



DST-AMRITA  
TECHNOLOGY  
ENABLING  
CENTRE

## **SMAC & DIGITAL TRANSFORMATION OF MSME CLUSTERS**

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 has 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, Internet and world-wide web:

The largest media company in the world is Facebook, but interestingly Facebook does not create any content. This content is created by its 2.93 billion monthly active users.

The largest car company in the world is Uber, but interestingly Uber does not own any of the taxi cabs that use its ride-sharing app. 118 million people use Uber on a monthly basis with 3 million cars available for hire using the app as per company disclosures.

The largest retailer in the world is 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 billion in 2022 as per the company's financial statements.





**SOCIAL**



**MOBILE**



**ANALYTICS**



**CLOUD**

## SMAC STACK

An integration of various disruptive and game-changing technologies in the form of the SMAC - Social, Mobile, Analytics and Cloud stack will push the envelope in enterprise computing. Technologies within SMAC complement each other and combined together deliver a force multiplier effect. This would benefit enterprises across the spectrum, be it retail, healthcare, manufacturing or services. The change brought about by embracing the SMAC stack will help businesses to achieve market leadership, competitive advantage and increased profits. Each of the technologies that form the SMAC stack is widely deployed and pervasive, as seen by the statistics given below:

### SOCIAL

Number of Internet users worldwide today is over 5 billion as per Statista; almost 60% of the total population. Of these, number of social media users worldwide today is over 4.7 billion. Facebook is the leading social network at 2.93 billion monthly active users, followed by YouTube (2.5 billion monthly users) and WhatsApp (2 billion)

### MOBILE

Number of unique mobile phone users worldwide today is 5.34 billion with majority of them using smart phones as per Statista

### ANALYTICS

Business analytics market worldwide is almost US \$ 240 billion as per Fortune magazine

### CLOUD

Global cloud computing market worldwide today is nearing a whopping US \$ 450 billion as per the website [marketsandmarkets.com](http://marketsandmarkets.com)

Integration, intersection and interplay of the SMAC technologies have resulted in the disruptive business models of super-successful companies like Facebook, Apple & Google. One of the earliest adopters of the SMAC stack is Netflix, the entertainment netflix who is a leader in the video distribution space. Netflix has a subscriber base of 220 million subscribers. It is estimated that Netflix users watch billions of hours of movies, documentaries and entertainment every quarter. Netflix uses its proprietary Cinematch analytics module uses customer ratings and preferences to recommend the popular flicks. These movies are hosted on the cloud through the provider, Amazon Web services. The movies can be easily accessed using tablets, smart phones and/or television. Customer choices and preferences with regard to the movie selection and recommendation are also in Facebook. This is a classic example of a SMAC stack building a collaborative eco-system, where technologies complement each other and derive customer value and satisfaction. The ultimate beneficiary is the consumer, who gets a personalized experience of watching movies.

Another successful integration from the innovation leader, Apple is iTunes. iTunes peruses and analyzes user-experiences to facilitate faster downloads of the popular trends. The ubiquitous, Google Apps is yet another example of SMAC stack integration.

Google Apps has various value-added services like Calendar, Document Management E-mail,



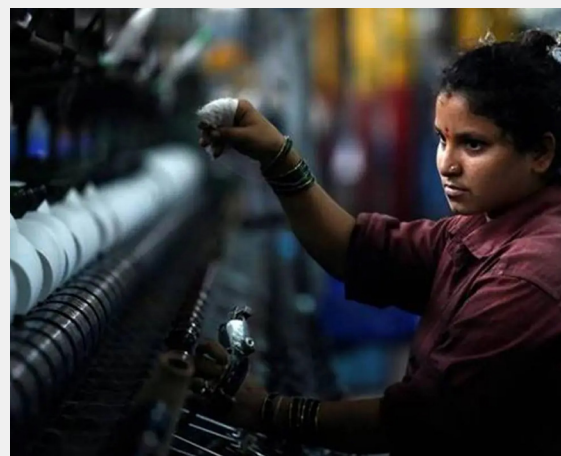
Chat groups, bulletin boards, websites etc. Amazon too works on similar principles. When we scout for books to buy on Amazon, we bump into several recommendations and reviews by book buyers. Amazon, which is fully hosted on the cloud, is available as an App on any tablet or phone.

# 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. MSMEs not only play crucial role in providing large employment opportunities at comparatively lower capital cost than big industries but also help in industrialization of rural & backward areas, thereby, reducing regional imbalances, assuring 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.

Coir industry originated in the state of Kerala and spread to the other coconut producing states like Tamil Nadu, Karnataka, Andhra Pradesh, Orissa, West Bengal, Maharashtra, Assam, Tripura, etc. Likewise, MSME segment includes various verticals and sectors including services and recent governmental classification scheme in for MSME has also widened the net as also provided larger benefits accrued to the MSME. As per the MSME ministry's annual report of 2021-2022, there are 65 lakhs+ MSMEs registered in the Udyam portal in 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% of these are micro with 0.52% small and 0.1% medium. Number of jobs in the MSME sector is estimated to be 15+ crores.

Ministry of MSME has executed a slew of ICT initiatives for the benefit of the sector. These include web-based application module, namely, MyMSME and other e-portals for loan, job-seekers, procurement, digital payments, marketing and app development. Ministry of MSME has taken numerous initiatives to digitally enable the entire MSME ecosystem.



This include subsidies for cloud and analytics platforms and CHAMPIONS portal, which is a technology-driven centralized control room, grievance management, and information platform to support MSME. This is a one-stop solution for handholding MSMEs and uses the power of AI & ML. Indian MSMEs are steadily moving towards technology adoption and usage. The Covid-19 pandemic has accelerated this trend and the Internet economy. 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. However, a vast majority of the MSME do not have a comprehensive ICT policy or wide deployment of enterprise-wide software like ERP.

A miniscule percentage of these MSME are harnessing cutting-edge Industry 4.0 technologies such as block chain, robotics, 5G, IoT, sensors, AI, AR/VR, 3D printing etc. Generally, MSMEs are slow towards technology adoption. Added to this, funding and resources are also a challenge.

There is also a lack of awareness on many of these advanced ICT-based solutions and/or technologies and their wide-ranging benefits. This white paper outlines the wide-ranging benefits of the SMAC stack for MSME and its clusters. 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 of 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 Coimbatore region is Southern India Engineering Manufacturers' Association (SIEMA) has 300 members.

## **SMAC FOR MSME**

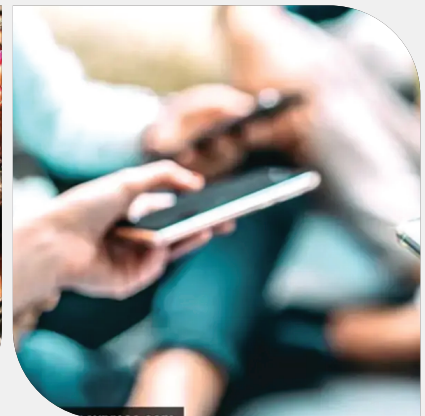
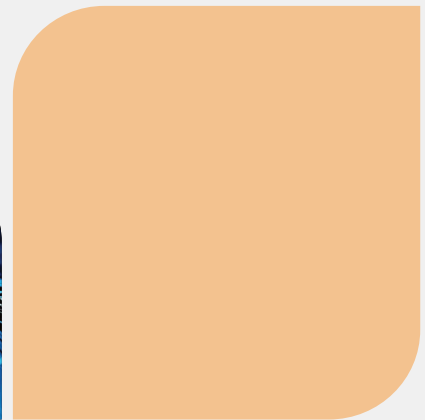
Micro, Small and Medium Enterprises (MSME) sector has emerged as a vibrant sector of the Indian economy over the last five decades. MSMEs contribute more than 29% to the GDP and are responsible for 50% of the country's total exports. They are also accountable for one-third of India's manufacturing output. MSMEs not only play crucial role in providing large employment opportunities at comparatively lower capital cost than big industries but also help in industrialization of rural & backward areas, thereby, reducing regional imbalances, assuring 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 intersection of the game-changing technologies in SMAC can dramatically improve manufacturing processes and propel production toward growth and increased efficiency as also achieve improved integration with stakeholders spread across different geographies for MSMEs.

SMAC will help MSMEs unbundle tightly-coupled, industrial-age value chains and transform business, if not entire markets, creating boundary less ways of working. The manufacturing team is also kept abreast of the future cutting-edge manufacturing trends through the proliferation of information as a result of SMAC.

SMAC removes the need for MSMEs to manually updating of inventory control, production reporting, and pricing reports. The SMAC advantage means leveraging and mining real-time data and this visibility of information helps in efforts towards marketing & sales.

Mobility driven by the proliferation of apps is impacting the manufacturing cycle, right from raw materials procurement to logistics & supply chain, and to shipping. Mobile apps have changed the way people communicate, shop and work.



Workers are syncing their PDA, tablets and smart phones to their internal network. This gives the individual more responsibility while increasing productivity, communicate production flow and solve problems in a timelier manner.

Social media has opened the door for MSMEs to connect with each other and any one around the world as also their customers, suppliers and partners. Various outlets for posting content include company's Facebook wall, website, blog, tweeting, texting and instant messaging. Physical meetings are being replaced by virtual communication. Digital assets of an enterprise are as important as its brick and mortar physical assets.

Analytics provide insights about how products are made to how they're received by customers. Data that could be mined include employee expertise, production techniques, product innovation and customer purchase patterns so as to address the areas which need improvement. Analytics have completely changed how customers determine whom to connect with on what topics, which products they buy or where they find the best deal. Learning how to understand customers and to communicate with them as individuals has new improved avenues for marketing and sales. The proliferation of information has and will continue to shift the balance of power from the seller to the buyer with the end-goal being competitive differentiation.

Cloud provides the MSME the ability to scale up and down its capacity and computing power as needed. If operational information is restricted to a data warehouse in a manufacturer's facility or remotely, cloud technology has reduced worry about the security of its physical location.

Any enterprise can now store important data wirelessly for easy retrieval for employees in an office setting or for staff members who are traveling and using their mobile devices. The cloud element of SMAC refers to the capability to store large amounts of capacity that are paid for by the minute or hour. There is need to spend money building additional data warehouses and massive & expensive servers. The infrastructure, storage hardware or software can be simply be subscribed it from a cloud provider as a service. Using cloud also contributes towards green manufacturing and sustainability and reduces the Total Cost of Ownership (TCO) for the MSME.

SMAC is becoming a top priority in the movement towards smart manufacturing today and promises to be very beneficial for MSMEs. The very foundation of SMAC is the broader concept of convergence of shared infrastructure, mobile accessibility, real-time analytics and collaborative services. This will no doubt help MSMEs stay competitive, differentiate themselves, and provide a great customer experience.





# DIGITAL TRANSFORMATION OF SUPPLY CHAINS TAKES THE CENTER STAGE

”

“Amateurs discuss tactics; professionals discuss logistics.”

Napoleon Bonaparte

The deployment of ICT tools and digital technologies such as Internet of Things (IoT), big data analytics, cyber physical systems, cloud computing & virtualization, mobile apps, 5G, robotics and the like are revolutionizing automation in enterprises. This trend, dubbed as Industry 4.0, is fast emerging as an inflection point in manufacturing and is being touted as the fourth industrial revolution.

McKinsey estimates the Industry 4.0 value creation potential to be a whopping US\$ 3.7 trillion by 2025. Industry 4.0 has accelerated the transformation of supply chains to value chains. This trend is often referred to as Supply Chain Management (SCM) 4.0. There is a compelling need for SCM 4.0 considering that the magnitude of global supply chain losses is huge.

## SUPPLY CHAIN MANAGEMENT 4.0

Between 2000 and 2010, losses caused by supply chain disruption averaged \$115 billion per year. A large chunk of these disruptions are associated with their transportation networks also called logistics networks.

The Covid-19 pandemic has also accelerated the need for digital transformation and SCM 4.0. None of us can forget the horrific imagery of the wailing families who lost their near and dear ones due to shortages of oxygen, life-saving drugs, vaccines and hospital beds in India. Nor can we discount the fact that this fall-out has happened directly or indirectly due to disruptions in supply chains and their logistics networks. A whole lot of these disruptions and operational inefficiencies could be pro-actively addressed by digital supply chains. And India Inc. is responding. Today 90% of enterprises of all hues and sizes are increasing their digital footprint so as to remain agile and resilient in these testy times.



ICT adoption and deployment across various processes and links in the supply chain has become a determinant of competitive advantage for enterprises. ICT tools are great enablers, enhancers and facilitators of enterprise operations.



Deployment of these tools in supply chain planning and execution processes have resulted in better transparency, visibility, resilience, adaptability, dialogue, adaptability and decision-making for enterprises. This is not only within the enterprise intranet but also within the extranet which is the ecosystem of their partners and suppliers.

Broadly speaking, ICT impact in SCM can be classified into 3 major areas viz. transaction execution, collaboration & coordination and decision support.

The tangible outcomes as a result of these interventions include cost savings; improved operational efficiency, inventory visibility & control; quality, reliability & accuracy of information; improved communication, collaboration & customer-connect. Interestingly, many of the buzz words in SCM such as VMI, POS and ERP stem from ICT usage. The list of ICT tools deployed for SCM is exhaustive. It includes but is not limited to ERP, RFID, block chain, web services, electronic commerce, cloud computing, social media, mobile technologies, high performance computing and business analytics to name a few. A force-multiplier integration and intersection of disruptive technologies in the form of the SMAC - Social, Mobile, Analytics and Cloud stack is also gaining prominence. Netflix & Amazon are early adopters of SMAC for rating movies and books respectively.

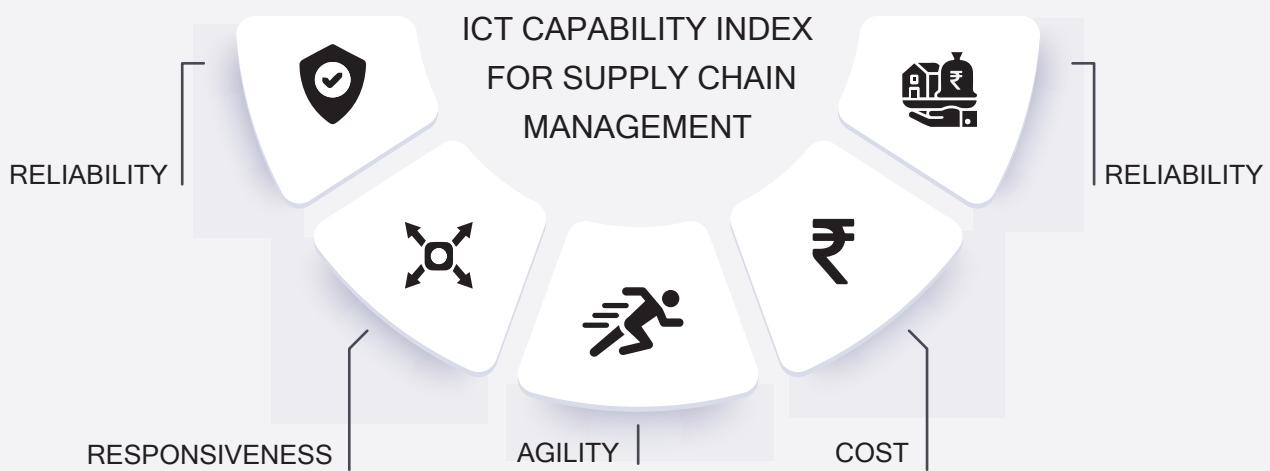


# HOW TO ASCERTAIN YOUR SUPPLY CHAIN'S DIGITAL FOOTPRINT?

“If you can't  
measure it, you  
can't manage it”

Peter Drucker

While most researchers and industry practitioners are unanimous about the fact that ICT positively impacts supply chain performance and improves the supply chain capabilities, there is an identified gap in terms of assessment and rubrics of these ICT benefits in SCM as also which are the processes or sectors or domains that they impact. Clear and concise metrics of ICT deployment for SCM are elusive. There is also asymmetry and unevenness in ICT adoption for SCM across various sectors and verticals. This is further reinforced by the fact that we do not see ICT deployment listed as a metric though it contributes to all of the metrics and measures of supply chain performance in various process reference models of SCM like Supply Chain Operations Reference (SCOR), GSCF, balanced scorecard and benchmarking. When this research commenced, the popular SCM model in vogue was the SCOR Process Reference model version 11 by American Production and Inventory Control Society (APICS). This model does not explicitly mention ICT but considers the supply chain ecosystem in terms of the extended enterprise and the addition of 'enable' processes primarily meant to address the collaboration and communication between stakeholders in the enterprise, all of whom happen through ICT alignment.



Plugging this gap resulted in an investigation that evolved into a novel supply chain perspective of developing an assessment framework to measure the impact of ICT in SCM. Although there has been some talk of conceptualizing metrics of ICT impact on SCM, no researcher has attempted to develop a comprehensive assessment framework. This provided the impetus to develop an assessment framework consisting of an empirical model and ICT capability index for SCM. This index serves as benchmark on the enterprise's ICT deployment in SCM and is similar to indices developed for industry like McKinsey Global Institute (MGI) Firm Digitization Index, which shows how digitally advanced firms are pulling ahead of their peers and ICT Development Index (IDI) used by the United Nations for ranking nations based on ICT readiness and bridging the digital divide. This ICT capability index for SCM is universal and can be used by any enterprise irrespective of the geography or country, vertical or domain, manufacturing or services, profit or non-profit. The supply chain performance constructs for the empirical model and index were adopted from SCOR for this investigation were reliability, responsiveness & agility, which are considered customer-facing and cost & assets, which are internal process-facing.

### **Benefits for enterprises are multifarious and are listed below**

Aids decision-making and policy makers to identify targets, and to track and benchmark progress

Provides strategic choices for their investment in ICT as also choice of ICT tool for SCM

Guidance on how to leverage ICT so as to adapt their organizations, digitize their operations,

Benchmark with their peers and competitors as also affect financial performance and diagnostics.



# Supply Chain Management 4.0

Dr. Prashant R.Nair,  
TEC Coordinator, Amrita Vishwa Vidyapeetham,  
Coimbatore

Companies that leveraged digital technologies and become a market leader.



**2.5 Billion**

monthly active users  
creating contents



**101 Billion**

people use Uber on a  
monthly basis and 3 Million  
car available to hire



**\$109 Billion**

Alibaba - Turnover of  
US\$ 109 billion in 2021 without  
any physical retailing through  
virtual market place.

## The Opportunity



McKinsey estimates the Industry 4.0  
value creation potential to be a  
whopping US\$ 3.7 trillion by 2025

Between 2000 and 2010, losses  
caused by supply chain disruption  
averaged \$115 billion per year



The Covid-19 pandemic has also  
accelerated the need for digital  
transformation and SCM 4.0

Today 90% of enterprises of all hues  
and sizes are increasing their digital  
footprint so as to remain agile and  
resilient in these testy times.



### ICT Capability Index for Supply Chain Management



## SCM 4.0 Advantages

• Cost savings



Improved operational  
efficiency

• Inventory visibility  
& control



Reliability & accuracy  
of information

• Quality



Improved  
communication

• Collaboration &  
customer-connect





The ICT Capability Index for SCM provides insights, transparency and visibility to enterprises on their digital capabilities so as to enable them to attain greater operational efficiencies and reduce supply chain losses. Plugging supply chain losses holds immense potential and savings for Indian industry, be it large enterprises or Micro, Small and Medium Enterprises (MSME). There is an added possibility of this investigation subsuming into the SCOR framework, which has universal appeal and wide acceptance. Interestingly, the latest version, i.e. SCOR version 12 factors various digital capabilities mapped to processes of SCOR making this research all the more relevant. Another recent postulation on similar lines is the Digital Capabilities Model (DCM) for SCM by Deloitte & ASCM.

Considering the digital transformation that we are witnessing today not only in SCM but all fronts and the topical relevance of the investigation, this research journey continues. The next steps for this investigation is exploring collaboration with professional bodies and industry to dovetail these outcomes into the SCOR and DCM frameworks. A scoring system and rubric is also being evolved for this index with a cluster-specific and/or sector-specific scoring system on the cards.

Early results point to encouraging outcomes for sector-specific application of this research for retail, MSME and automotive sectors. It is envisaged that the index will expand into a gradation artifact with specific recommendations on moving up the ladder in terms of adoption of digital technologies.

A 360 degrees multi-dimensional one-stop beacon of guidance for enterprises on their digital footprint for SCM. Adding on to the famous quote from Sun Tzu from the art of war ...

*“The line between chaos and order lies in ‘Smart’ logistics...”*



[tec@amrita.edu](mailto:tec@amrita.edu)

Technology Enabling Center Amrita Vishwa  
Vidyapeetham, Amritapuri, Clappana P. O.,  
Kerala, India - 690 525.