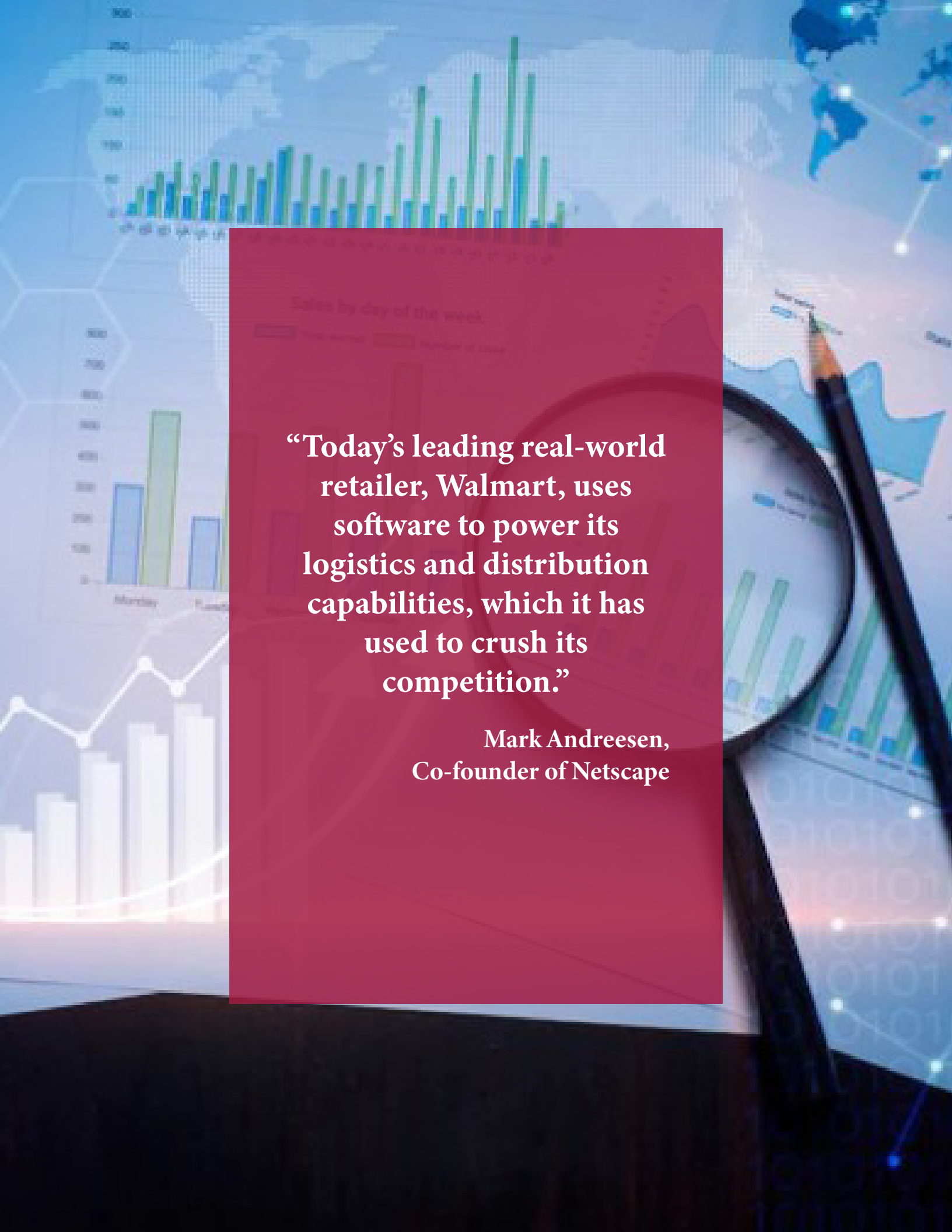


Supply Chain Analytics for MSME Clusters



DST-AMRITA
TECHNOLOGY
ENABLING
CENTRE

The background is a collage of business-related imagery. It features a world map, various bar and line charts, a magnifying glass over a document, and a pencil. The overall color scheme is blue and white, with a prominent red rectangular area in the center containing the text.

“Today’s leading real-world retailer, Walmart, uses software to power its logistics and distribution capabilities, which it has used to crush its competition.”

**Mark Andreesen,
Co-founder of Netscape**

Rapid technology advances and dynamic market forces have altered the business landscape as also fundamentally altered existing business models. Information and Communication Technology (ICT) usage and deployment have opened the doors for all enterprises and especially Micro, Small, and Medium Enterprises (MSME), to compete in any marketplace. Today's challenging and dynamic business environment is popularly referred to as VUCA, short for Volatility, Uncertainty, Complexity, and Ambiguity.



Information Superhighway has further muddled the competitive waters by providing round-the-clock access and dissemination of information. The following examples illustrate the power of ICT, the Internet, and the worldwide web:

- The largest media company in the world is Facebook, but interestingly Facebook does not create any content. This content is created by its 2.94 billion monthly active users in 112 languages. Facebook is the 3rd most website on the Internet.
- The largest car company in the world is Uber, but interestingly Uber does not own any of the taxi cabs that use its ride-hailing app to provide mobility as a service for the gig economy. 122 million people use Uber every month in 72 countries and 10,000+ cities. It is estimated that 3+ million cars are available for hire using the app, with 21 million per day as per company disclosures.
- The largest retailer in the world is the e-commerce giant Alibaba, but interestingly, Alibaba does not own or run any swanky stores in malls or shopping complexes. Alibaba is a pure online-play retailer in a crowded virtual marketplace with a turnover of US\$ 134.5 billion in 2022, as per the company's financial statements. Alibaba hosts the most prominent B2B, C2C, and B2C marketplaces in the world. On 11th November 2021, singles day per the Chinese calendar, Alibaba and JD combined had a whopping single-day sales of US\$ 139 billion.

The deployment of cutting-edge technologies such as big data analytics, the Internet of Things (IoT), cloud computing & virtualization, mobile apps, and the like are revolutionizing automation in enterprises. ICT adoption and deployment across various processes and links in the supply chain has become a determinant of competitive advantage for enterprises. Interestingly, many of the buzzwords in Supply Chain Management (SCM), such as Vendor Managed Inventory (VMI), Point of Sale (POS), Collaborative Planning, Forecasting and Replenishment, and Enterprise Resource Planning (ERP), stem from ICT usage. The Covid-19 pandemic has also accelerated the digital transformation of enterprises and their supply chains. The pandemic has disrupted not only global supply chains but also exposed various vulnerabilities and dependencies. No doubt, digital is here to stay...



Business Analytics

A paradigm shift in enterprise computing is the emergence of business analytics for improving their bottom line as well as maintaining their competitive edge over their rivals. Business analytics aims at building fresh perspectives and new insights into business performance using data, statistical methods, quantitative analysis, and predictive modeling. Business analytics coupled with disruptive and game-changing technologies like social media like Facebook, Twitter, and LinkedIn; cloud computing & associated technologies like virtualization and mobile & android technology in the form of the SMAC - Social, Mobile, Analytics, and Cloud stack holds tremendous promise to be the next inflection point in enterprise computing. Some common usages are retailers using business analytics to predict consumer buying patterns, governments providing a better delivery of services to citizens, and banks categorizing their customers based on their credit history.

Business analytics is primarily classified into the following three types namely:



Descriptive Analytics gets insights and patterns from historical and raw data by using techniques like reporting and scorecards.



Predictive analytics gets insights from historical data using techniques like statistics, modeling, machine learning, and data mining.



Prescriptive analytics is a kind of predictive analytics involving building predictive models using techniques like optimization and simulation.

The business analytics industry's annual spending was worth US \$ 231 billion in 2021. The amount of corporate data was in the order of 97 zeta bytes in 2022 and is expected to breach 120 zeta bytes in 2023. This explosion of information is dubbed Big Data. Analytics of this big data can point towards actionable intelligence to help enterprises to adapt their strategy. Various sources of big data which provide inputs for analytics include internet data, primary research, secondary research, location data, image data, supply chain data, and device data.

Netflix, the global video distribution company, has over 222 million subscribers, who watch tens of billions of hours of programs every quarter. Netflix, through its Cinematch engine, uses business analytics and trends of consumer preferences to recommend movies. Another example of analytics usage from a common man's perspective is Apple iTunes, which analyses user experiences to facilitate quicker, downloads of popular music.

MSME Sector in India

Micro, Small, and Medium Enterprises (MSME) sector has emerged as a vibrant sector of the Indian economy over the last five decades. MSMEs contribute more than 29% to the GDP and are responsible for 50% of the country's total exports. They are also accountable for one-third of India's manufacturing output. Interestingly, in the EU, 99% of all businesses fall under this category, and globally it is 90%, per the International Finance Corporation. MSMEs not only play a crucial role in providing enormous employment opportunities at comparatively lower capital costs than big industries but also help in the industrialization of rural & backward areas, thereby reducing regional imbalances and assuring a more equitable distribution of national income and wealth.



MSMEs are complementary to big industries as ancillary units, and this sector contributes enormously to the socio-economic development of the country. Khadi, village industries, and coir have historically been the early MSME clusters. The coir industry originated in Kerala and spread to other coconut-producing states like Tamil Nadu,

Karnataka, Andhra Pradesh, Orissa, West Bengal, Maharashtra, Assam, Tripura, etc. Likewise, the MSME segment includes various verticals and sectors, including services, and the recent governmental classification scheme for MSME has also widened the net as also provided more considerable benefits accrued to the MSME.



As per the MSME ministry's annual report of 2021-2022, there were 65 lakhs+ MSMEs registered in the Udyam portal at the beginning of 2021, but the actual number is in the order of 10 times that number in sectors including manufacturing, services, and trades. 99% are micro, with 0.52% small and 0.1% medium. The number of jobs in the MSME sector is estimated to be 15+ crores. Considering the sector's importance, the Government of India has created a separate ministry for MSME under a senior cabinet minister. Over a period of time, through MSME-friendly policies and initiatives, it is envisaged that MSME will contribute 50% of the GDP and 75% of the exports of India.

A hand is shown reaching out towards a futuristic digital interface. The interface features a central circular graphic with a bar chart and gears, surrounded by various icons representing data, business, and technology. The background is dark with glowing blue and yellow light effects.

Supply Chain Analytics

ERP systems and SCM packages have a limited amount of analytical capabilities primarily aimed at transactional data generated. Supply chain data can be analyzed for inventory management as well as demand forecasting and prediction. This could be in the form of reports, queries, and forecasts. These forecasts may not be very accurate considering the complex nature of business and unpredictable external factors like weather patterns, price, and economic volatility.

This calls for Supply Chain Analytics (SCA) which promises several benefits like improved decision-making, customer engagement, adaptability, and cost reduction due to better inventory visibility and accurate demand forecasts. Supply chain analytics allows companies to deconstruct new forms of data as also analyze the data to give actionable intelligence. Analytics will provide us with the ability to extract, cleanse and integrate data from multiple data sources.

Supply chain analytics render supply chains with advanced capabilities like dashboards, pattern & trend analysis, drill-down views, forecasts, knowledge base, scenario & what-if analysis, simulation, and optimization capabilities. These significantly improve decision-making and interpretation of situations, which is crucial for enterprises. Timely information through analytics significantly impacts raw material sourcing, manufacturing, goods delivery, and return.

Business analytics has the potential to impact wide-ranging improvements in SCM both at the strategic and operational levels, thereby improving operational efficiency and creating customer value. However, some challenges faced include the high cost of such solutions. This is all the more significant when considering enterprises that have made substantial investments in ERP or SCM packages and solutions. The aggregation of data from multiple sources is another challenge. For example, production data from the factory shop floor is difficult to gather and collate as most of these systems use proprietary applications and systems with multiple data formats.

Almost 85% of big data is unstructured and needs to be translated into an understandable format. Supply chain analytics can be just data analytics in general or big data analytics depending on the availability of data in different companies. Several companies like SAS, Genpact, and Capgemini are offering Supply Chain Management analytics solutions to companies across all verticals. IBM uses its own Buy Analysis Tool (iBAT) channel collaboration solution for large partners across

North America and Europe. This primarily focuses on inventory management for optimized replenishment decisions under price protection. The company estimates considerable business savings due to the tool. The ERP world leader, SAP, has its in-house Business Objects analytics solution. This platform has in-built scenario analysis, risk management, alerts, and monitoring features for factors like order fulfillment, payments, shipment tracking, etc.



Supply Chain Analytics for MSME clusters

Indian MSMEs are steadily moving towards technology adoption and usage. MSME's software deployment is primarily restricted to stand-alone packages for finance, HR manufacturing, or payroll. Video-conferencing and messenger services are also being widely used. There has been a visible digital shift in channels for communication, marketing, payments, hiring, and other business verticals.

A recent MSME digital readiness survey of 250 Indian MSMEs by PayPal highlights that 29 percent of these firms witnessed an increase in online customers and 32 percent experienced better payment solutions. The survey highlights that 98 percent of surveyed MSMEs were keen on investing further in digital payment solutions.

However, there is a significant digital divide between big industry and MSME. Most of the MSMEs fall into the group of low digitalization and low data-driven companies. This is a trend not only in India but even in developed economies. Competitive pressures amongst MSMEs are also not so evident regarding ICT adoption.

This white paper outlines the wide-ranging benefits of supply chain analytics for MSMEs and their clusters. It also provides recommendations for MSMEs to adopt this advanced digital technology and outlines the barriers to its adoption.

Adopting cutting-edge digital technologies, such as Supply Chain Analytics (SCA), provides immense benefits to MSMEs and gives them opportunities to transform their supply chains into value chains. A cluster-based approach towards procurement of digital technologies can benefit them if the procurement of the technologies is done as an MSME cluster. This could transform the modest adoption rate, which is the status quo.



SCA is available in the application areas such as inventory management, procurement planning, demand shaping, demand forecasting, distribution planning & management, production planning, Customer Relationship Management (CRM), and fleet and route sizing and optimization. Of course, large enterprises can leverage all of these capabilities, but most of these apply to MSMEs in varying measures as well.

SCA helps MSMEs to capture and analyze internal and external data, which has become an enormous asset. SCA provides access to historical data, which can be used to generate insights, simulate and forecast future scenarios. The ability to capture, collate, analyze and infer the external data concerning competition, dynamic market conditions, market demand, and customer preferences helps the MSME to pivot their plans on distribution channels and strategies. It prepares the ground for them to exploit Omni-channel distribution avenues, which has now become the industry norm.

SCA provides MSMEs better visibility, transparency, and integration into their distribution network that includes distribution channels, inventory,



logistics, invoicing, and payment, as also ensure efficient delivery of products to their customers. The ability to track the physical logistical movement of goods puts the MSME on a stronger wicket to satisfy customers' expectations.

SCA helps MSMEs to understand the internal performance of their companies as well as the external market in terms of chronicling all interactions, transactions, and dialogue with all the stakeholders like suppliers, subcontractors, partners, branches, and

Decision-making for the MSME migrates from intuition to data points, e.g., demand planning; analytics will transform those SMEs into a data-driven culture. This has a force-multiplier effect in terms of greater agility which translates to improved firm performance.

SCA helps MSMEs to effectively address problems related to demand planning, inventory management, and logistics that cause a lot of cost for the companies. SCA adoption results in cost-cutting in the long run and reduces the TCO. The benefits of supply chain analytics adoption unlock value and outweigh the cost of the adoption.

SCA helps in ascertaining and tackling the pain points and analyzing key performance indicators such as production quantity, plant downtime, operating costs, and return on assets in the manufacturing and production process to enable the enterprise to address these and meet business goals.

Predictive SCA can be used to perform preventive maintenance of the equipment in the MSME. Predictive analytics can be used to forecast the possible failure of the machine components and take corrective actions.

SCA helps in the functions of sales and marketing, which complement the manufacturing and services where they are engaged

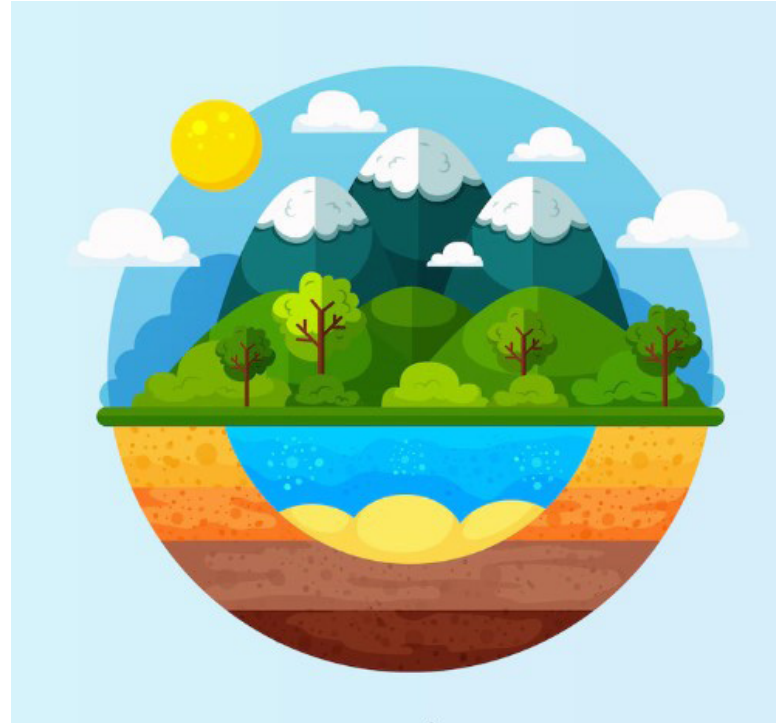
Analytics can be used in various stages of marketing customer segmentation to do demographic-based targeting, analyzing customer behavior and designing new products, market mix modeling to analyze the effectiveness of their advertising, and customer feedback analysis to improve their existing products and services.

In 2020, India emerged as the fifth-largest automotive market, with around 3.5 million units combined sold in the passenger and commercial vehicles categories. A significant number of MSME units in the auto ancillary sector who are supporting large manufacturers such as Tata Motors, Mahindra and Mahindra, Hyundai & Ford are very technology-savvy, and some of them have also adopted SCA.

Some of these MSMEs are tier-1 suppliers in the Rupees 200 to 300 crore turnover range, while others are in the tier-2 mid-size suppliers with a turnover of Rupees 100 to 200 crores. In 2020, India emerged as the fifth-largest automotive market, with around 3.5 million units combined sold in the passenger and commer

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Challenges in Adoption of Supply Chain Analytics for MSMEs

- Challenges in adopting SCA for MSME primarily fall into 2 buckets, namely organizational and technical challenges. Organizational challenges include human resources, financial resources, and management resources.
- There is a need for domain experts in the supply chain to work collaboratively with the ICT experts.
- There is also a need for re-training and adapting to changes in the workforce.
- Management support is needed in articulating a vision and executing the adoption of SCA in terms of policies, strategies, and initiatives.

- Technical issues point out the existence of legacy systems in the MSME and integrating these with SCA, as also infrastructure requirements and compatibility issues.
- Most MSMEs do not have a comprehensive ICT policy or wide deployment of enterprise-wide software like ERP.
- A minuscule percentage of these MSMEs harness cutting-edge digital technologies such as business analytics, block chain, robotics, 5G, IoT, sensors, AI, AR/VR, 3D printing, etc. Generally, MSMEs need to be faster towards technology adoption.
- Added to this, credit facilities for working capital are also a challenge. The scarcity of funds is undoubtedly the biggest challenge for MSMEs to adopt digital technologies.
- There is also a need for more awareness of these advanced ICT-based solutions and/or technologies and their wide-ranging benefits.
- Hiring trained manpower such as data analysts, data engineers, and data scientists is also a significant challenge, as the numbers available in the market are not very high. And these job roles are in high demand.






Recommendations for Adoption of Supply Chain Analytics for MSMEs

- In terms of procurement of advanced ICT technologies, a cluster-based approach can reduce the Total Cost of Ownership (TCO) for the MSMEs. An added advantage is that most of the MSME clusters are well-organized. To cite an example, CODISSIA, Coimbatore District Small Industries Association, boasts more than 2000 members in 43 sectors. A world-class trade Fair Complex as an industrial and exhibition venue and incubation center for defense are some of the achievements of this cluster. Likewise, there are many similar success stories Pan-India. Another cluster representing the pump, foundry, and motor sectors in the Coimbatore region is the Southern India Engineering Manufacturers' Association (SIEMA) has 300 members.
- SCA packages can be sold as a cloud-based solution to the MSME. This would reduce the TCO as the MSME need not procure expensive servers, hardware, and/or infrastructure to host the software package. Exploring open-source supply chain packages such as OpenBoxes and Odoo for analytics capabilities may be a good option.
- SCA packages, either as part of comprehensive supply chain solutions or ERP packages, can have modules that would permit MSMEs to choose specific capabilities as per their need. And this can be scalable, providing the opportunity for the MSME to top up step by step and migrate rather than change their existing legacy systems in one go. This flexibility and choice would be indeed a boon.

- Considering the rapid growth of digital technologies, regular upskilling and training programs for employees in MSMEs are absolutely necessary. Their domain knowledge, coupled with their expertise in analytics and the link, would be an excellent combination.
- Awareness needs to build from top to bottom of the organizations such that not only the top management but employees at all levels also champion the adoption of SCA. This awareness would also propel top management to make the necessary investments toward procurement of SCA and other digital technologies. Data management and associated policies must also be formulated and communicated to all stakeholders.



No doubt, there is a considerable benefit to adopting SCA for MSMEs. To tackle the barriers and follow the recommendations, efforts are underway to develop a framework on the factors that affect the adoption of supply chain analytics in MSMEs and measure their contribution and impact in organizational performance of MSMEs