Sustrax is adaptable and can grow to suit your requirements. Organizations can use Sustrax to measure their GHG emissions and get assistance in disclosing their ESG reports.

Applications of IoT that enable a sustainable supply chain:

- By using an integrated IoT solution and with the help of other technologies, we can find better driving routes. Thus, we can reduce the consumption of diesel and gasoline fuel used by freight vehicles, which are one of the biggest energy users and contributors to greenhouse gas emissions.
- Another benefit of IoT concerning sustainability is the reduction and elimination of waste. With connected IoT technology, we can track and have real-time visibility of all goods from their point of origin to their destination. Therefore, we can reduce all kinds of loss, theft, and damage.
- IoT technology can also be used to improve safe working practices, which is one of the key concerns of every manufacturing and logistics company. Internet-connected sensors can be located around a factory or warehouse and worn by workers. Data about their activity and movements can be analysed to discover quickly any dangerous behaviour.

Artificial Intelligence (AI):

- AI algorithms can help in Backhauling activities. These are the return movements of trucks from their destination to their points of origin. AI can analyse vehicles, volumes, routes, and stops instantly to identify optimal opportunities to share shipping with other organizations. Sharing shipping doesn't help just in reducing transportation costs, it also reduces the environmental impact.
- AI can also have a huge impact on the sourcing activities of an organization. An example of this is

Prewave, a company developing a new monitoring system that uses AI to find, monitor, and analyse suppliers' news through the internet to find quickly some sustainable risks like CSR incidents, labour unrest, customer unrest, financial stress, and so on.

- Manufacturing products that people will not buy is another issue that can impact not only the financial performance of a company; but also the environment. AI can therefore be a very useful tool in predicting the customer's demand accurately. And so, companies only manufacture and ship what customers are going to buy.

Blockchain: Blockchain is regarded as the next disruption in the technology world that can overcome many business obstacles. In addition to its economic and environmental benefits, Blockchain has many other benefits concerning Social Sustainability. IBM defines Blockchain as a shared, immutable ledger that facilitates the process of recording transactions and tracking tangible or intangible assets in a business network.

- Blockchain enables a healthy supplier and customer relationship by providing transparency and trust between the supply chain stakeholders.

Conclusion: New technologies are impacting sourcing in four important ways. First, technologies can leverage data to present an integrated picture of the "spend" enabling firms to optimize contracts. Second, supply chains are becoming more transparent—it is becoming easier to track the environmental, social, and economic performance of suppliers. This has significantly improved risk management. Third, ubiquitous sensing technology is enabling the tracking and tracing of products improving efficiency and safety. Finally, collaborative planning technologies (such as CPFR) are removing the old stumbling blocks of poor information availability and improving customer service (Piluso et al. 2016 for the emerging landscape in procurement). With the rise of Industry 4.0, novel technologies open new opportunities for business transformation. These technologies change supply chains and drive new ways to create value. However, not all companies chose this path of digitalization due to significant investment costs, and thus risk becoming laggards.

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(Footnotes)

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Indian Institute of Materials Management MISSION

- To promote professional excellence in Materials Management towards National Prosperity through sustainable development.

OBJECTIVE

- To secure a wider recognition of and promote the importance of efficient materials management in commercial and industrial undertakings.
- To safe guard and elevate the professional status of individuals engaged in materials management faculty.
- To constantly impart advanced professional knowledge and thus improve the skill of the person engaged in the materials management function.
- Propagate and promote among the members strict adherence to IIMM code and ethics.

CODE OF ETHICS

- To consider first the total interest of one's organisation in all transactions without impairing the dignity and responsibility of one's office :
- To buy without prejudice, seeking to obtain the maximum ultimate value for each rupee of expenditure.
- To subscribe and work for honesty and truth in buying and selling; to denounce all forms and manifestations of commercial bribery and to eschew anti-social practices.
- To accord a prompt and courteous reception so far as conditions will permit, to all who call up on legitimate business mission.
- To respect one's obligations and those of one's organisation consistent with good business practices.



GREEN SMART IOT-BASED SUPPLY CHAIN MANAGEMENT

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The concept of “Green Smart IoT” has expanded in recent years as a new form of sustainable development and represents a model that incorporates all alternative approaches to improving the quality and performance of a business in order to better interact between production and service space and customers. The modern business environment deals with data, and this has created many challenges and opportunities. New information sources provide opportunities for new applications to improve the quality of business activities and their relevance to modern life. Business data is usually about the interactions between humans as well as the types of machines and tools that, in addition to their complexity, are a concern for privacy and security. There is a great deal of information and financial interactions in the relationships between different parts of the business and the people involved in different parts of the supply chain through Internet-based systems as well as a variety of smart phones and tablets. Route analysis data is used to indicate the desired route, depending on the current location and destination. The most advanced routing systems take real-time traffic into account and predict the best route by predicting different route traffic using random time spatial fields, which use past traffic data for forecasting. IoT is one of the key components of a sustainable ICT infrastructure that is introduced because of its high potential to promote environmental sustainability. The IoT, as a social human technology, leads to dramatic environmental and urban technological changes in complexity and diversity. Big data capability has been a key factor in implementing new IoT applications. Overall, the development of IoT, as a computational paradigm and analytical process of big data, promotes sustainable smart business initiatives and applications in the environmental field of advanced countries.

IoT enables the integration of digital and physical structures and provides a completely new class of applications and services that should be used with respect to the stability of the environment. This reveals the importance of concepts such as the green IoT. On the green IoT, sensors, devices, applications, and services are portrayed in terms of energy efficiency. In the domain of green and sustainable smart businesses, increasing the volume of data generation is beyond

imagination, and the vast amount of information available in different areas is of great value. Therefore, they can be used by planners and IT professionals to promote environmental sustainability. Despite increasing research on IoT and urban development data related programs, the bulk of the work is primarily aimed at economic growth and quality of life in smart cities and there has been little attention given to the green applications of IoT in business. Therefore, the main research question to be considered is: “How can the information landscape of sustainable smart businesses be enhanced by using IoT and big data processing programs with emphasis on environmental sustainability? Since there is always a shortage of innovative solutions based on IoT applications that can make an effective contribution to sustainable environmental development. This framework is based on the creation of big data (generated by IoT) with an emphasis on being green process. This framework illustrates the components of the green IoT-based supply chain implementation in a transparent manner. With this framework, effective points can be identified and by changing the influential parameters, it has made optimal decisions to sustain the environment for the supply chain. This research provides a basis for researchers to develop analytical frameworks for future research. The proposed framework can be developed and evaluated in empirical research and will lead to deeper studies in the field of sustainable intelligent systems.

The term of IoT was first introduced by Kevin Ashton in 1999. Using the IoT Everyone, plants and even lifeless objects (such as machines) can have digital identities for themselves. The Internet is now connecting all people. But with the help of IoT, all objects can be connected, managed and controlled using apps on smartphones and tablets. In fact, the IoT is a new concept in the world of information technology that provides the capability to send data through communication networks such as the Internet. The use of these technologies can also play a significant role in the growth of intelligent smart systems. Now a days, businesses have paid much attention to this issue. Because the IoT approach enhances the interoperability between objects as well as objects with humans, and with the help of such an approach, new services will

emerge. Various fields, such as e- health, e-commerce, and cloud-based production, have been transformed by the IoT. IoT is one of the most important ways to generate big data. Using this data, useful models can be created to optimize different business models. Therefore, acceptance of IoT has many potential benefits. These benefits include improving operational processes, creating value, reducing costs and minimizing risks resulting from the flexibility created by IoT. The IoT is built on the backdrop of applications that have created key empowerment for technology. These technologies include Radio-Frequency Identification (RFID), wireless sensors, smart technologies and nano technologies. These applications enable real-time monitoring and control of changes that occur in the physical state of the connected objects. **Figure 1** shows the IoT ecosystem. Many research points to various uses of the IoT. All technologies in the health system can be continuously tracked and monitored using technologies such as identity recognition and communication capabilities on the IoT. The use of IoT in the supply chain has also been the subject of much research. IoT offers many solutions for tracking, observing and managing supply chain challenges. IoT technologies can collect process and distribute data related to this chain. The use of the IoT for safer production in mines is another area of research. IoT technologies can detect the occurrence of a mine accident and provide the necessary warnings. On the other hand, using accident data can predict the occurrence of the accident and improve mine safety. IoT also plays an important role in the transportation and logistics industries. The greater the number of physical objects with RFIDs or sensors, the more logistics and transport companies can monitor the movement of objects from source to destination. Many other studies have also addressed the link between IoT and smart cities and environments. For this reason, the environmental applications and greenness of these technologies can be of great importance.



Figure 1. The IoT ecosystem

Green IoT

The concept of sustainable smart business has emerged from important global trends, namely the dissemination of sustainability and the spread of ICT. This term, using IoT technology, becomes a more powerful concept. IoT involves the massive use of expected network and number nodes in the future. Therefore, there is a need to reduce resources to implement all network elements and the energy consumed for their operation. Today maintaining the ideal energy consumption rate has become one of the most important challenges in IoT research. Therefore, Green IoT (G-IoT) is always essential to achieve lower energy consumption and to become a modern environment. To this end, all the key technologies associated with the G-IoT must be taken into account. These technologies include green tags, green sensing networks and green internet technologies. These technologies are embedded in the lifecycle of the IoT and help sustain them. The life cycle of the IoT is illustrated in **Figure 2**. One solution to achieving green RFID is to reduce the size of RFID tags and thus minimize the amount of non-degradable material. In other research on green RFID, algorithms for RFID inventory with energy saving and optimization have been proposed. In addition, in order to achieve a Green Wireless Sensor Network (WSN), different techniques have to be considered that have been mentioned in various studies. These techniques include :

- The sensor uses the energy required to operate and then placed idle or sleep.
- Use energy-saving techniques.
- Use efficient routing techniques to reduce mobility energy consumption.

In the case of green internet technology, hardware and software should be considered, where the hardware solution produces devices that have less energy without reducing performance.

There are many applications to the G-IoT, such as Green Smart City, Green Smart Factories, Green Smart Healthcare and Green Smart Logistics. In the following, we examine the green supply chain that encompasses many of these applications.

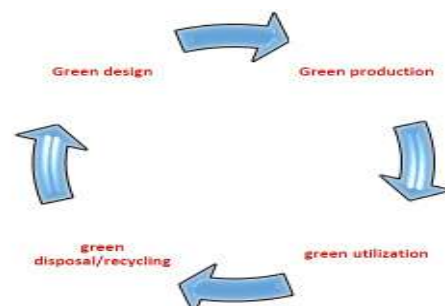


Figure 2. The G-IoT life cycle

Since the issue of environment was linked to the economy and countries have come to the conclusion that environmental protection can increase productivity, different approaches have been taken to realize these technologies, one of which is the latest, the Green Supply Chain Management (GSCM) approach. The idea of green supply chain management is to eliminate or minimize waste, which as an important innovation helps the organization to develop strategies to achieve common profit and market goals by reducing environmental risks and enhancing environmental efficiency. The main drivers for green supply chain adoption are laws and regulations that dictate compliance with environmental issues. Other drivers of using the green supply chain can be increased capacity for transportation, recycling and reusable packaging, reduced use of resources (water and energy), compliance with environmental standards. All interactions in the supply chain can provide valuable information for analysis and decision making. IoT, as one of the most important sources of big data generation, plays a significant role in these interactions. Organizations gain competitive advantage by improving the environmental role of IoT and by adhering to environmental laws and standards, enhancing customer knowledge and reducing negative environmental impacts on their products and services. Since the supply chain is one of the most important organizational units and covers a large range of organizational processes from supply and supplier relationships and then to manufacturing processes and ultimately to sales, distribution and customer relationships, so considering environmental parameters in the supply chain can play an important role in the sustainability and greening of human life environment. Therefore, adopting an investment strategy to improve the environmental performance of the supply chain will bring many benefits such as saving energy, reducing emissions, eliminating or reducing waste, creating value for customers and ultimately enhancing productivity for companies and organizations. Due to the importance of the issue, the issue of GSCM has been studied from various aspects. Some believe that supply chain greening, in addition to its environmental impacts, can also have a number of positive economic and operational implications and increase the efficiency of organizations. Other studies have also suggested that the use of green technology in the supply chain, in addition to creating competitive advantage, can give the organization more flexibility and increase profitability. In some papers, the role of IoT in the supply chain is also mentioned and even models have been created to make the supply chain smarter base on IoT. In the following, the IoT-based green supply chain is examined and analyzed.

The present research is applied in terms of research (considering its general purpose, which is to identify,

discover and explain the indicators and effective components in the IoT-based smart supply chain process) and the method of qualitative content analysis has been used in it; Because narrative data paints a more natural and realistic picture than numerical data. In order to extract the data in this research, literature review as well as review and evaluation of experts' opinions have been used. The experts in question were supply chain activists as well as information technology activists. In the present study, in-depth interview tools were used to collect data. First, the general question was, what are the characteristics of an IoT-based smart supply chain? Then, based on the answers provided, the following questions are asked. To check the validity of the data, the following measures were taken: 1) some of the final findings were provided to experts to review the researchers' perceptions and analysis, 2) data analysis and results were provided to several experts to express their expert opinion on data analysis and results, and 3) in order to increase the verifiability of the interviews, notes were taken. The data obtained from the interviews were analyzed using the thematic analysis method. Thematic analysis is a systematic approach to reduce and manage large volumes of qualitative data without losing context, immersing oneself in data, organizing, summarizing, and focusing on data interpretation.

Green IoT Based Supply Chain Framework

Sustainable smart supply chain emphasizes all processes of supply chain from supply to distribution with a view to energy efficiency and other environmental solutions based on ICT, IoT, and big data analytics. The results of these processes cover a variety of subject areas, including applications, sensor technology, data processing applications, and sustainable computing models. In its fullest sense, the smart supply chain is a chain of physical, social and economic smart infrastructures ensuring that businesses are focused on key features such as smart economy, smart mobility, smart people, smart environment, smart activity and smart management in a sustainable environment. Strategic use of new technologies and innovative approaches to increase efficiency and competitiveness are other features of this chain. Objects, people, processes, and devices communicate with each other through an Internet-connected infrastructure in the IoT supply chain and generate a large amount of information. The data sources for generating big data in the IoT-based smart supply chain are shown in **Figure 3**. The combination of smart supply chain and sustainable supply chain is less well

known in the current definitions. This term refers to an innovative supply chain that uses information and communication technologies and other tools such as exploring big data from IoT to improve business quality,

efficiency of operations, services and competitiveness to meet the needs of current and future generations, taking into account economic, social and environmental aspects. Since big data has very high diversity, variety and growth rate, traditional analytical systems are not suitable for their management. This means that big data processing involves the use of tools (classification, clustering, regression and other algorithms), techniques (data mining, machine learning, statistical analysis, etc.) and technologies that it is beyond the range of analytical methods used in extracting useful knowledge from a large volume of data for accurate and rapid decision making with the aim of increasing insight.

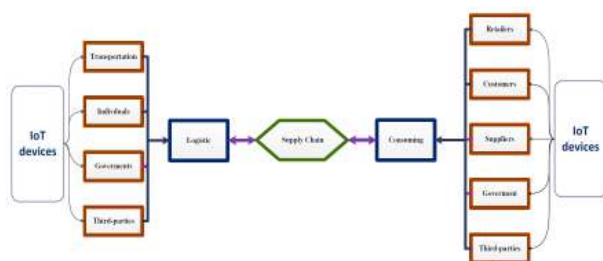


Figure 3. Big data sources in the supply chain.

In the context of sustainable smart supply chain, big data analytics refers to a suite of sophisticated software applications and database systems run by highly computing machines and capable of handling large data. Research on the uses of IoT and big data is active in the realm of smart businesses and is mainly related to economic growth and quality of activities. But the role of IoT and big data applications in promoting environmental sustainability in the field of smart green businesses as a holistic approach to development has rarely been addressed to date. In addition, IoT-based green supply chains have addressed the challenges posed by environmental sustainability arising from the disparity of ICT-based solutions with emphasis on green information and functional approaches. Given all that has been said, creating a framework for integrating the information and physical aspects of sustainable smart businesses is essential. However, there is always a need to strengthen supply chain information using IoT as well as big data in order to increase their contribution to environmental sustainability. Therefore, dealing with complex mechanisms and patterns involved in the interaction between the environmental and physical systems of advanced smart businesses is crucial and these interactions affect the environment. However, in order to make an effective connection between the IoT supply chain as well as the green supply chain, first the key indicators that affect the green supply chain should be found. According to literature, the key performance indicators can be selected as shown in Table 1. As can be seen, the main places of influence of these indicators

have also been identified. Given these performance indicators and the extent to which IoT data is used effectively in effective locations, a framework can be proposed to implement green IoT-based supply chains.

PIs	Supply Chain Sector
Green purchasing	Supply
Green manufacturing	Production
Green design	Production
Green transportation	Distribution
Environmental management	Supply-Production-Distribution
Operational performance	Supply-Production-Distribution
Cold storage	Supply-Production-Distribution

This framework is created by emphasizing the four-layer architecture of IoT implementation. Generally, these four layers respectively, include data acquisition, data refinement and analysis, data processing, and ultimately data integration and use (Figure 4). Therefore, the various sources of data involved in the supply chain must be collected, stored, processed, analyzed and integrated into operations, functions and plans in the field of environmental sustainability (with emphasis on key green indicators) and then the data should be shared. Processes associated with knowledge discovery include selection, pre-processing, modification, exploration, interpretation and evaluation. Data mining processes include information comprehension, data preparation, modeling, evaluation and deployment. These two processes are involved in areas related to environmental sustainability and their aim is to discover new knowledge or exploit large populations. Discovered or extracted knowledge includes information functions intended for decision making, decision support, and automated decision making. Information functions are used for real-time and strategic decision-making in the form of control, automation, optimization and management.

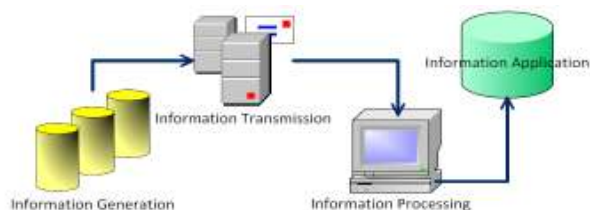


Figure 4. 4-layer architecture for IoT implementation.

Figure 5 shows a framework for deploying large-scale data processing using IoT technologies implemented on the cloud or in the fog in the green smart chain. These technologies include sensors, data warehouses and repositories, data processing platforms and cloud or fog computing models. In fact, this framework illustrates the effective link between input data and their green processing using IoT and their place in the supply chain.

A review of the literature reveals that frameworks for smart cities using IoT have already been presented. Since a dedicated framework for the implementation of IoT-based supply chain and with the emphasis on sustainability and greening not previously provided, this framework can be very useful. In this framework, sensor data from different domains of the supply chain, which are collected, integrated, pre-processed and converted based on key performance indicators of the green supply chain, using data mining and machine learning techniques for model building Patterns, pattern recognition, correlations are used to automate, support, and make decisions in operations, plans, and other supply chain activities.

Cognitive analysis is intended to identify key conceptual themes in a sustainable green supply chain model that emphasize the use of IoT and big data processing in relation to environmental sustainability. These include sensor technologies, data processing platforms, computational models, and data-driven applications related to the various components of the supply chain. The main parts of this framework are described in **Figure 5**.

Sensors and other communication devices such as tablets, smartphones have a direct relationship with the data sources in the supply chain. Therefore, these valuable data can be used through these tools as well as a variety of real and virtual transactions to improve environmental sustainability in the supply chain. Sensor data is available in a variety of formats, and there are various ways to capture and store this data. The extracted data have a large volume and their production speed is extremely high. At the same time, because they come from a variety of sources, their diversity is also high. As a result, these data are big data and need their own analytics tools. By interacting with these data and key performance indicators in the green supply chain, effective factors on environmental sustainability can be deduced and their performance improved. Some of these improvements can be demonstrated in traffic control, monitoring and optimization of fuel consumption, reduction of the pollution caused by the use of industrial machines, energy optimization, and so on. To achieve this goal, it is necessary to use specific analytical tools in the big data range. In recent years, cloud and fog computing have gained a lot of attention and become popular in the world. Therefore, by expanding distributed and networked computation on extracted and refined data in order to increase environmental sustainability, the possibility of optimizing processes as well as improving system performance and thus optimizing decision making is increased. One of the most important benefits of this framework is to provide a transparent process of implementation of IoT-based supply chain with an emphasis on environmental sustainability and

identifying a well-established path for implementation. Accurate communication between data entry pathways as well as identifying the location of impact can guarantee optimal performance at the optimal time.

The framework presented in **Figure 5** has been provided to 30 supply chain professionals after repeated design and review. In this regard, a five-level Likert scale questionnaire was used to evaluate the experts' opinions. The results of the questionnaires confirmed the validity of the framework. Cronbach's alpha for the questionnaires using SPSS software was 0.9 which indicates good reliability of questionnaires.

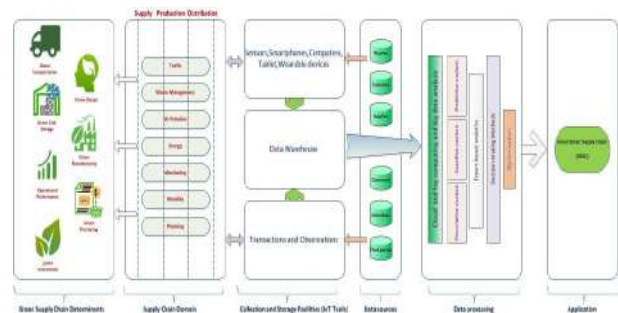


Figure 5. Green IoT-based supply chain implementation framework.

IoT is a new form of large-scale applications that, due to its operational performance, have received considerable attention from sustainable smart industries. Therefore, the potential of IoT and macro data analytics depends on such industries being able to optimize their information landscape by implementing and combining relevant frameworks to improve designs and services. There is high expectation for environmental gains from ongoing IoT research and big data analytics in science as well as industry. Therefore, the purpose of this paper is to review and integrate related literature and provides a framework for identifying and discussing the applications of Big Data based on advanced IoT enabled sensors for environmental sustainability and data processing platform in addition to green smart supply chain computing models. This framework provides an innovative multilevel methodology for implementing the green IoT-based supply chain that demonstrates the direct relationship between data in effective locations for environmental sustainability and their impacts using robust analytics. This framework outlines a clear path to implementing the green IoT-based supply chain and identifies influential locations. The reliability of the presented framework has been confirmed by experts.

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HOW INDIA CAN IMPROVE ITS HEALTHCARE SUPPLY CHAIN

LT GEN BALBIR SINGH SANDHU

The second Covid wave has made it evident that the problem in India's healthcare supply chain lies not so much in manufacturing, provisioning or procurement, but in transportation, distribution and last-mile connectivity with consumers. Going ahead, the civil administration must fill in the gaps with efficient planning, policymaking and use of technology, and safeguard citizens' health and safety.

The sudden spurt in Covid-19 cases due the second wave of the pandemic has left many people literally gasping for breath and begging for critical medical equipment and drugs. Many doctors working in the Covid hospitals feel helpless because they had never thought that items like oxygen and drugs, whose supply was taken for granted, would no longer be available. Healthcare workers, who are rightly fatigued after more than a year's deployment in the Covid Combat Zone, were in for a big shock due to the failure of the basic healthcare supply chain. No one could have imagined that hospitals would ask relatives of the patients to arrange for oxygen cylinders or that religious place like gurdwaras would be organising oxygen 'langars' to provide the life-saving gas to the needy.

Upon a basic analysis of the crisis, it is evident that the extraordinary pain inflicted on patients, their relatives and the doctors has emanated from the failure of the healthcare supply chain which relied mainly on the unorganised sector. It appears that the administration never applied their minds to this crucial facet of healthcare for citizens.

It is interesting to learn that even during this crisis, the country was not short of oxygen because oxygen being utilised for industrial purposes was immediately diverted for medical use by the Government of India. The industry responded to this call by the government post haste. However, the healthcare supply chain did not have the capacity and resources to transport the oxygen from manufacturing units, most of which are co-

located with the steel plants situated in the eastern part of India, to the consumption points, some of which were located more than a thousand kilometres away. It is evident that the problem was not in manufacturing, provisioning or procurement, but in transportation and distribution, which were the two most important links to the consumers.

Problems arising due to the inadequacy of transportation resources to deliver oxygen to the cities/towns were further accentuated by a simultaneous collapse of the distribution system in these towns. At a time when there was a crying need to fine-tune the distribution network to minimise the ill effects of a shortage of bulk supply because of skyrocketing demand, unscrupulous elements in the oxygen distribution network found it to be a golden opportunity to resort to black marketing and hoarding. It is extremely difficult to comprehend that officials in charge of the distribution network could not have foreseen such exploitation of citizens. Such a failure of last-mile delivery is obviously due to the incompetence or connivance, both of which are unacceptable to the society, where the lives of citizens are involved.

What was experienced by the population at large during the last one month has exposed major chinks in our civil administration's armour. Citizens diligently contribute to the state by obeying government orders and discharge their obligations to the state by paying direct and indirect taxes. In return, the least they expect from the state is their safety especially during a crisis or pandemic. Unfortunately, the government functionaries who have been given power by the state refused to shoulder responsibility and offer accountability. Such crises demand total commitment, innovation and working in an operational mode, something which was not visible to the citizens, especially patients and their families.

There is a need to have a look at the supply chain of all medical equipment, drugs and oxygen, in case the nation does not wish to be surprised by the next phase of this pandemic or another such disaster. The world is becoming more vulnerable to such natural and human-made disasters which were earlier encountered only in fiction. A few steps which are within easy reach and do not need much investment must be immediately implemented.

The first step would be to wargame and plot realistic future contingencies which can disrupt the healthcare supply chain of the country or a region. This job can be easily undertaken by our think tanks and be presented to the civil administration and be documented after detailed discussion and evaluation at appropriate levels. All contingencies visualised must be realistic and for which workable solutions within the capacity of the state are feasible.

In order to put in place a sustainable and effective supply chain, there is an urgent need to map all available resources in terms of manufacturing facilities with capacities, transportation resources, both routine and ramped up numbers at times of crisis. Likewise, all the consumption centres which would generally be in the cities and towns must be identified and mapped. There is a need to understand the distribution network, especially under stress, evaluate the existing supply chain, understand the voids, and identify steps required to improve it.

During current times, smart use of technology can act as a game-changer. It is extremely important to use the latest software to help planning, implementation, monitoring and real-time information dissemination to all stakeholders. Multiple means of communication will make the system more responsive and reliable. Technology can also help real time tracking of bulk consignment as also retail distribution of oxygen cylinders using RFID and such other applications. The efficient use of technology can minimise malpractices and ensure accountability. In order to make a networked supply chain pan-India, this monitoring system must operate from Control Rooms established at all levels of administrative links from a tehsil to Central ministries at Delhi.

A network must be plotted based on the location of resources such as oxygen, drugs or critical medical devices manufacturers or distributors and

the consumption points which are collocated with the population centres. At places where the turnaround time for a particular region is too long, local resources must be created in the form of oxygen generators or hold a greater number of oxygen concentrators and reserves of drugs/medical equipment in that area to meet emergent requirements. Hospitals can be located close to oxygen manufacturing facilities which can use piped oxygen supply which would cut down the turnaround time. A composite supply chain comprising of all modes of storage, transportation and distribution must be utilised to make it reliable. Cutting down the turnaround time and ensuring punctuality will make the supply chain efficient and reliable even during disruption.

Institutionalised policies regarding the holding of reserves by hospitals and manufacturers must be promulgated as part of essential and critical goods and services. Clear cut levels at which the alarm will be raised by the stakeholders must be laid down so that the administration can invoke necessary provisions to ramp up the production and transportation of critical resources. Besides oxygen, other healthcare components and drugs must be monitored using the same software or technology platform to ensure the nation is not surprised by any natural or manmade health disasters in the future.

Healthy citizens form a critical gross national power resource. It is extremely important for the state to ensure the health and safety of its citizens under all situations and circumstances. A pandemic of this magnitude is as much a national security challenge as a military attack by an irresponsible neighbour. Therefore, the country needs to wargame contingencies and be fully prepared to meet them so any virus or potential pandemics do not achieve in surprising us the way it did this time.

During 39 years of military service, Lt Gen Balbir Singh Sandhu secured the apex appointment of Director General of Supplies & Transport of Army, headed a force of approximate 75,000 officers, JCOs, jawans and civilians deployed across India. He also served as the Director General of Information Technology of the Army. He is actively involved with think tanks such as USI, CLAWS, IDSA and ORF. The views expressed are personal.

Source : the dailyguardian.com





STRENGTHENING HEALTHCARE SUPPLY CHAIN

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The importance of Supply Chain Management (SCM) as a key enabler to any organisation's business objectives has sharply been brought into focus during the peak of the Covid-19 pandemic over the past two years. More recently, its relative relevance has only grown through the ongoing semiconductor and logistics challenges, as current global trends push it to the forefront of business strategy. Specifically within the healthcare industry, these happenings have been causing significant disruptions in supplies across the globe, affecting suppliers, hospital administrators, clinicians, caregivers, patients and society at large. Therefore, navigating through these challenging times heightens the need to strengthen the overall supply chain at both public and private health infrastructure systems.

In general terms, SCM in a traditional product manufacturing industry involves the sourcing, procurement, transportation & storage of material at various stages (covering raw material inputs, work-in-process assemblies & finished goods inventory), from point of origin to the final destination.

Within Healthcare though, where we see a fusion of both product and service, the SCM scope expands to encompass not just the end-to-end distribution process covering pharmaceuticals, medical consumables, capex equipment and allied services, but also the element of human life and care, with accountability right until a patient has ingested a drug or availed a health-related hospital procedure/service. These intricacies make a compelling reason for advanced analytics and robust processes within Healthcare Supply Chain to ensure material of the right quality continues to be made available in the right quantity and cost, and at the right time. Here are a few ways this can be done.

Central planning alignments: The supply lead-times for imported drugs, medical consumables and biomedical equipment have shot up in recent times. Besides, the pandemic has also altered disease profiles, causing a significant shift in the material consumption patterns at hospitals. These external changes necessitate tweaks in the Material Planning algorithms across the supply channel viz. MedTech & Pharma suppliers, distributors and Hospitals, to ensure efficient material availability. The planning horizon, which is typically 2~3 months for consumables and 4~6 months for devices & equipment, now needs to be expanded to 4~6 months and 8~10 months respectively.

Multi-tiered supply visibility : Behind the ongoing supply constraints are distinctly identifiable bottlenecks – semiconductor shortages for equipment, API shortages (especially from China) for drugs, geo-political tensions associated with Ukraine-Russia & its neighbouring regions, a resurgence of Covid-linked lockdowns in China, to name a few. A good way to neutralise the risks associated with these is to go beyond the Tier-1 supplier, understand everything that goes into the products being purchased, and work with these Tier-1 supplier partners on alternatives that have relatively lower dependencies on the associated risks. This would lead to win-win-win scenarios for suppliers, hospitals and patients alike.

Internal efficiencies : Across the distribution channel, inventory norms need to be adapted to have higher stocks than usual, to overcome supply uncertainties. While this may be unfavourable from a cashflow standpoint in the short-term, it would act as an insurance cover with a long-term benefit, especially in the ongoing inflationary environment. Having longer term pricing contracts with quantity and supply commitments would also be in order. Specifically within hospitals, consumption efficiencies can be improved through replacing slow-/non-moving inventory with useable SKUs, optimising inter-departmental material transfers, maintaining Formulary Compliance and following share-of-business guidelines within competing brands. This is equivalent to the last mile in Healthcare Supply Chain, to ensure the small things are taken care of too, thus helping reduce miscellaneous spend.

Relationships : External events during tough times bring forth situations that challenge continued compliance to signed clauses in legal contracts. It then becomes pertinent to view these clauses in the spirit of the agreement, and the importance of inter-company relationships comes into play. During such times, it is crucial to maintain sound mutual relations while protecting business interests on both sides. This becomes an easy proposition to execute when, despite an ever-evolving external environment, all stakeholders are aligned towards the singular objective of patient care.

With all these measures being taken care of, I am sure Healthcare Supply Chain professionals would be able to weather any storm that comes their way.

Source: timesofindia.indiatimes.com





SUPPLY CHAIN TRENDS 2022: DIGITIZATION OF HEALTHCARE SUPPLY CHAIN FOR IMPROVED OUTCOMES

SHAILENDRA SINHASANE

Shailendra Sinhasane (Shail) is the co-founder and CEO of Mobisoft Infotech. He has been focused on cloud solutions, mobile strategy, cross-platform development, IoT innovations and advising healthcare startups in building scalable products.

The healthcare digitization of supply chains has been a steering point for organizations and companies in addressing the recent requirements of the patients and customers. The challenges in the supply chain in healthcare industry also have given rise to supply chain trends 2022 with newfound expectations



The efficient healthcare supply chain is paramountly helping patients and saving their lives. Embracing digital healthcare technology is a significant step toward building this efficiency even further. The transforming aspect of the traditional healthcare supply chain with a digital health supply chain is creating sustainable value in healthcare organizations. It is giving faster, smoother, affordable, and safer healthcare services to the patients. Additionally, the digitization in healthcare is helping the hospital and healthcare systems in bringing down the costs of operations and finding the right growth opportunities. Among the adopted innovative technologies like AR/VR, Big Data, Blockchain, and more by the healthcare supply chain, how can it help healthcare providers in becoming more resilient and cost-effective for providers?

The Challenges in the Traditional Healthcare Supply Chain : The traditional healthcare supply chain cannot be built on the regular demand and supply in the market. Good health and wellbeing at affordable expenses is a product that cannot be stocked like other services and products in the supply chain. The traditional healthcare supply chain faced various challenges like:

1 Unreliability in inventory data : The inventory data that is maintained with the traditional supply chain in healthcare is often unreliable and inaccurate. Apart from this being a big challenge, it is not updated

regularly and it is highly fragmented amongst various stakeholders in the healthcare industry. This is in addition to the poor hospital inventory visibility that leads to information inconsistency. This is one of the biggest challenges in the non-digital traditional supply chain that was faced in the healthcare industry. This is due to the lack of automated tracking mechanisms and systems, real-time sharing of data, and hence the optimal relocation of the supplies.

2 Slow innovation and manufacturing : One of the many ways to gauge the efficiency of the healthcare supply chain is the observation of production in healthcare that matches the demand. It is essential for manufacturing, innovation, and production to be ramped up at the correct pace. With slow-paced manufacturing, it creates another challenge for the traditional healthcare supply chain. This can lead to medication and prescription drug shortages, forcing providers to spend on alternatives that can be more expensive. This can lead to a risk in maintaining a comprehensive backup inventory for the supply chain in healthcare by increasing the management of inventory and the expiration of products.

3 Supply hoarding : The supply chain in healthcare relies a lot on distributors and other third-party logistics providers. Healthcare and hospital systems require to procure essential medicines, medical equipment, healthcare products, and more. But the traditional healthcare supply chain metrics are not necessarily equipped with the adept demands in healthcare products. Poor logistics is yet another misplaced priority and a challenge that often leads to hoarding supplies like masks, ventilators, and other equipment that are not to be stored in warehouses.

4 Wastage of supplies : This can be blamed on the mismanagement in tracking inventories in the traditional healthcare supply chain. This leads to immense wastage causing healthcare providers and hospital systems in wasting hoarded supplies or having excess inventories of expired products, medical devices, and unnecessary shipping expenditures.

5 Lack of digital integration : The practices in healthcare and hospitals are becoming consolidated and expanding. Even then, the traditional supply chains within the siloed organizations continue to remain detached from the system. This is due to the lack of digital integration leading to inconsistent information among hospitals and supply chains.

Digitization in healthcare combines automation, tracking, and analysis and is an integral part of the digital health supply. So what are the opportunities and trends in supply chain healthcare?

Healthcare Supply Chain Trends 2022 : Having a smart and digital health supply chain is now one of the pressing priorities. Digitization in healthcare can set to bring forth a supply chain that can enable organizations to address the recent requirements of patients and customers. This can improve the efficiency of the healthcare supply chain.

1 Improvement in patient engagement and care

Adopting new and innovative digital health tools and technologies can build efficiency in the healthcare supply chain. The medical care organizations and hospital systems can help in saving costs by automating the processes. Automating the workflow can lead to better staff productivity. The supply chain in healthcare can redirect the staff time in better utilization of patient care, reduce the wait time for patients, and lessen the number of rescheduled appointments. Improving patient care can redirect priorities to better patient engagement and increased satisfaction.

2 Optimizing cost-effectiveness : The supply chain in healthcare industry is known as a strategic asset as it offers the potential for significant savings on expenses. Automation in the industry is key to propelling this potential. According to recent studies, about 94% of surveyed healthcare providers have identified a direct relationship between the organization and the supply chain's success in finances. Progressing toward digitization in supply chain can build a holistic approach to optimizing cost-effectiveness.

3 Workflow efficiency : Boosting the efficiency of a healthcare organization and healthcare system can help to automate physical planning and tasks. It can be well observed that duplication in the work processes. This is due to the process of making up the supply chain that is disconnected and siloed. When attempting to automate and implement the workflow tasks, stakeholders can share information more efficiently.

4 Accuracy of data : Once the digitization in the supply chain has been achieved, it can be noticed that poor outcomes generate many data errors and inconsistencies. Additionally, the employees get freer time to engage in higher productivity in their activities with the digitization that provides an accuracy of data.

5 Easy to use : The digitization of supply chain can help to improve the healthcare processes to be more standardized. Once that has been achieved, every individual involved can work together to make healthcare services more efficient and easy to use.

Significance of Digital Supply Chain in the Healthcare industry: The supply chain in healthcare generates a large amount of data. For transforming the supply chain, it is necessary to utilize the data correctly. Integrating the best digital technologies can help to increase the performance of the supply chain at every

level. The challenges for traditional supply chain management rely a lot on acquiring products and supplies for offering high-quality care for patients. This can also reduce the value and increase the cost.

A digital health supply chain can bring out:

1 Evidence-based decision making: The data on product outcomes can be crucial for the healthcare supply chain. This sort of data is not readily available or accessible. Adopting new products or services that are in demand requires clear clinical-based evidence. This can be collected with the digitization of the supply chain in the healthcare industry. While using the products, it is necessary to verify if the information is available, this can provide improved clinical outcomes in the form of reduced hospital stay lengths, reduce operating room time, reduced use of anesthesia, and/or fewer healthcare complications. Automation offers to acquire valuable data by translating the raw data into actionable and relevant information. This can help to make informed and evidence-based decisions.

2 Involve more cross-functional teams: Digital transformation in supply chain healthcare can transform the efforts and lead to diminishing and breaking down of organizational siloes. This will give a way for forming cross-functional teams. Working together, these teams can improve the digital integration and offer a more holistic situation that consists of shared risks.

3 Increase in acquisition and merger activities: Businesses across the world, healthcare entities, and hospital systems go through a process of acquisition and merger activities. Having this merger and acquisition in place, it becomes essential regarding a large amount of data be transferred safely and seamlessly. The automation in supply chain management will ensure improved integration of data.

4 Adoption of better data standards : The supply chain digitization can standardize the process and workflows that can improve efficiency lower expenses, and improve patient care solutions. With cloud-based solutions, improvement in creating scalable, connected, efficient, and fast supply chains is possible. This will make room for flexibility and transparency around the healthcare system.

In Conclusion : The digitization of the supply chain for the healthcare industry has various benefits that can be cost-saving for the industry. A digital health supply chain brings forth efficiency and streamlined work processes by automating and improving decision-making abilities. Technology-based solutions and operations will simplify the work for the supply chain personnel by allowing them to be more productive. Mobisoft's integrated digital health system can help to build a system that can help to eliminate any manual effort and receive real-time information when decision-making is necessary.

SOURCE:mobisoftinfotech.com

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WHAT IS THE ROLE OF TECHNOLOGY IN STRENGTHENING THE HEALTHCARE SUPPLY CHAIN?

DILEEP GUPTA

Top executives at medical facilities are considering possibilities to restructure their supply chain management for healthcare to be more efficient in operations and cost-effective. They want to do so while improving patient care as hospitals and health systems gradually adjust to life after the pandemic.

The ability to save patient lives depends on an effective healthcare supply chain. Additionally, adopting technology is a big step in the direction of increasing that efficiency.

That said, it is not surprising to see that hospitals are utilizing technology more than ever, from patient portals to electronic health records (EHRs). However, it may come as a surprise that hospitals haven't adopted technology to its fullest in one field: inventory management, often known as supply chain management (SCM).

So it makes sense that supply chain expenses frequently rank among the highest for hospitals and healthcare systems. By automating and standardizing their supply chain procedures with the use of technology, hospitals may, according to research by Navigant Consulting, save an average of 17.7%, or \$11 million per hospital, annually.

Healthcare firms gain long-lasting benefits from the conversion of a traditional supply chain to a digital supply chain. Everyone now has access to quicker, safer, more convenient, and more affordable healthcare in the form of digital healthcare. In addition, hospital systems can save operating costs and identify growth prospects thanks to the digitization of the healthcare supply chain.

In this article, we will discuss the various aspects of a healthcare supply chain and explain the importance of adopting technology to make traditional healthcare supply chains even more efficient. We will see how technology can aid in supply chain development and take a look at the steps to integrate it successfully. Let's begin.

What is Supply Chain in the Healthcare Industry?

The production, distribution, and delivery of medications and other healthcare supplies to patients are ensured by a complex network of systems, elements, and procedures known as the supply chain in the healthcare industry.

Even during pandemics or natural disasters, this intricate worldwide system has been set up with plenty of built-in safeguards to guarantee that medicines and

other medical supplies are produced and distributed promptly.

The ability of the supply chain to anticipate, plan for, and respond to probable interruptions in one or more chain links over a varied pre-established global network is the most important of these defenses.

Pharmaceutical quality standard developers, hospitals, health systems, pharmacies, and health insurance providers are a few of the numerous participants in the healthcare supply chain. However, manufacturers and distributors are crucial to the healthcare supply chain.

We rely on manufacturers to produce the medications and medical supplies that form the initial link in the supply chain in hospitals. Manufacturers control their product flow from the site of manufacturing to wholesalers and, in some cases, directly to a pharmacy or hospital. The second link in the supply chain for healthcare is the distributor.

When it comes to medical supply distribution, distributors buy prescription medicines and other healthcare supplies in huge quantities from manufacturers and carefully manage substantial inventories in key sites across the region. Some wholesalers specialize in serving particular clientele, such as nursing homes, or a particular product category, such as biologics.

What is Supply Chain Management for Healthcare?

Supply chain management for healthcare is the practice of buying and distributing medical goods and services as they are transported from the loading port to the patient.

According to James Spann, Practice Leader of Supply Chain & Logistics at Simpler Healthcare, "Supply chain is simply the management of upstream and downstream connections between suppliers and customers to offer higher customer value at less cost to the supply chain as a whole."

The management of the healthcare supply chain is quite difficult. The difficulties are only exacerbated by inadequate data reporting, subpar product uniformity, growing regulatory requirements, and a general lack of automation.

While there are many difficulties in supply chain management, the main problems are hoarding of goods, desire for particular products that are in stock, product expirations, out-of-stock problems that may result in high delivery costs, theft, and an unjustified increase in inventory costs based on demand. These

and other problems are a factor in supply costs that exceed the budget.

Role of Supply Management in Healthcare

The purpose of the supply chain in the healthcare industry is to identify departmental vulnerabilities and suggest solutions to mitigate them. It tries to pinpoint problematic areas to attain desired health outcomes and boosts financial support for international health.

The benefits of a good supply chain in the healthcare industry include enhanced operations, efficient resource usage, content staff, successful treatment, and contented patients.

Supply management in healthcare enables proper integration of hospital departments, operations, and revenue cycle. The supply chain can be thought of as a backend application that is essential for integrating all the various activities.

Supply chain management in hospitals ensures that medications and other products are available when they are needed, reduces inventory waste, improves patient care, and coordinates efforts across all departments to reduce human and pharmaceutical errors.

This can be done by taking various actions, such as integrating digital subsystems, optimizing processes, and incorporating technologies to promote supply chain digitization.

How Crucial is Technology in the Healthcare Supply Chain?

The incorporation of cutting-edge, disruptive technologies into supply chain management systems, such as data analytics, AI (artificial intelligence), IoT, and Blockchain, promotes efficient operations, enhanced security, and rapid growth in the global healthcare sector.

Markets & Markets predicts that the worldwide healthcare supply chain market will grow from \$2.2 billion in 2020 to \$3.3 billion by 2025. The development of cloud-based solutions, decreased operating expenses, increased efficiency, and general profitability are key drivers fostering this expansion. The widespread use of SCM, particularly in the healthcare sector, is proving to be incredibly advantageous for people's lives.

How can Emerging Technologies Transform Healthcare Supply Chain Solutions?

The results could be fatal or drastically alter a patient's life if practitioners run into unexpected shortages while providing care. Fortunately, technological advancements can lead to a stronger supply chain in hospitals that is more resilient to shocks. Following are the ways in which some of the most cutting-edge modern technologies can propel us towards a more efficient digital healthcare with robust medical supply distribution.

Increasing visibility using blockchain

Blockchain and cryptocurrencies are frequently used interchangeably. Although this digital ledger technology began there, its promise extends well beyond that. For

instance, the blockchain might make it easier to share knowledge about medical supplies and other vital items that sustain healthcare institutions.

The circular economy seeks to reduce waste and repurpose resources to meet changing requirements. A recent paper explores how the blockchain could support this approach. For instance, the authors mentioned how, after the COVID-19 outbreak began, distilleries switched to making hand sanitizer, and those with spare fabric utilized it to make face masks for essential personnel.

The most effective new methods for tracking the whole lifecycle of a medicine, down to a single dose, are those based on blockchain technology. To provide a way to track items securely and dependably throughout their entire lifecycle, organizations are already developing a range of innovative blockchain-based solutions.

By decreasing fraud and enabling better-managed quality in the production and distribution of pharmaceuticals, blockchain plays a critical role in supply chain transformation. Pharmaceutical corporations like Pfizer and Roche are already actively developing such solutions.

Predictive analysis and AI

The way that data is managed, analyzed, and used across all industries has undergone a fundamental transformation, thanks to AI. Organizations now use predictive analytics instead of the more fundamental descriptive kind because of the strides in AI. Monitoring patterns and estimating the possibility of future events are made easier with the use of predictive analytics.

Healthcare firms can use predictive analysis to take advantage of statistical data and manage the supply chain in hospitals and elsewhere by reducing variance while also learning more about demand trends and supply utilization. Accurate forecasting supported by data facilitates the optimization of inventories and aids in better-informed decision-making.

IoT and RFID tracking

The workforce may lose hours of production over a simple activity like finding an asset. The use of IoT-capable devices equipped with hospital supply chain software with RFID (Radio-frequency Identification) tracking systems may prove to be both cost and time-efficient.

The assets can be located, tracked, and monitored using a real-time location system (RLTS). In addition to streamlining the healthcare supply chain, automated inventory tracking also gives full system awareness.

Robotic Process Automation (RPA)

The labor-intensive, repetitive, and manual processes in a healthcare supply chain are eliminated by the adoption of an RPA system. Usually, it cuts down on the time and money spent on a supply chain and gets rid of the chance that human error will be a problem down the line.

Routine automated tasks improve productivity and lower costs. Modernizing a warehouse with RPA-

deployed devices optimizes revenue and boosts productivity.

Drone technology

When it comes to quickly and efficiently delivering medications, vaccines, medical kits, and other supplies, drone technology can provide organizations an advantage. Drones can help with challenging deliveries by serving as adaptable courier equipment.

When necessary, it can also be used to deliver blood or blood samples to the desired recipient at the specified location. Additionally, compact indoor drones can be put in hospital buildings to be used to carry medications to patients right at their bedsides.

Healthcare Supply Chain Automation

With the straightforward objective of improving the supply chain process, supply chain software streamlines and automates routine manual processes carried out within healthcare firms.

Among the many advantages of software automation is its ability to streamline inventory, reduce waste, enable quick, data-based decisions, and reduce labor, supply, and operational costs. For these reasons, it is becoming increasingly crucial to enlist the help of supply chain software development firms like Appinventiv.

Typically, there are two categories of SCM technology solutions available to decision-makers in medical supply inventory management.

Enterprise resource planning (ERP) systems are the first option, but they are not necessarily the ideal option for hospitals because they are used in many different industries, and the vendors frequently lack considerable healthcare knowledge.

Since ERP systems are often adopted by bigger, non-healthcare-related firms, they may take longer to build and require specialized customization resources, resulting in a system that is essentially rigid and that healthcare professionals must adapt to rather than having it adapt to their workflows.

The second type, referred to as specialty healthcare inventory and supply chain solutions, frequently have lower prices and incorporates more in-depth industry knowledge, resulting in adaptable, healthcare-focused solutions. These kinds of systems frequently concentrate on particular fields, such as surgery, interventional medicine, and other healthcare divisions.

Digital Healthcare Provides An Edge

Delivering the ideal product to the appropriate patient at the right time is made possible by the supply chain digitization in a cost-effective way for healthcare providers.

By creating a digital supply chain, healthcare providers will be better positioned to take advantage of technological advancements made to enhance data flow, analytics, provider-patient connectivity, asset monitoring, and regulatory compliance. Digital healthcare is the way of the future.

Why are Digital Supply Chains Gaining Such

Importance?

The following issues that healthcare organizations confront are pushing them to think about creating digital supply chains:

Cost reduction

The healthcare industry's shift from an emphasis on volume to value is forcing providers to look for new ways to manage resources and lower overall costs. These changes to payment models are the result of healthcare reform, as well as rising prices and narrowing margins.

Improving patient engagement, care, and delivery

Hospitals may save money by having a productive digital supply chain, and by repurposing staff time for patient care, cutting down on wait times, and fewer canceled appointments, they can improve patient engagement and satisfaction.

Cutting out irrational variation

By automating routine procedures, hospitals may free up staff time for higher-value tasks while lowering the likelihood of bad results brought on by error and variability.

Some digital supply chain examples

Utilizing data to organize and monitor flu medication

Utilizing real-time data to predict seasonal demand for anti-influenza medications gives the hospital a clearer view of where the drug doses are located in the supply chain. It confirms that the proper supplies are accessible for the right patient at the right time and enables the hospital to shift supplies to areas of most need during a shortage.

Increasing inventory transparency

Healthcare providers and suppliers can enhance visibility over consignment inventory at the patient's bedside and alter the movement of inventories in real-time to locations experiencing shortages by implementing cutting-edge technologies like radio frequency identification (RFID) and supply chain digitization at the point of use.

Tracking resources with blockchain throughout the care spectrum

The immutability of blockchain paves the way for product traceability from suppliers of raw materials to manufacturers to healthcare providers to consumers, and it may help with inquiries into how opioids end up in the wrong hands.

Supply chain digitization and digital healthcare will be the biggest trends in the healthcare industry in the years to come.

Steps to Successfully Integrate Technology into Healthcare Supply Chains

The following four steps are vital to successfully infuse the right technologies in the supply chain management for healthcare:

Alignment

It's essential to first bring your business and stakeholders together by defining a vision of success geared at the long-term value, given the variety of elements and moving parts in the process.

This transition will frequently necessitate major adjustments to procedures and job descriptions. For the digital supply chain transformation to be effective, it is essential to make sure that everyone is on the same page about the overarching strategy, plan, and objective.

Assessment

While the majority of hospitals and health systems have a high-level understanding of where their supply chain operations stand, a full evaluation entails a thorough investigation of the processes, people, and technology.

This should be done with a special focus on transformation and optimization in line with the end goal in mind. It is possible to develop more precise strategies, make adjustments more quickly, and implement them more quickly thanks to a thorough grasp of supply chain staffing and the current operating structure.

Analysis

After you've aligned and thoroughly examined every aspect of the digital supply chain, the solutions you find assist in building a thorough value proposition that simulates a scalable and sustainable future state.

To find potential for improvement in each process, people, and technology area, analyze the data already available, and map the supply chain operations. As a result, you may develop a data-driven business case for the future that will serve as a roadmap for concrete adjustments and advancements.

Planning

Create an all-encompassing strategy that relates crucial organizational objectives to both short- and long-term operational initiatives to bring the value proposition to life. By analyzing processes and data, it is possible to identify short-term investments and create a long-term transformation road map.

How can Appinventiv Help in Leveraging Technology in Healthcare Supply Chains?

Appinventiv is a rapidly growing IT consulting organization, taking pride in the effective implementation of projects using cutting-edge technology. We offer innovative services such as supply chain software development that goes above and beyond what is expected by our customers.

We are a fast-growing software development firm that offers software development for businesses of all sizes and across all industry verticals. We have a solid clientele base and almost ten years of experience. Our offerings also include top-notch healthcare software development services.

For instance, Appinventiv collaborated with Health-e-People to develop a highly functioning mobile app

solution that unifies all of a user's medical data on a single mobile platform. We made sure that each challenging task was divided into manageable chunks to facilitate user interaction with the program. The result that was delivered was an app that supported every action we wanted it to take and benefited everyone—users, caregivers, and researchers.

If you are keen on implementing supply chain digitization, we can ace healthcare supply chain management software development for you. Get in touch with our professionals now.

Conclusion

The correct infusion of technologies such as AI, Blockchain, automation, data analytics, IoT and RFID, etc., can drastically improve supply chain management for healthcare. All you need to do is follow the four steps mentioned above to understand what will work best for your needs.

FAQs

Q. How does technology affect the supply chain?

A. Organizational flexibility, business process automation, and supply chain management innovation are all accelerated by the use of technology in supply chains.

Q. How can the healthcare supply chain be improved?

A. The Healthcare supply chain can be improved by infusing the latest technologies such as AI, Blockchain, data analytics, etc., to supply chain management in hospitals.

Q. What is supply chain management in healthcare?

A. Supply chain management for healthcare is the practice of buying and distributing medical goods and services as they are transported from the loading port to the patient.

Q. What role does technology play in healthcare?

A. Modern disruptive technologies that are being integrated into healthcare encourage effective operations, improved security, and quick expansion of the global healthcare industry.

Q. What is the role of technology in supply chain management?

A. Hospital supply chains may become more robust and shock-resistant as a result of technological improvements.

Q. What are the functions of the healthcare supply chain?

A. It makes it easier to monitor and regulate the flow of pharmaceuticals, medical equipment, and healthcare services from the producer to the consumer, as well as to make sure that patients and healthcare professionals receive the prescription drugs and treatments they require when and when they need them.

Source : [appinventiv.com](https://www.appinventiv.com)

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DISCOVER THE TOP 10 HEALTHCARE INDUSTRY TRENDS & INNOVATIONS IN 2022

Are you curious about which healthcare industry trends will soon impact your business? Explore our in-depth industry research on 3 622 healthcare startups & scaleups and get data-driven insights into technology-based solutions in our Healthcare Innovation Map!

Healthcare industry trends that we witness today are new technologies and solutions that address the requirements for clinical diagnosis, treatment, and disease management. The global **COVID-19 pandemic** led to an upsurge in technologies for disinfecting, limiting transmission, detecting disease spread, as well as for treatment, patient management, and immunization. The advancements in the healthcare industry range from e-consultations, telemedicine, real-time diagnosis to accessing digital therapeutics provided by immersion technology tools. Genetic analysis, clinical data storage, and big data and analytics enable the development of precision medicine. Startups customize treatment planning and execution for individual patients using real-time, remote monitoring devices. The adoption of artificial intelligence (AI), the internet of things (IoT), and data management practices is making hospitals smarter. These solutions enhance workflows and staff scheduling and provide connected infrastructure, devices, and systems to accelerate accurate and equitable clinical services.

Innovation Map outlines the Top 10 Healthcare Industry Trends & 20 Promising Startups

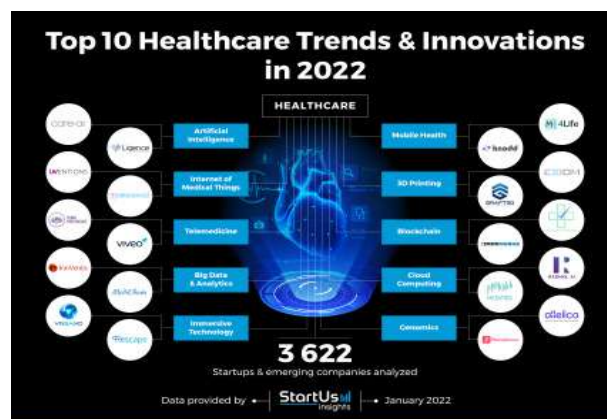
For this in-depth research on the Top Healthcare Industry Trends and Startups, we analyzed a sample of 3 622 global startups and scaleups. The result of this research is data-driven innovation intelligence that improves strategic decision-making by giving you an overview of emerging technologies and startups in the healthcare industry. These insights are derived by working with our Big Data & Artificial Intelligence-powered **StartUs Insights Discovery Platform**, covering 2 500 000+ startups and scaleups globally. The platform quickly delivers an exhaustive overview of emerging technologies within a specific field as well as identifies relevant startups and scaleups early on.

In the Innovation Map below, you get an overview of the Top 10 Healthcare Industry Trends and Innovations

that impact healthcare companies worldwide. Moreover, the Healthcare Innovation Map reveals 20 hand-picked startups, all working on emerging technologies that advance their field. To explore custom insights, **get in touch**.

Top 10 Healthcare Industry Trends

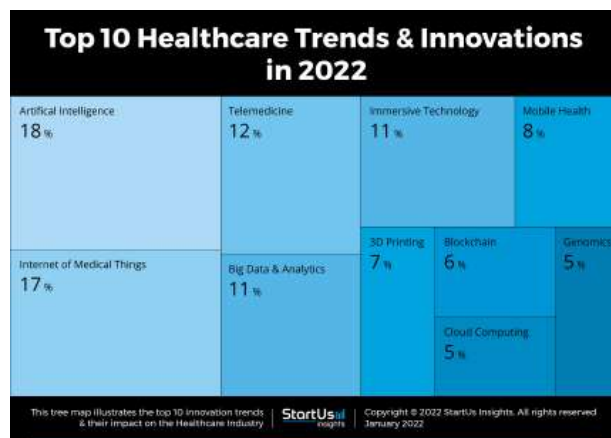
1. Artificial Intelligence
2. Internet of Medical Things
3. Telemedicine
4. Big Data & Analytics
5. Immersive Technology
6. Mobile Health
7. 3D Printing
8. Blockchain
9. Cloud Computing
10. Genomics



Tree Map reveals the Impact of the Top 10 Healthcare Industry Trends

Based on the Healthcare Innovation Map, the Tree Map below illustrates the impact of the Top 10 Healthcare Industry Trends. HealthTech startups employ AI and the internet of medical things (IoMT) for real-time, continuous, and remote monitoring of patients. Telemedicine solutions enhance accessibility to clinical services for patients unable to visit hospitals frequently. Big data and analytics solutions process structured and unstructured medical data and biomedical literature to generate novel insights. Virtual reality (VR), augmented reality (AR), and mixed reality (MR) allow MedTech startups to develop enhanced digital therapy experiences. 3D Printing, particularly bioprinting,

enables the development of quality prosthetics and organ transplants while reducing the risk of graft rejection. With the growth of digitization in healthcare, blockchain and cloud computing technologies play a major role in clinical data collection, storage, and exchange. Lastly, developments in genomics, nanomedicine, and regenerative medicine are advancing personalized healthcare.



Global Startup Heat Map covers 3 622 Healthcare Startups & Scaleups

The Global Startup Heat Map below highlights the global distribution of the 3 622 exemplary startups and scaleups that we analyzed for this research. Created through the **StartUs Insights Discovery Platform**, the Heat Map reveals that the United States is home to most of these companies while we also observe increased activity in India as well Europe, particularly in the UK.

Below, you get to meet 20 out of these 3 622 promising HealthTech startups and scaleups as well as the solutions they develop. These 20 startups were hand-picked based on criteria such as founding year, location, funding raised, and more. Depending on your specific needs, your top picks might look entirely different.



Top 10 Healthcare Industry Trends in 2022

1. Artificial Intelligence

AI is **replacing conventional labor-intensive and time-consuming processes** in healthcare with rapid, remotely accessible, and real-time solutions for diagnosis, treatment, and disease prevention. HealthTech startups develop software platforms, application programming interfaces (APIs), and other digital products to extend the benefits of AI. Some of the applications of artificial intelligence in healthcare include clinical workflow management, advanced surgery assistance, and medical diagnostics.

Care AI provides Autonomous Patient Monitoring

Care AI is a US-based startup offering an AI-powered autonomous patient monitoring platform. The startup's platform connects to the proprietary edge sensors and transforms ordinary rooms into Self-Aware Rooms. The platform increases patient safety, reduces medical errors, and improves the quality of care and clinical efficiency. It finds applications in monitoring hand sanitation, in-bed patient monitoring to prevent falls, and prediction of pressure ulcers, tremors, and other risks.

Ligence develops an Image Analysis tool

Ligence is a Lithuanian HealthTech startup that develops tools for cardiac risk diagnosis and measuring tools. The startup develops CardioEchoAI, a heart ultrasound image analysis tool. It uses deep learning algorithms to mimic steps performed by a cardiologist during a regular heart ultrasound examination, speeding up the analysis of 2D transthoracic echocardiography (TTE). The startup's automated heart ultrasound imaging workflow reduces the average examination time from 30 to 5 min, as well as increases the overall accuracy and diagnosis.

2. Internet of Medical Things

IoMT is instrumental for the development of products that need less or no human interaction to provide healthcare services. Connected medical devices, equipment, and infrastructure enable multiple applications like automatic disinfection, smart diagnosis, and remote patient management to name a few. Cognitive IoMT (CIoMT) is a recent subtrend that integrates sensory information, automatic processing, and communication through networks for real-time diagnosis, monitoring, tracking, and disease control.

Uventions provides Automated Disinfection

German startup **Uventions** develops solutions for automated disinfection of surfaces and infrastructure. The startup offers multiple products for the disinfection

of air in the room, door handles, objects, surfaces, and handrails. These solutions are easy to install in settings like hospitals, clinics, offices, airports, hotels, and even cruise ships. The system detects the presence of people in a room or door handle usage and automatically disinfects using ultraviolet C (UV-C) light radiation. The solution documents the disinfection process and reports in real-time through a dashboard.

Tredomo offers a Dose Monitoring device

Tredomo is a US-based startup developing a portable IoT device for dose monitoring. The remote, integrated dose monitoring system guarantees on-time delivery of a valid and monitored thermosensitive dose with smart disposal. The device also continuously monitors each new dose, disposable sharps, internal and ambient temperatures, battery level, performance diagnostics, and more.

3. Telemedicine

The COVID-19 pandemic accelerated the adoption of telemedicine by many governments, healthcare systems, clinicians, and patients. To tackle the pandemic, governments issued telemedicine guidelines to decongest healthcare facilities. **Telemedicine minimizes the load on facilities** and reduces the use of personal protective equipment (PPE) as medical practitioners reach their patients via telecommunication. HealthTech startups are working on telehealth services that facilitate public health mitigation strategies by increasing social distancing. Telemedicine also aids to assist elderly people remotely, reduces bed space, and conserves clinical supplies.

Ceiba develops a Tele-Intensive Care Unit (Tele-ICU) platform

Ceiba, a Turkish startup, provides a tele-ICU platform. The platform offers a fully customizable proprietary dashboard, providing a snapshot of all ICU patients and beds to relay time-critical information demonstrating their need for care. The platform provides AI-based predictive alerts for sepsis, mortality, length of stay, early warning patient deterioration, acuity level scoring, automated doctor progress notes, and nurse notes. Moreover, the solution is easy to integrate with any electronic health record (EHR) platform.

Viveo Health enables End-to-End Telehealthcare

Estonian startup **Viveo Health** offers a fully working, end-to-end telehealthcare platform that bridges insurance and healthcare. The startup provides an online doctor consultation platform for clinics, doctors, patients, and companies. It allows users to communicate with healthcare providers through video calls, as well as book appointments. The platform also

allows users to receive medical advice, e-prescriptions, or e-referrals directly from doctors by using the app.

4. Big Data & Analytics

Digitization is transforming medical data collection, storage, diagnostic techniques, treatment planning, surgical workflows, remote patient monitoring, and consultations. The volume of health and medical data is expected to increase exponentially in the coming years. **MedTech startups leverage big data and analytics to analyze** the unstructured and huge volumes of medical data. It improves the patient-based services, detects diseases earlier, and generates new insights into disease mechanisms. Moreover, big data solutions monitor the quality of processes at healthcare institutions, as well as enable better treatment methods.

InnVentis manages Chronic Inflammatory Diseases

Israeli startup **InnVentis** utilizes big data and machine learning to provide solutions for diagnostics, monitoring, and therapeutic decisions on major chronic inflammatory diseases. The startup's platform combines high-quality data with advanced algorithms to generate actionable insights for diagnostics and disease/health management of inflammatory diseases. The startup also provides products and services for discovering drugs for rheumatoid arthritis (RA). The startup plans to extend its platform to other inflammatory conditions like asthma, multiple sclerosis, and colitis.

MediChain enables secure Medical Data Exchange

MediChain is a British startup offering a decentralized platform for secure, fast, and transparent exchange and usage of medical data. The startup uses blockchain technology to securely store health records. It provides access to a patient's record to doctors, hospitals, laboratories, pharmacists, and health insurers while recording transactions on the distributed ledger.

5. Immersive Technology

The use of immersive technologies, such as AR/VR and MR, is on the rise in the healthcare sector. Applications for **VR in healthcare** vary from rehabilitation therapy and exposure therapy anxiety disorders to aiding in cognitive and physical rehabilitation. AR/VR also plays an important role in medical education. Immersive technologies also find applications in surgery, for instance for the perioperative projection of patient information, holographic images, and scans.

VRANO develops a Brain-Computer Interface

VRANO is a US-based MedTech startup that develops a brain-computer interface. Its technology combines

VR, neurofeedback, and clinical hypnosis principles to optimize health outcomes. The startup's patented method pulls medical patients out of a state of distress by immersing them in a relaxing virtual world. It induces a psychophysiological state that helps patients with their mental health needs. The platform alleviates symptoms and improves long-term patient outcomes while lowering healthcare costs.

Rescape Innovation supports Patient Care

British startup **Rescape Innovation** develops immersive technologies to support patient care in both adults and children. The startup specializes in virtual reality (VR) distraction therapy to support pain and anxiety/stress management. The solution offers cystic fibrosis (CF) patients to view therapeutic documentaries, wherein they can travel among the planets in the solar system or experience surfing, skydiving, and other adrenaline-fueled activities. The startup's interventions reduce anxiety in patients.

Curious to learn which technology will most impact your business?

6. Mobile Health (mHealth)

mHealth technologies provide access to personalized information using digital solutions and connected devices. Mobile devices enable visualization of health issues that prevent patient commitment. Unconstrained by geographical boundaries and using real-time data streams, smartphone-linked wearable sensors, point-of-need diagnostic devices, and medical-grade imaging make healthcare delivery more equitable and accessible. mHealth solutions played a critical role in controlling the spread of the COVID-19 pandemic by enabling contact tracing, surveillance, quarantine control and management, testing, and dissemination of relevant information, as well as immunization cycle tracking and notification.

M4Life develops Blockchain-based mHealth platform

M4Life is an Israeli startup developing a mobile health platform. M4Life's provides a simplified and smooth patient/caregiver relationship, allowing information traceability inside the mHealth care chain. The startup's platform uses a blockchain-based architecture to share prescriptions, diagnostic images, medical certificates, patient consent. Moreover, it offers a telemedicine interface for communication between patients and physicians.

Knodd provides E-Consultation services

Swedish startup **Knodd** provides a platform for e-consultation with pediatricians. The startup's platform offers video calls to experienced pediatric nurses and pediatricians with more than 5 years of experience,

providing safe answers about children's health within minutes, free of charge from anywhere. The platform also has digital courses on parenting and child care.

7. 3D Printing

3D printing is gaining traction in the healthcare industry for multiple applications like **printing lightweight prosthetics, bionics, and casts** for fracture repair. The use of inexpensive, lightweight biomaterials and smart materials ensures improvement in care delivery and time of production while reducing costs. 3D printing technologies are advancing the development of patient-specific models of organs and surgical tools, using the patient's own medical imaging. Another area of application includes personalized surgical instruments that increase a surgeon's dexterity and support better surgery outcomes while facilitating faster and less traumatic procedures.

Exiom develops Reusable Support Device

Exiom is a US-based startup that uses 3D scanning and printing technology to produce customized solutions to heal fractures and sprains. The startup develops a hygienic, waterproof, breathable, itch-proof, easily removable, and reusable support device that adapts immobilization to each patient's condition. The key benefit of the startup's solution includes onsite printing in a clinical setting, eliminating the time and cost of recasting with traditional materials.

Graft3D assists in Surgery Planning

Indian MedTech startup **Graft3D** provides a solution for surgery planning and execution. It utilizes radiological-assisted 3D Model (RAM) technology to visualize a patient's anatomy prior to surgery. The startup's Virtual Surgical Platform (VSP) assists doctors in predetermining surgical cuts. The startup designs patient-specific implants (PSI) with informed evidence from nearly 100 successive case studies on complex surgeries. It uses a haptic device that allows doctors or surgeons to sense the bone consistency.

8. Blockchain

The security and traceability of blockchain make the technology suitable for multiple applications in the healthcare industry. Some of these include electronic medical records, remote patient monitoring, pharmaceutical supply chain, and health insurance claims. **Blockchain technology** supports the management of EHRs and FHIRChain (Fast Health Interoperability Records) for sharing clinical data. It also plays an important role in smart contracts, tackling drug counterfeiting, as well as storing, sharing, and retrieving remotely collected biomedical data.

Blockpharma enables Drug Traceability

Blockpharma, a French startup, develops blockchain-based drug traceability and anti-counterfeiting solution. The Blockpharma app allows the consumer to instantly check the authenticity of the drug box. BlockPharma integrates with multiple information systems and stores authenticated data on medicines stored on Crystalchain, the startup's private blockchain. Upon detection of a falsified medicinal product, the laboratories immediately alert BlockPharma which then adds the medicine to its flagged list.

Iryo Moshi provides a Practice Management tool

Slovenian startup **Iryo Moshi** provides a modern practice management tool for private healthcare providers. The startup specializes in blockchain, interoperability, open EMR, consumer relationship management (CRM) areas, and provides an integrated digital healthcare platform. The platform features automated appointments, invoicing, clinical data storage and management, and digital documents and forms. The solution is cloud-connected and also is compliant with General Data Protection Regulation (GDPR) and Health Insurance Portability and Accountability Act (HIPAA).

9. Cloud Computing

Cloud computing allows clinicians to establish quality patient journeys supported by tech-enabled care delivery via telehealth and remote monitoring. It allows for **greater storage capabilities and processing power** for data analytics and eliminates the need for on-premise storage. Cloud platforms integrate network, security, billing, monitoring, and alerts, together with access and identity management. It also provides streamlined data access, data storage and management, data backup and recovery, smart data potential, and data interoperability, among others.

Radmol AI improves Access to Healthcare

Irish startup **Radmol AI** utilizes the latest advancements in cloud computing, data analytics, blockchain, and AI-based technology. It provides a platform for connecting patients and healthcare providers to local and global expert radiologists on-demand. The startup's technology enables accessing reports from anywhere, at any time. It creates solutions that democratize access to healthcare, enabling patients, physicians, and providers.

Medified offers Mental Health Monitoring

Finnish startup **Medified** provides cloud-based dynamic mental health monitoring software. The software as a service (SaaS) platform aids physicians to monitor patients in real-time, helping patients get the right treatment faster and more efficiently. The software analyzes clinical data and provides valuable clinical

insights, enabling remote, digital healthcare services with an interactive dashboard. It allows patients to capture and communicate daily mood and well-being to provide healthcare professionals self-treatment information in real-time.

10. Genomics

There have been notable efforts in developing **genomics tools** for various applications in recent times. Integration of both genomic knowledge and genomic processes into existing clinical workflows would ensure physicians perform established communication and actionable recommendations that a genomic test can provide to patients. The new arena of personalized medicine is possible due to the advent of innovations in genomics. Gene therapy and gene-based therapy solutions have revolutionized clinical medicine and specialty care for several unmet clinical needs.

Allelica performs Genomic Risk Prediction

Italian startup **Allelica** predicts human traits and diseases based on genomics data. The startup's proprietary platform performs genomic risk prediction based on polygenic risk scores (PRSs). Allelica's technology uses machine learning algorithms to accelerate clinical genomics for applications in precision medicine. The startup's solution identifies individuals with a high genetic liability of cancers and heart diseases who are unidentified by traditional risk models.

Phosphorus provides At-Home Genetic Testing

Phosphorous is a US-based startup developing an at-home genetic test. PhosphorusONE, the startup's test, uses saliva samples to detect diseases that are caused by multiple genes. The comprehensive test uses next-generation gene-sequencing technology to analyze 375 different genes. It determines the risk of multiple diseases including heart disorders, inherited cancers, infertility, adverse drug reactions, neurodegenerative disease, vision loss.

Discover all Healthcare Technologies & Startups

The Healthcare Industry Trends and Startups outlined in this report only scratch the surface of trends that we identified during our in-depth research. Among others, robotics, 5G, and stem cell therapy will transform the sector as we know it today. Identifying new opportunities and emerging technologies to implement into your business early on goes a long way in gaining a competitive advantage. **Get in touch** to easily and exhaustively scout relevant technologies and startups that matter to you.

Source: www.startus-insights.com



3 STRATEGIES TO LEAN INTO THIS NATIONAL HEALTH CARE SUPPLY CHAIN WEEK

KAILA GEISINGER

In the healthcare “theater,” supply chain professionals largely work behind the scenes. As a result, we tend to notice supply chains only during times of disruption. Yet, these professionals frequently engage in logistical acrobatics to help protect clinicians’ ability to perform in their roles to ultimately provide excellent patient care.

Since the pandemic upended healthcare, there’s been an overwhelming realization of just how crucial the supply chain is to the healthcare delivery ecosystem. Healthcare supply chain professionals are innovators who increasingly have the ear of top healthcare leaders.

Shining light on this evolution of appreciation, two-thirds of respondents in a McKinsey survey of U.S. health system and supply chain executives said that the pandemic improved their perception of the supply chain’s impact on their organization. Despite countless disruptions in the supply chain, their position as a strategic ally has been confirmed.

As we celebrate **National Health Care Supply Chain Week** sponsored by The Association for Health Care Resource & Materials Management (AHRMM), we extend our gratitude and appreciation to all the professionals who continue to show resiliency and flexibility to ensure supply chain health and continuity within patient care.

Here are some of the top strategies for healthcare supply chain professionals to lean into this year and beyond.

1. Strive for clinical alignment via a common mission

Technology, on-demand data, and proactive sourcing strategies are all impactful when it comes to supply chain health, but interdisciplinary teams that position organizations to spend wiser are just as critical when it comes to pinpointing value. Internal policies, conversations around value models, and flexibility between non-clinical and clinical stakeholders are all indispensable factors in the modern healthcare supply chain.

When we consider the role of collaboration, the relationship between the supply chain and clinicians can either be a detractor or driver of compliance. During COVID-19, physicians and other clinicians were exposed to supply chain challenges like never before, requiring them to elevate their engagement and provide clinical validation for the allocation of products. An inflection point, this formed a necessary bridge for clinical alignment to occur and connected a chasm that may have seemed too vast to have crossed in previous years. To move forward with sustainability, systems are recognizing that it is no longer a war between clinical preference and cheapest cost. Understanding and prioritizing value, not preference, is the only way forward together. This takes a common mission where all stakeholders unite around the shared, systemwide mission to provide the highest value at the lowest possible cost.

In today’s complex environment where the best of efforts can still result in negative margins, fiscal responsibility must be tied to a larger mission. For both products and processes, this opens the door for healthy debate and flexibility as partners in the clinically integrated supply chain always come back to patient outcomes as the common denominator. For instance, the act of evaluating and selecting a new product or technology to be brought into a facility is a primary supply chain activity via value analysis functions, but it also directly impacts patient care from a clinical perspective.

In this operational framework, every decision is viewed from a patient-centric lens, because even choices that may not seem to directly impact outcomes may inadvertently influence care if they take resources away from care delivery. Engaged leadership is at the helm of this charge, promoting a culture where accountable physician champions actively participate in larger supply chain initiatives to ensure outcomes and cost are understood together. From consideration and contracting to utilization and ongoing evaluation, the two functions should be united around the same, outcomes-focused goal.

2. Work to build transparent infrastructures

In the healthcare ecosystem, and particularly within the supply chain function, transparency is essential. Look no further than the period of inopportune supply challenges and the resulting emphasis on forecasting and visibility across the entire value chain, from raw materials to product usage. Additionally, when we consider the wave of M&A activity in healthcare, the challenge of finding savings opportunities and reconciling processes across the system also elevates the need for transparency. While cost reduction is a big incentive for hospital consolidation, it is also a challenge to reach consensus on how to standardize products and processes across the system. Unfortunately, it is far too easy to fall into the trap of comparing apples to oranges when the available data isn't clear and expertise is scarce.

Organizations are building transparent infrastructures to identify how facilities differ, share information across stakeholders, and unite the supply chain around a standardized approach. As systems standardize, reporting must be transparent and frequent enough to track performance and ensure accountability.

Yet, while the need for transparency is clear, the path is often foggy. As leaders lean into transparency initiatives, proactively socializing supply chain realities is critical in creating a culture focused on efficient, transparent operations. Ultimately, it is both an organization's culture and digital infrastructure that work in tandem to promote visibility and enable a nimble supply chain.

It is worth asking:

- In our current state, can we promote transparency by rapidly informing our diverse stakeholder groups when a disruption in the supply chain occurs?
- Are our methods of reporting user-friendly, and is critical information easily accessible for different stakeholder groups?
- How is our organization articulating, evaluating, and communicating value?
- Who is accountable today and in future years when it comes to realizing value? How must we expand our current thinking to deliver value across the continuum?
- How are our current organizational policies, procedures, and technologies working or not contributing to the achievement of transparency

and value goals?

3. Invest in a digital infrastructure

Data is the backbone of a top-performing supply chain. Yet, while data may be widely available, a lack of integration hampers analytics capabilities. Shockingly, in many cases, external organizations that sell to hospitals may have more transparency into a hospital's fiscal footprint than the hospital itself. But investing in digital infrastructures allows the supply chain to function with a competitive level of awareness, making goals like compliance and cost avoidance achievable. For those who still use spreadsheets, cost-benefit analysis can only go so far, and emergency situations can expose a dangerous breakdown in hospital operations.

When it comes to making operations practical, digital dashboards are equipping supply chains with the tools necessary to drive strategic decision making, not just audit information. When data-backed software is used at the points of evaluation and decision—for instance to process and evaluate product requests or create access management policies—analytics become operational and promote process standardization.

Another key benefit of a digital infrastructure is the newfound level of flexibility that allows the supply chain to increase an organization's reaction speed and pivot quickly when needed. Spend management software can be the strategic partner necessary to add value, increase standardization across the continuum, optimize contracting, streamline new product introduction, maintain continuity, and integrate clinical evidence to mitigate risk, protect governance, and ensure compliance.

Ultimately, a digital strategy that replaces manual processes to deliver definitive value can significantly boost supply chain strength. To learn more about how clinical alignment, increased transparency, and digital tools are positioning supply chains to lead in the healthcare innovation journey, request a demo here.

At the juncture of opportunity and critical need, there has never been a better time to recognize hospital supply chain professionals for their strategic partnership in supporting healthcare longevity. We look forward to celebrating National Health Care Supply Chain Week for years to come. Thank you to all the professionals who make patient care possible every day!

Source: www.symplr.com





WHAT IS THE RESPONSIBILITY OF TECHNOLOGY IN STRENGTHENING THE HEALTHCARE SUPPLY CHAIN?

SHUBHAM CHAUHAN

Leading executives at medical facilities are considered to restructure their supply chain management for healthcare which is most efficient in terms of operations and cost-effectiveness. It supports **improving patient care as hospitals**, and health systems will gradually adjust to life after the pandemic.

It can save patient lives by depending on an effective healthcare supply chain. Furthermore, applying technology in the medical field is one step toward progress in healthcare firms.

Hence, it is not surprising that hospitals are utilizing technology more than ever, from **electronic health records (EHRs)** to patient portals. However, it may be a surprise that each hospital has not completely adopted technology in one field: inventory management referred to as supply chain management (SCM).

Therefore, it makes sense that the supply chain usually charges higher for hospitals and healthcare systems. By automating and standardizing their supply chain procedures with the use of technology, hospitals might save an average of \$19.8% or \$25 million annually.

Healthcare firms obtain long-lasting advantages from transferring a traditional supply chain to a digital one. Accessibility to everyone is now rapid, secure, convenient, and more affordable healthcare in the form of digital healthcare. By this, a hospital system will save operating costs and classify the growth prospects a lot thanks to the digitization of the healthcare supply chain.

In this blog, we will discuss the different aspects of a healthcare supply chain and describe the importance of adapting technology in creating the traditional healthcare supply chains after it is more efficient. Let us see how the technology supports supply chain development with the steps below, which are integrated successfully.

Define supply chain in the healthcare industry

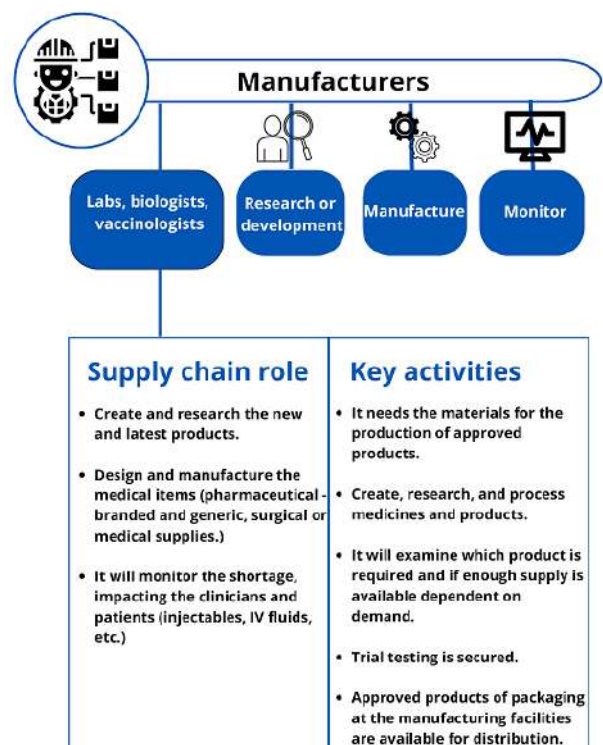
The production, distribution, and delivery of medications and various healthcare supplies to patients are ensured by the complicated network of systems, elements, and processes which is referred to as the supply chain in the healthcare industry.

However, during the pandemic or natural disaster, this

sophisticated worldwide system has been designed with various built-in safeguards to guarantee that medicines and other medical supplies are produced and distributed swiftly.

The capability of the supply chain to anticipate, plan for, and respond to the possible interruptions in one or more chain links over the various pre-established global networks is the utmost of these defenses.

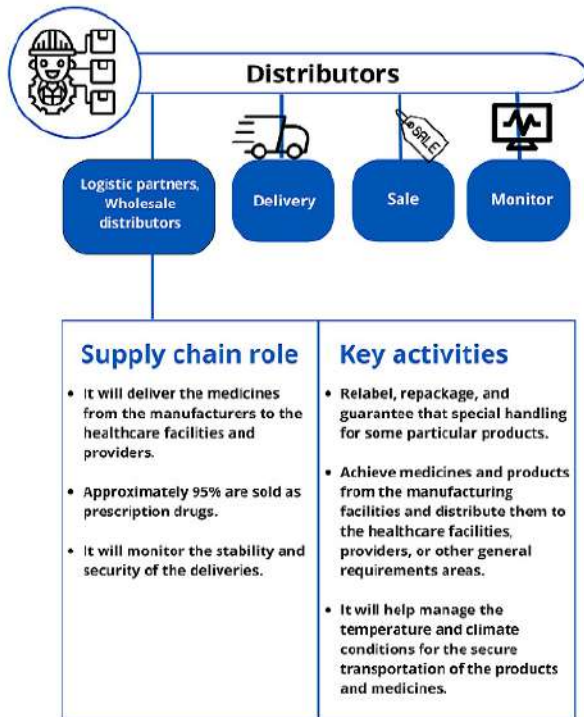
Pharmaceutical quality standard developers, health systems, pharmacies, hospitals, and health insurance providers are some participants in the healthcare supply chain. On the other side, manufacturers and distributors are necessary to the healthcare supply chain.



Healthcare supply chain manufacturers

We believe in manufacturers producing the patient medications and medical supplies that form the initial link in the supply chain in hospitals. Manufacturers can control their flow of products from the site of manufacturing to wholesalers, and, in some cases, it is directly to hospitals or pharmacies. The other link is

the distributor in the supply chain for healthcare.



Healthcare supply chain distributors

When we think about medical supply distribution, distributors purchase the prescribed medicines and the other healthcare supplies in a very large quantity from manufacturers and correctly manage the heavy inventories in the key sites across the region. A few wholesalers serve some clientele, like nursing homes or a particular product category, like biologics.

What is supply chain management for the healthcare industry?

Supply chain management buys and distributes medical services and goods as they are transferred from the loading port to the patient.

The management of the healthcare supply chain is very complicated. The issues are only exacerbated by improper data reporting, low product uniformity, growing regulatory needs, and the general lack of automation.

While there are so many problems in the supply chain management, the major issues are hoarding of goods, desire for some specific products that are available in stock, product expirations, out-of-stock problems, which will result in high delivery costs, theft, and unjustified increment in the inventory costs dependent on the demand. Many other factors in the supply chain will increase the budget.

Performance of supply management in healthcare

The goal of the supply chain in the healthcare industry is to analyze departmental vulnerabilities and suggest

solutions to mitigate them. It will try to pinpoint the problematic areas to obtain the desired health outcomes and boost the financial support for international health.

The main advantage of a better supply chain in the healthcare industry has enhanced operations, content staff, successful treatment, and contented patients.

Healthcare supply management properly integrates hospital departments, revenue cycles, and operations. A supply chain can be considered a backend application required for implementing all various activities.

Supply chain management in hospitals will guarantee that medications and other products are available when required, reduce inventory waste, improve patient care, and coordinate efforts across all the departments to lessen human and pharmaceutical errors.

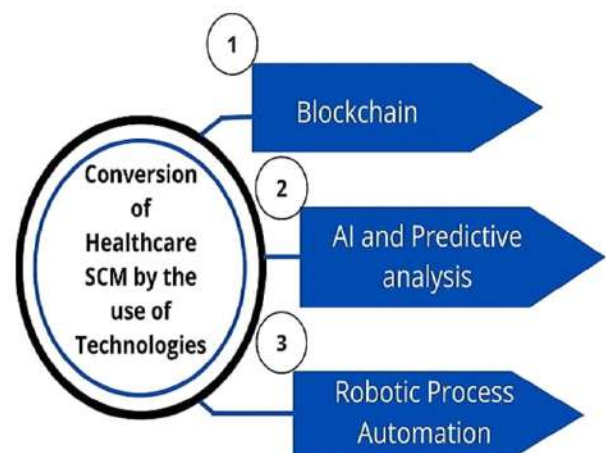
It is achieved by taking various steps, such as optimizing processes, integrating the digital subsystem, and incorporating technologies to promote supply chain management.

Importance of technology in the healthcare supply chain

Incorporating the cutting-edge, latest technologies into the supply chain management systems, like data analytics, AI (artificial intelligence), IoT, and Blockchain, promotes efficient operations and increases its security and fastest growth in the global healthcare sector.

Marketing of **medical app development** assumes that the supply chain market will rise from \$2.5 billion in 2022 to \$3.5 billion by 2025. Developing cloud-based solutions, reducing operating expenses, and increasing efficiency are key drivers that foster this expansion. The common usage of SCM, specifically in the healthcare sector, proves incredibly advantageous for human lives.

How can emerging technologies convert healthcare supply chain solutions?



Transfer healthcare SCM via technologies

The results could be disastrous or intensely alter a patient's life if the practitioners run into unexpected shortages while giving the care. Fortunately, technological advancement will lead to a stronger application chain in hospitals that is much more resilient to shocks. Let us see some ways in which some of the most cutting-edge technologies will help us to move towards efficient digital healthcare with robust medical development distribution.

Increase the visibility by utilizing the Blockchain

Blockchain and cryptocurrencies are generally used vice-versa. The digital ledger technology began there; its promise extends beyond that. For example, the Blockchain makes it easier to share knowledge about medical supplies and other vital products that will sustain **custom healthcare development**.

The most effective procedure for tracking the entire lifecycle of a medicine, down to a single dose, is completely based on blockchain technology. Organizations are developing a complete range of innovative blockchain-based solutions to offer a way of tracking items safely and independently via the entire lifecycle.

Blockchain plays an important role in the supply chain transformation by reducing fraud and enhancing the better-managed quality in producing and distributing pharmaceuticals. Pfizer and Roche are the pharmaceutical corporations developing this type of solution.

Predictive analysis and AI

A mechanism in which data is managed, analyzed, and used across all firms has gone through a fundamental transformation, and it is because of AI. Institutions that use predictive analysis instead of a more fundamental descriptive kind are because of the strides in AI. Pattern monitoring and estimating the possibility of future events are made easier by the use of predictive analytics.

A **custom healthcare software development** uses predictive analysis to benefit the statistical data and operate the supply chain in hospitals and elsewhere by reducing variance and learning more about demand trends and supply utilization. Accurate forecasting supported by data facilitates the optimization of inventories and assists in better-informed decision-making.

Robotic Process Automation (RPA)

The repetitive, labor-intensive, and manual processes in a healthcare supply chain are removed by adopting an RPA system. It reduces the time and money spent on a supply chain and eliminates the chance that human error will be an issue down the line.

Routine automated tasks will help in improving productivity and lowering the price. Modernizing a warehouse with RPA-deployed services will boost productivity and optimize revenue.

Healthcare supply chain automation

The main purpose of improving the supply chain process software is to streamline and automate the routine manual processes carried out within **healthcare development**.

Usually, two categories of SCM technology solutions are available to decision-makers in medical app development.

First is **Enterprise Resource Planning (ERP)**, but it doesn't need to be the only option for hospitals as it is used in many industries, and sometimes the vendors may lack healthcare knowledge.

ERP systems are frequently adopted by the non-healthcare and the largest firms that need a longer time to design and customize resources in their workflow.

A second type is specialty healthcare inventory and supply chain solutions, generally low in price, in-depth industry knowledge, and healthcare-focused solutions. This system intends to focus on specialized fields, like surgery and other healthcare divisions.

Examples of the digital supply chain

Organize the data and manage the flu medication

Using real-time data to predict the seasonal demand for anti-influenza medications provides the hospital with a clear view of where drug doses are in the supply chain. It also confirms that the proper supplies are accessible for the right patient at the correct time and permits the hospital to shift supplies to the most required areas during a shortage.

Increases transparency in inventory

Healthcare software developers and suppliers will enhance visibility over the consignment inventory at the patient's bedside and transfer the movement of inventories in real time to the areas experiencing shortages by integrating cutting-edge technologies.

Track resources with the Blockchain via the care spectrum

The stability of Blockchain paves the way for product traceability from suppliers of raw materials to manufacturers to consumers to healthcare providers, and it might aid in determining how opioids will end up in the wrong hands.

Supply chain digitization and digital healthcare are the largest trends in the healthcare industry in the future.

Conclusion

A correct selection of the technology will help you drastically improve healthcare supply chain management. You have to follow the whole process properly, which will help you to give the desired output.

Source: flutteragency.com

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HEALTHCARE SUPPLY CHAIN MANAGEMENT MARKET REPORT

Healthcare Supply Chain Management Market Report: By Component (Software and Services, Hardware), Deployment Type (On-Premises, Cloud-Based), End User (Healthcare Product Manufacturers, Healthcare Providers, Distributors and Retailers, Logistics Companies) – Global Industry Revenue Estimation and Demand Forecast to 2030

Market Overview

The healthcare supply chain management market was valued at an estimated \$2,090.5 million in 2021, and it is expected to advance at a CAGR of 10.2% during 2021–2030. The major factors propelling the growth of the market include the pressure of cost reduction in the healthcare industry, adoption of GS1 standards, along with the increasing investments by healthcare providers and related product manufacturers in healthcare supply chain management solutions.

According to a study, the average annual spending on supply chain management solutions by hospitals is around \$12.1 million, including on product inventory that expires before use. Such products account for approximately 7–10% of the hospital inventory. Moreover, if used on a patient, they could cause severe health problems, in turn, drawing the ire of the FDA and medical malpractice

the purchase of medical supplies at reduced costs. Few other startups that are trying to make a difference in the industry include Aknamed, Inneate, Feiyi, Veratrak, and Hashprix.

The market experienced the positive impact of the COVID-19 pandemic, as the demand for medical supplies and other related products across the globe spiked significantly. Cold chain companies that delivered vaccines and other medicines, which require temperature control, during the pandemic embraced technological upgradations and new modes of operations. For instance, UPS, which acted as one of the major cold-chain companies to supply temperature-controlled medical supplies, including vaccine doses, was able to deliver on-time with the help of advanced SCM technology.

However, the crisis amplified the issues or gaps in healthcare supply chain management, such as a lack in the adoption of enhanced technology for managing the supply chain functioning, along with a strong dependence on overseas manufacturing. To combat such issues, healthcare companies are investing in SCM solutions.

Software and Services To Witness Faster Growth during Forecast Period

The software and services category of the market is expected to grow at a significant CAGR, of more than 10%, during the forecast period. The major factors credited for this growth include the frequent product introductions, rising need for greater access to business intelligence data to formulate strategies, ease of product tracking via these solutions, adoption of eco-friendly initiatives, such as those for decreasing the paperwork in healthcare organizations, and increasing number of online purchases.

The software helps organizations in planning, procurement management, inventory management, and warehouse management. Supply chain management software not only automates the process, thus minimizing manual tasks, but also makes the process cost-effective. These benefits propel the adoption of healthcare supply chain software and services.

Healthcare Supply Chain Management Market Report



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To address such issues in the supply chain of the healthcare industry, a large number of startups are being launched across the globe. For instance, StratMed connects hospitals and manufacturers for

Coverage

Report Attribute	Details
Historical Years	2017-2021
Forecast Years	2022-2030
Market Size in 2021	\$2,090.5 Million (Estimated)
Revenue Forecast in 2030	\$4,999.3 Million
Growth Rate	10.2% CAGR
Report Scope	Market Trends, Drivers, and Restraints; Revenue Estimation and Forecast; Segmentation Analysis; Impact of COVID-19; Companies' Strategic Developments; Market Share Analysis of Key Players; Company Profiling
Segments Covered	By Component; By Deployment; By End User; By Region Explore more about this report - Request free sample pages

Cloud-Based Healthcare Supply Chain Management Solutions Are Being Preferred

Cloud-based platforms are expected to witness sales growth of around 12% during the forecast period as they are transforming the healthcare supply chain management market. A large proportion of the end users are preferring cloud-based solutions over on-premises solutions owing to the former's scalable deployment through the software-as-a-service (SaaS) model, ease of sharing information at varied locations, and low maintenance and installation costs.

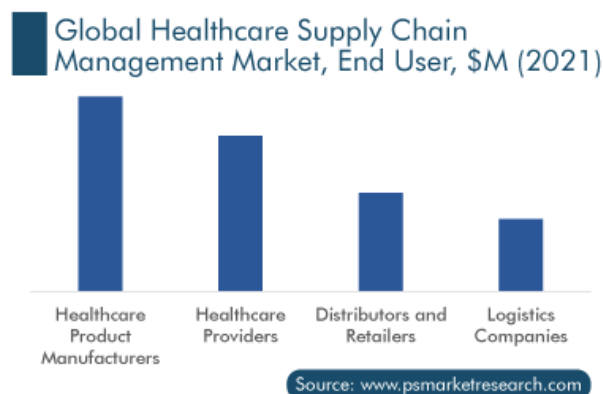
The SaaS model is quite popular among pharmaceutical companies as it helps them reduce time delays across the product lifecycle, from development to manufacturing and distribution. Additionally, using the SaaS model across the entire supply chain helps companies apply a standardized process to meet environmental and social objectives.

Healthcare Product Manufacturers Are Largest End Users of Healthcare Supply Chain Management Solutions

Healthcare product manufacturers are the largest end users, accounting for more than 35% of the market share. Large pharmaceutical companies are outsourcing the manufacturing to CDMOs in developing nations so as to meet the increasing demand for various products and decrease the cost of their operations. Thus, CDMOs are expanding their footprint across countries by establishing manufacturing units. For instance, in 2021, Sun Pharma planned to set up a new manufacturing unit in the Andhra Pradesh state of India. Thus, manufacturers are opting for supply chain

management solutions to track the manufacturing process, warehouse management, and transportation.

Additionally, healthcare providers, such as hospitals, clinics, and diagnostic centers, are the second-largest users of healthcare supply chain management solutions. The reason for the same is the rising need for data for procurement planning and inventory management, so that organizations neither have a shortfall nor do they incur extra costs because of an inventory of expired products.



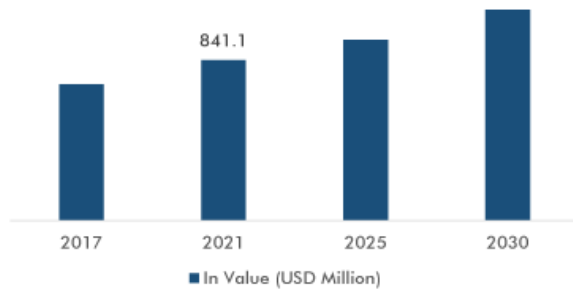
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Regional Outlook

The North American healthcare supply chain management market held the largest share, of around 40%, in the global market. The region dominates the market mainly because the U.S. is the largest employer in the healthcare sector across the globe with more than 780 thousand companies. Moreover, the U.S. spends almost twice of what other countries spend on healthcare, which accounted for 19.7% of its GDP in 2020.

The APAC market is expected to witness the highest CAGR, of more than 11%, during the forecast period. This is ascribed to the emergence of countries such as India, China, South Korea, and Singapore as the preferred locations among large pharmaceutical companies for drug manufacturing, pathological testing, and clinical trials. As a result, pharma companies are either outsourcing to CDMO companies or investing in them. For instance, in January 2022, Piramal Pharma Limited (PPL) invested in India-based Yapan Bio; the former now has a 27.78% equity stake in the latter company. This investment was done to add the capabilities of developing and manufacturing large molecules for human clinical trials to PPL's portfolio.

North America Healthcare Supply Chain Management Market, \$Million, 2017–2030



Source: www.psmarketresearch.com

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Business Opportunities

- Medical device and pharmaceutical manufacturers and healthcare providers are massively investing in advanced technology for managing their supply chains and moving toward automated processes. The most-prominent technologies in this regard include artificial intelligence, internet of things, 3D printing, product tracking, and logistics optimization.

- The blockchain technology, which is still in the development stage, also has the potential to prosper in the healthcare SCM market.

Key Strategic Developments of Market Players

In recent years, companies operating in the market have been actively involved in product launches, mergers & acquisitions, partnerships, and other development activities. For instance:

- In April 2022, TraceLink launched the multi-enterprise Supply Chain Work Management solution on the Opus Digital Network Platform for the healthcare and life sciences industry.

- In March 2022, symplr announced plans to acquire medical supply chain management software company GreenLight Medical, to help build its product line and offer its clients more services in the SCM arena.

- In February 2022, Global Healthcare Exchange acquired Syft, a provider of AI-enhanced inventory control and end-to-end supply chain management software and services, to enhance automation, data analytics, and inventory management capabilities for the healthcare industry.

Key Players in Healthcare Supply Chain Management Market Are:

- SAP SE
- Oracle Corporation
- Infor Inc.
- McKesson Corporation
- Tecsyst Inc.
- Global Healthcare Exchange
- Cardinal Health
- Determine
- Epicor
- Manhattan Associates

Market Size Breakdown by Segment

The report offers comprehensive market segmentation analysis along with market estimation for the period 2017–2030.

Based on Component

- Software and Services
- Hardware

Based on Deployment Type

- On-Premises
- Cloud-Based

Based on End User

- Healthcare Product Manufacturers
- Healthcare Providers
- Distributors and Retailers
- Logistics Companies

Geographical Analysis

- North America
 - o U.S.
 - o Canada
- Europe
 - o Germany
 - o France
 - o U.K.
 - o Italy
 - o Spain
- Asia-Pacific (APAC)
 - o China
 - o India
 - o Japan
 - o Australia
 - o South Korea
- Latin America (LATAM)
 - o Brazil
 - o Mexico
- Middle East and Africa (MEA)
 - o Turkey
 - o Saudi Arabia
 - o South Africa

Source: www.psmarketresearch.com

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HOW TO TACKLE HEALTHCARE LOGISTICS CHALLENGES IN 2022

KAWALPREET, PRESIDENT
ASIA PACIFIC, MIDDLE EAST AND AFRICA, FEDEX EXPRESS

Combining the power of networks with data is paving the way for better logistical support for healthcare players across Asia Pacific and beyond.

COVID-19 infections hit East Asia considerably in 2022, with Hong Kong, Shanghai and Beijing reporting record numbers of daily cases since the start of the pandemic. Like the response to previous waves, adequate and regular supplies of COVID-19 vaccines, diagnostic test kits, and other personal anti-epidemic equipment were needed to help reduce transmission chains among the population. At the same time, the global supply chain faces a monumental challenge due to one of the world's most stringent zero-COVID measures in China, one of the world's largest manufacturer of goods.

The impact of the COVID-19 restrictions and the rise in e-commerce have squeezed the global healthcare supply chain. Building a more resilient network of logistics centers and storage facilities has therefore become an imperative for many logistics services providers. So, how can logistics providers address the new challenges healthcare customers are facing today?

Shortage of cold-chain storage facilities hinders mass immunization

Immunization against COVID-19 is essential to overcoming this pandemic. The World Health Organization (WHO) set a global target of immunizing 70% of the world's population by June of this year, but by July, the vaccination rate still stood at under 67%. In Asia, where nearly two-thirds of the world's population resides, the lack of cold chain storage facilities has been a challenge to mass vaccination efforts. Many developing

countries in the region still lack the infrastructure to stockpile vaccines, particularly ones that require extremely low-temperature storage.

Cold chain storage serves as the backbone of global vaccinations – through effective vaccine inventory management. The ability to stock vaccines, preserve their efficacy and reduce the wastage of shots allows countries to implement comprehensive immunization programs. To enable this, logistics providers have been partnering with national governments and local healthcare authorities and clinics to establish supply lines and respond swiftly whenever an outbreak arises.

For decades, FedEx has been able to leverage its cold chain network to ship vaccines, biologics, and medical aid across five continents. In the past three years, we've added more than 10 additional facilities to our network, including three key Life Science Centers in Asia – South Korea, Japan and Singapore. This means we provide extensive capabilities to support cold chain logistics in the region, including round-the-clock temperature monitoring and contingency cold rooms at several air cargo gateways. To create a sustainable global healthcare supply chain to combat future pandemics, Asia's logistics sector will need to expand its current cold chain infrastructure to better meet unforeseen demand surge in the future.

Imbalance of demand and supply due to compressed supply chain capacity

Data released by the International Air Transport Association (IATA) reveals that the impact of the Omicron variant in Asia, the zero-COVID policy in China and Hong Kong, and the Russia-Ukraine

conflict has led to a decline in both air cargo volume and available capacity: 5.1% and 6.4% year-on-year for the APAC region, the largest drop among all regions. Asian countries make up half of the world's top 10 manufacturers, of which China is responsible for nearly one-third of the global output. The Omicron resurgence in China has inevitably put strain on global supply chains.

The good news is, despite these headwinds, the need for vaccines, treatments, diagnostic tests, and protective equipment has not waned thanks to strong production capabilities within the Asia markets. China and India now lead the world in the production of personal protective equipment, and Indonesia is becoming a major manufacturing hub for mRNA-based vaccines according to the WHO. The challenge for logistics providers is navigating demand fluctuations of the healthcare supply chain and other types of shipments (such as e-commerce shipping), and consistently delivering for both.

Since the start of the pandemic, we've been actively flexing our network and overall capacity to ensure the distribution of life-saving healthcare and pharmaceutical supplies will not be compromised while supporting the growing demands of e-commerce shipments across the globe. In September last year, we added six new intercontinental flights with an added capacity of nearly 2,700 tons each week. While global supply chain disruptions persist, logistics providers need to work towards expanding shipping capacity and strengthen networks to alleviate delivery bottlenecks for businesses.

Limited healthcare expertise compromises the reliability of delivery services

Supply chain disruptions, coupled with high volumes of shipments and bottlenecks in customs clearance, can easily lead to undesirable situations where packages are being mishandled, delivered to the wrong location, or even lost. In healthcare logistics, failure to deliver the right package to the right location could mean life or death in some cases.

The pandemic has highlighted the drawbacks of a

distribution system that relies heavily on human labor, and a need to explore solutions offered through technology. At the same time, COVID-19 provided an impetus for the world to accelerate its digital transformation. It's also acted as a catalyst for the logistics industry to build smarter supply chains for businesses of all kinds.

Imagine the amount of insights logistics players can gain from scanning approximately 20 million packages everyday through a global network - and each package is scanned multiple times during its transportation. Not only does this allow us to track and monitor our customers' shipments, but it can also help collect real-time data such as current air cargo traffic or changing weather patterns that could delay shipments or threaten the integrity of sensitive medical supplies.

That's exactly what we're focusing on. Firstly, we're leveraging FedEx Surround, our first customer-facing solution built on AI, machine learning, and analytics to monitor vaccine transportation throughout the pandemic. And our sensor-based tracking solution, FedEx SenseAware ID delivers real-time updates on a package's location. We recently collaborated with Microsoft to transform healthcare supply chains to be more predictive and adaptive. Customers are given more visibility into shipping including delivery lead times, warehouse inventory levels and more - across the whole network.

Resilient supply chains to support future growth

Recent events suggest that resilient supply chains are vital to support global anti-pandemic efforts.

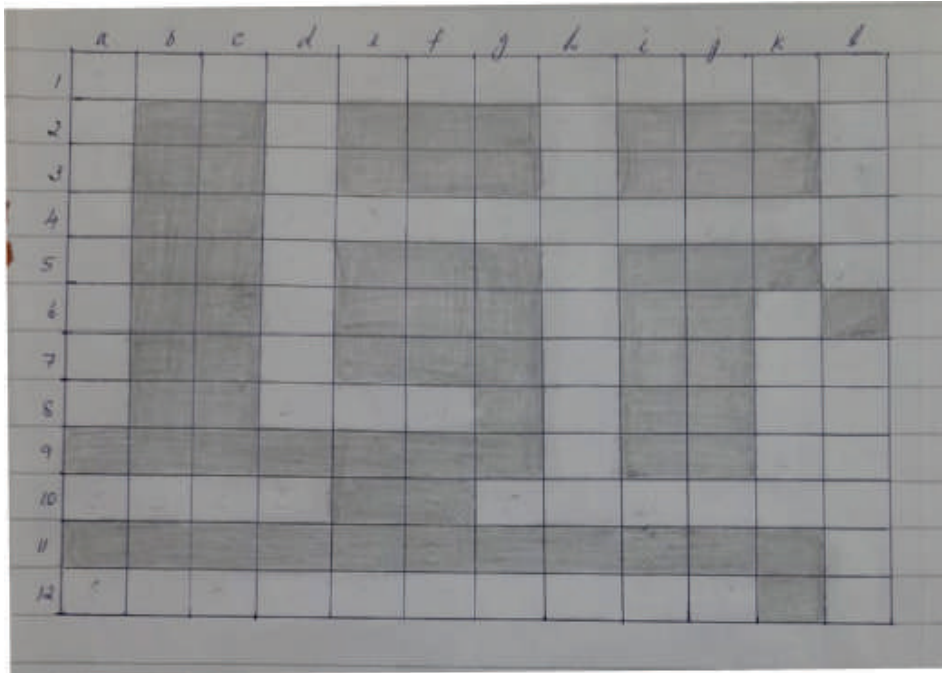
We must combine a robust transportation network with technological innovation and human expertise at every step along the supply chain. That way, logistics providers will be well-positioned to address the complex and, unique challenges healthcare companies face today and, in the future.

A version of this article first appeared in World Pharma Today on 4 July, 2022.

Source: fedexbusinessinsights.com



CROSSWORD PUZZLE



Across

- 1a. The process of achieving world-class status (12 letters)
- 4d. Supply chains are now transforming to this (7 letters)
- 8d. The most favorable Incoterm for suppliers (3 letters)
- 10a. The name used for the sourcing of proprietary items (4 letters)
- 10g. One of the three Rs of circular economy (5 letters)
- 12a. This is a form of decentralized technology (10 letters)

Down

- 1a. The demand amplification that occurs in the supply chain as one moves from customer upwards (8 letters)
- 1d. Major cost component in any of the Incoterms (8 letters)
- 1h. Supply chains post covid are expected to show this (10 letters)
- 1l. The Japanese name for the place of value addition (5 letters)
- 6k. All supply chains are designed to deliver this to customers (5 letters)

- 7l. The driving force behind a JIT supply system design (6 letters)

If there are more than one correct answer, the winner will be decided by a draw of lots. The winner will get a free delegation to the NATCOM 2022.

Global Supply Chain quiz answers

- 1. d
- 2. a
- 3. a
- 4. b
- 5. c
- 6. c
- 7. c
- 8. b
- 9. d
- 10. c

CPO DIALOGUE – V EDITION – HOTEL TAJ CONNAMARA, CHENNAI

The fifth edition of CPO Dialogues – an event by IIMM in association with SAP, was held at the Hotel Taj Connamara on 09 September 2022

The CPO Dialogue series is being hosted on the theme of “Reimagining Procurement: Path to Resilient, Profitable and Sustainable Supply Chain”

In the four hours evening event, 27 CPOs from various industries engaged in freewheeling discussions- sharing with passion, building on each other’s learnings, as well as bonding for a better tomorrow.

It was divided in three segments – opening talk by Mr. Nikhil Kamath, Director Business Development, SAP. Followed by an hour of panel discussions, facilitated by Mr. Bala Iyer, Former National President – IIMM, and CPO Deccan Chemicals. Panelists – Mr. TA Barathi, Group Director Procurement, Wheels India Group; Mr. KarthikSanthanam, CPO, Tagros Group; Mr. Veeramani, DGM, Ashok Layland. And a concluding talk by Mr. SendthiNaathan, MD, TANFAC Industries Ltd.

The event started with a welcome address by Mr. B. Ramesh, Chairman, IIMM, Chennai Branch and concluded with the Vote of Thanks by Mr. Animesh Shah, Chairman, IIMM, Mumbai Branch. Notable IIMM Leaders from Chennai, including Mr. Nagappan, Mr. Subir Kumar Mohonthy, Dr. Sampath participated. Mr. Surendra Deodhar, National Secretary and Treasurer – IIMM, VP Materials – Reliance Life Sciences, kept the event flowing as the Master of Ceremony.

During his address, Mr. Nikhil Kamath, set the tone, by highlighting the evolving opportunities and challenges for Procurement, Supply Chain in view of some dominant trends observed in the business environment. Key points included: Need to upskill talent, capture knowledge thru technology, enhancing visibility, sustainability and developing local network of vendors.

In the segment of Panel Discussions, not only the panelists, but everyone in the auditorium shared their experiences, added to the sharing by others – each one had a take back on learning.

Sharing was triggered by questions by Mr. Bala Iyer. He set the backdrop of Covid, Ukrain war, China factor, Price increase and uncertainty of Oil, Commodities and Chemicals, and reminded that Resilience is a product of adaptability and decisiveness. He posed several questions to the panelists: Strategies used in the past two years to keep procurement ahead of the competition; How the pandemic has changed the perception of Supply Chains towards Risk and Resilience; Prioritizing Industry 4.0; and How has Procurement been made easy for the Procurement Professionals.

Some of the notable points which emerged during this discussion were as follows:

Mr. KarthikSanthanam: At Tagros, they created a virtual “Idea Box” to capture ideas of people to steer thru the situation. It helped innovative actions through collective conscious of people. They insourced or near sourced some key inputs, did risk analysis of all suppliers, and accelerated digitalization. Also explained how they had to facilitate supplier operations by obtaining permissions, and created on campus food and accommodation for workers to carry on with projects.

Mr. Bala Iyer: Shared that at Bayer India they helped suppliers to obtain permissions to continue business operations, supported by advancing credit terms to make cash available, and supported truck drivers with essentials like food. Also assured contractors that Bayer will pay minimum wages to every contract employee.

Mr. Krishnakumar, CFO, Sterling Resorts: Described that businesses during that time had access to lower cash, banks were not as much willing to extend credit but businesses were forced to increase inventory. They sailed thru with

renegotiated contracts with suppliers.

Mr. T A Barathi: Talked of 3 features – uncertainty of demand / supply; availability of resources; and visibility w.r.t workforce. He especially highlighted how low information was available on workforce. And added that they (Wheels India) could do better due to the lessons learnt during 2008.

Mr. Karthik, Wipro: Highlighted the challenge of managing procurement for various Wipro business verticals across various global geographies, and added how thru micro-management they could ensure business continuity for all customers by ensuring laptops, connectivity. Specifically highlighted the role played by data availability in making this happen.

Mr. Nagappan: Explained how his organization - Apollo Hospitals – managed the surge in demand as well as shortage of all supplies, coupled with issues of waste management.

Mr. Venkateswaran, MD, Madras Fluorine: Shared the experience of sourcing 150 resources for operations, the logistics difficulties as well as cost management handled by them.

Mr. Parthasarathy, L&T Constructions: Emphasized the role of continuous communication with all stakeholders in retaining a force of 2500 people of multiple nationalities who were executing a project in Sri Lanka when everything was locked down. Further highlighted how access to rich data, analytics capability, the process orientation at L&T, and risk management practices were responsible for successfully steering through the situation.

Mr. Veermani, Ashok Layland: Presented an exciting case study of implementing Supplier Relationship Management for about 650 suppliers across India which went live with 100% compliance, for about 15000 ASNs per day. He highlighted how processes were redefined before putting SRM, digitalized platform for various procurement processes including component development. SRM is also used for directing vehicles to correct unloading point. Invoice for services itself is generated digitally.

Mr. Subir Kumar Mohanty, Vice Chairman, IIMM, Chennai: Shared on circular economy.

Mr. SendhilNaathan, MD, TANFAC, shared a turnaround success story of TANFAC under his leadership.



BRANCH NEWS

CHANDIGARH BRANCH

Technical wing of IIMM Chandigarh branch launched 'Lean, Green and Zero defect Certification program for MSME to upgrade their processes to improve overall productivity, Lean and Green manufacturing and to improve quality of the product to bring it to Zero defect. After a lot of study and elaborate discussions with various industries 34 parameters are finalized to assess and audit to issue certification in 5 levels. Technical team of IIMM consisting of M/S Rajesh Gupta, Arun Batra, S. K. Sharma, O. P. Longia, T. K. Magazine and V. S. Maniam. Above program launched at the premises of Godrej Appliances, Mohali, at the initiative of Mr Akash Sehgal Local head of Sourcing and entire Godrej Sourcing team on 25.8.22. App 10 vendors were present. Mr Akash welcomed the idea and listed benefits of this certification in improving overall productivity and profitability. Mr Rajesh Gupta Chairman Chandigarh branch has given power point presentation about various aspects and Mr Arun Batra NC, and Mr S. K SHARMA Former National President answered various questions asked. by the Vendors. Program ended after Lunch was hosted by Godrej Appliances Mohali.



With Vendors of Godrej Appliances Mohali after introductory session on Lean Green and Zero defect Certification program

A. G. M. : IIMM Chandigarh branch has organized Annual General Meeting of the Branch on 28.8.22 at Hotel Sip N Dine Chandigarh. Mr Rajesh Gupta Chairman of the Branch welcomed the members and presented the performance report of the branch during 2021 - 22. Mr Dalip Manchanda presented the audited Balance Sheet of the branch which was unanimously approved by the Branch. M/S S. K. SHARMA, T. K. Magazine, V. S. Maniam and Arun Batra shared their future plans for the development of Branch. After it, A talk was delivered by Swami Jay Tirth Ji of Akshardham Delhi on Family Unity and peace. Swami Ji has given 7 point formula to achieve peace in the family. Self transformation, respect for elders and youngsters, inculcate values along with Education among children, believe in God, forgive and forget, tolerance, service and shun ego are the main points to achieve family unity and peace. Event concluded after dinner.



PUNE BRANCH

57th Annual General Meeting on 28th August 2022 : IIMM Pune Branch held its 56th Annual General Meeting on 28th August 2022 in Hotel Shantai under the chairmanship of Mr. Shripad Kadam.

The meeting started with the Chairman, Shripad Kadam welcoming all to the AGM 2022. He also made a short eulogy of late Mr. Arvind Navadikar, (Former National President & Past Chairmen, IIMM Pune branch) and invited the gathering to stand up and observe a minute of silence in his remembrance.



The Hon. Secretary Mr. Arjunsingh Rajput then read the report of the activities conducted during the year. The report included the details of the several online programs, onsite training programs, Educational activities & the knowledge sharing session conducted by the branch for the members. He further the members that during the year 2021-22, Twelve Executive Committee Meetings and Five Education Committee Meeting were held by the branch. It was followed by presenting and passing of the accounts for the year 2021-22 by Hon. Treasurer Mr. Prasad Rao.

The meeting concluded with all the EC members introducing themselves to the gathering & a vote of thanks from the Hon. Secretary Mr. Arjunsingh Rajput.

The AGM was attended by over 30 members

8th Annual Awards for Supply Chain Management

Indian Institute of Materials Management (IIMM), Pune Branch organized its "8th Annual Awards for Supply Chain Management" ceremony on Saturday, 17th September at Hotel Sheraton Grand, Pune. The awards are held every year to recognize the best practices in supply chain management (SCM).

Mr. Harish Kumar Sharma, National President, Mr. KR Nair Vice President, West, Mr. Shripad Kadam, Chairman, Pune branch, Mr. Shrivardhan Gadgil, Vice Chairman, Mr. Arjunsingh Rajput, Honorary Secretary, Mr. Prasad Rao, Hon. Treasurer, Mr. Amit Borkar Program Convener and Mr. Terrence Fernandes, Immediate Past Chairman, Pune branch were present on the occasion along with the executive committee and Pune branch members.

Mr. Terrence Fernandes and Prasad Rao moderated the program. The annual awards include recognizing the various companies in manufacturing and logistics sector. Manisha Compositex Pvt. Ltd. was awarded in

the micro and small enterprise category in the manufacturing sector, Intervale Poonawalla Ltd. was awarded in the medium enterprise category while Atlas Copco (India) Ltd. was awarded in the large enterprise category.

In the logistics sector, Vistar Logitek Pvt. Ltd. received the award in the small enterprise category while Avignon Shipping Pvt. Ltd. in the medium enterprise category. Mr. Ashwini Malhotra, Managing Director Weikfield Foods Pvt. Ltd. was conferred with the Lifetime Achievement Award.

Sangharsh Yuva Pratishthan was conferred the award for their social work in the area of education for the under privileged students from the rural areas of Pune. Trustee Mr. Dnyaneshwar Jagtap accepted the award on behalf of the organization. The jury included Mr. Sujit Mehta, Senior Manager - Engineering & QA, Renishaw Metrology Systems Ltd., Dr. Ramakrishnan Raman, Director at SIBM & Dean of the Faculty of Management at Symbiosis International, Pune and Mr. Madan Chande, Divisional Manager - Corporate Quality Assurance, Kirloskar Brothers Limited, Pune

The program was supported by Diamond Sponsors-MAN Logistics (India) Pvt. Ltd., Digital Data Automation Pvt. Ltd. & Newland AIDC, Platinum Sponsors-Mileage Logistics Pvt. Ltd., Gold Sponsors- V-Trans (India) Ltd. and Viscon Rubber Pvt. Ltd. and Bronze Sponsor-Ensigns Software & Communications Pvt. Ltd.

A souvenir of IIMM was also released on the occasion.

Mr. Ashwini Malhotra who is the second-generation flag bearer of Weikfield Foods Pvt. Ltd. said that supply chain management is extremely critical especially in the food industry which involves fresh produce and where perishability is an issue. It is critical to get right quantity at the right time and we have been able to do it effectively and consistently.

Mr. HK Sharma, National President informed that we have close to 10,000 members across 51 branches in the country. We serve the society in an area which is niche, and which contributes to employment generation and GDP.

The ceremony was concluded with vote of thanks by Mr. K.R Nair, followed by dinner.



Mr. Shripad Kadam - Chairman, Pune branch - Addressing the Audience



Mr. H K. Sharma - National President, IIMM - Addressing the Audience



Lifetime Achivement Awards - Mr. Ashwini Malhotra WeikFIELD Food Pvt. Ltd.



Social Organization Award - Sangharsh Yuva Pratisthan-min



Manufacturing Small Enterprise - Manisha Composetik Pvt. Ltd.



Manufacturing Medium Enterprise - Intervale Poonawala Ltd.



Manufacturing Large Enterprise - Atlas Copco (India) Ltd.



Logistics Small Enterprises - Vistar Logitek Pvt. Ltd.



Logistics - Medium Enterprise - Avignon Shipping Pvt. Ltd.



Release of Souvenir



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