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Logistics Focus®

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Technology, Automation & Productivity

The Dawn of New-Age Warehousing

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A joint venture between TCI and Mitsui & Co Ltd. TCI which is a logistics partner for Toyota Kirloskar Motors Ltd. & other Japanese companies in India.

Key Facts

- **1958** — Year of Establishment
- **4300 Crs (2019-20)** — Group Revenue
- **2.5% (by value)** — Moving India's GDP
- **6,000+** — Employee Strength
- **1,400+** — IT Enabled Own Offices
- **12Mn. sq. ft.** — Warehousing Space
- **12,000 (1,500 own trucks)** — Trucks in Operations
- **CSR** — TCI Foundation & TCI Institute of Logistics

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About Us

Group TCI, with revenues of over Rs. 4,300 Cr, is India's leading integrated supply chain and logistics solutions provider. TCI group with expertise developed over 6 decades has an extensive network of company owned offices, 12 mn. Sq. ft. of Warehousing space and a strong team of trained employees. With its customer-centric approach, world class resources, State-of-Art technology and professional management, the group follows strong corporate governance and is committed to value creation for its stakeholders and social responsibilities. TCI was the first to launch several solutions in the logistics field.

Credit rating and certifications: The company received AA-/ Stable rating for long-term debt instruments and A+ for short-term rating from CRISIL. ICRA rated A1+ rating for its commercial paper. The company was also accredited with ISO 9001:2008, reflecting its conformance with quality standards. It was also certified by IATA.

Listing: TCI is listed on the BSE Limited (scrip code: 532349) and the National Stock Exchange Limited (scrip code: TCI)

HSE commitment: The company is committed to provide a safe, healthy and eco-friendly work environment: strive for zero accident at the workplace, ensure the safe movement of people and material, control environmental pollution from business activities within permissible limits and strive to reduce further, reuse and recycle waste wherever possible, conserve energy and natural resources, create awareness of health, safety and environment at all levels, create a responsible work environment through enhanced safety and health, and promote continuous improvement.

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Special thanks to the content team of TCI who worked relentlessly behind the scene to make it happen viz. Vishakha Mahajan and Gourabi Das

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Foreword

Dear Readers,

Ever wondered about the journey of warehousing in India?

From being glorified godowns to the modern, technically-fitted floors with computerized specifications! We've travelled far, indeed!

"Technology, Automation & Productivity: The Dawn of New-Age Warehousing", the second edition of Logistics Focus for year 2019-20 brings to the forefront the significant part that warehousing plays in any supply chain. It is the fulcrum for procurement, manufacturing and distribution services which collectively build robust economy.

In addition, data-driven, flexible and robotic automation solutions further improve the performance while retaining the agility to adapt to tomorrow's changes. Post-GST with the removal of check-points, reduction in cargo movement time and replacement of multiple state and central taxes; there is a strong case for consolidation of warehouses.

The current issue talks about the post-GST warehousing aspects in detail whilst also highlighting how the new-age technology is shaping the warehousing dynamics today.

Do read the interesting cover story by Amazon!!

Last but not the least, sincere thanks to all the distinguished writers for their contribution. We look forward to your

Thanks,

Atul Endlay

Atul Endlay
Asst. Vice President – Warehousing Services

Mr. Atul Endlay heads the Warehousing vertical at TCI Supply Chain Solutions. Mr. Endlay has over 16+ years of experience in the Warehousing function. A specialist in warehouse planning and implementation, he has been closely working with many large clients with a global footprint for their warehouse site selection, designing and disposition requirements throughout India.

His interests are into reading and innovative technologies. He is also an active member of CSCMP (Council of Supply Chain Management Professionals) and also holds a six sigma green belt.

Technology, Automation & Productivity- The Dawn of New-Age Warehousing

Akhil Saxena, Vice President, Customer Fulfillment - APAC & Emerging Markets, Amazon

As we become ecommerce leaders in India, Amazon in its 6+ years of India operations has made the market its own while keeping the strategy global. Our focus is on building the three pillars of customer experience- Selection, Pricing and Convenience. Our vision for India is to transform how India buys and sells. We set ourselves a very high bar in customer and seller experience and we have made significant investments in infrastructure and innovation towards this.

For us India continues to be a key growth region and we will continue to invest in the country with a long-term focus to transform not only retail but also content creation and consumption in India. We are always creating innovative opportunities to build a robust Customer Fulfilment network that benefits our sellers, customers and delivery partners.

Amazon's Fulfilment Centres in India

Amazon continues to build a strong and robust fulfilment network in India, one that is helping to lead the way for our efforts globally. In line with our vision, a significant chunk of our investment goes in technology, logistics, and infrastructure as well as in seller enablement to ensure timely delivery and drive customer value

As part of our ongoing commitment to enhance services to customers and sellers on India's largest online store, we have more than 50 Fulfilment Centres (FCs) operational

across 13 states in India. Our Fulfilment Centres (FC) are hubs for storing millions of seller inventory while serving as distribution centres where associates pick, pack and ship orders seamlessly. Our FCs are integral to our process of fulfilling customer orders across the country. Additionally, these facilities allow us to offer Fulfilment by Amazon (FBA) service to thousands of small and medium businesses in the country and enable them to service customers at significantly low operating costs.

As part of our efforts to optimize our supply chain, we continue to invest in inventory placement technology and infrastructure within our FCs. Considering that India is a large country with varying topography, we carefully consider factors including geography, customer demand, access to transportation hubs and regions prior to identifying the location for an FC. While we continue to expand our delivery network, we ensure that the Fulfilment Centre is placed as close to the customer demand as possible to ensure faster fulfilment of customer orders. In the advent of varying regulatory and infrastructural challenges, we will continue to change our gears fast enough to support growth of sellers and customer promise.

Innovative technologies at Amazon Fulfilment Centres

India is a key market for us and we are deeply committed to enhancing our robust fulfilment network across the country. In line with our vision to continually elevate the customer experience, we have leveraged cutting-edge technology to optimize the processes and functions across our all our Fulfilment Centers (FCs). The technological innovations assist our FC associates in various stages, ranging from 'random stow and pick' to 'box sizing algorithms', software that determines the shortest, most efficient walking route from one place to another and the SLAM process (Scan, Label, Apply, Manifest).

A few concrete examples of technology/mechanisms designed for the associates in the FCs:

- **High shelving with motorized vehicles** (forklift): Instead of walking, associates (post systematic training) drive vehicles which take them to the highest ranges of racks in the FC. In addition to assisting the associate, this mechanism assures a larger capacity of storage and guarantees high safety.
- The use of **barcodes/ scanners** during the process: This enables the associates to identify the shortest way to a product, and thereby, ensure quick and efficient deliveries. The added value from pickers is their ability to view the product and gauge its quality.
- **The SLAM:** It is the ultimate point of quality control (package's weight and size, conformity to customer order) before loading the truck.
- **The Cubiscan machine** takes the measurements of each product once and then shares the information across the FC network to avoid the repetition of this task in each location.
- The global IT infrastructure is designed to reduce the walking distance for the pickers. Comments and reported

errors are implemented in the system to ensure improvement on a regular basis. The goal is to allow the associates to perform tasks with lesser time consumption and with the highest standard of quality for customers.

- **Box Sizing Algorithms:** We have special boxing programs where the systems will calculate the right size of the box for the order, eliminating the need for associates to try multiple sizes before getting the right box.

The technologies available within the FCs are integral to ensure faster and efficient processing of customer orders. From the FCs, the shipments are transported to the sort centre nearest to the delivery station within our middle mile operations.

Role of the middle-mile operations in fulfillment of customer orders

Our middle-mile operations act as a connecting nexus between our fulfilment centers and destination stations, which is typically either an Amazon Delivery Station or a Service Partner Station.

At Sortation Centers (SCs), associates sort customer orders by final destination and consolidate them onto trucks for faster delivery. In most of the cases, two or more sort centers are involved in the movement of packages in. A sort center is all about connection from one truck (in bound) to another (out bound) after sorting it to the right area. The automation in our sort centres has helped us build a 30% efficiency in our sortation process. At some of our sort centres, we have installed Sort Sliders to categorize the packages for easy identification and optimize the process for secondary sorting. In addition to this, we also have auto sorters in select SCs. An Auto Sorter is a completely automated machine which performs end-to-end sorting of packages - right from feeding the packages, reading the SLAM label, identifying the drop-off point and placing the packages directly into bags. The bags are then closed and loaded into the trucks.

The final and important step with Last Mile Operations

Last Mile Operations form the final and an essential peg within our operations network which allow us to provide speedy and reliable deliveries to our customers. Considering transportation and logistics, the big challenge is to ensure that we deliver a consistent experience to customers throughout the country. We have continually invested to improve technologies within our last mile operations to ensure a seamless customer experience.

- **Address accuracy:** Addresses are the single most important customer input for Amazon to make fast and reliable deliveries to our customers. To address the challenge of delayed deliveries due to errors in addresses, we have been using Machine Learning techniques to validate customer's addresses, compute address quality scores, correct city-pin code mismatches, and provide suggestions to users to correct wrong addresses. Specifically,

we are using Machine Learning algorithms to:

a) Identify instances when the user may have entered an incorrect pin code and suggest the correct pin code to the user.
b) Identify instances when an address is incomplete, and suggest words/ phrases that the user can add to the address to make it complete.
c) Score addresses based on their quality/ location/ deliverability, and use these address quality/deliverability scores to identify poor quality addresses.
d) Map addresses to geo-locations so that it becomes easy for delivery agents to locate the address and deliver to it.
e) Label addresses as residential or commercial so that we can improve delivery speeds and reduce failed deliveries.

- **Cash Loads at Doorstep:** This enables Indian customers to add cash to their Amazon Pay balance account right at their doorstep. This feature is in addition to the existing facility of adding money to their accounts using their bank accounts and credit/debit cards.

In addition to providing superior faster delivery of products, we use our own technology platform for vehicle execution and monitoring.

- **GPS Monitoring:** We introduced GPS monitoring system in every vehicle which transports goods, enabling us to get in-depth details on various parameters and track the movement of the packages. Implementation of GPS also helps in sending a replacement vehicle and repair vehicle quickly to the location in case of a vehicle break down.
- We also provide access to Amazon Technology platforms to our partners, which helps them review their schedule, plan vehicles for routes and communicate seamlessly with Amazon. We plan to invest more in this space this year and enhance carrier experience.

The technologies within our robust fulfilment network have enabled us to achieve three objectives – to widen our reach, provide faster delivery promise and improve the delivery experience for both customers and sellers. The innovations within these centres have also enabled the associates to effectively leverage the technology and has helped create a more efficient process to meet customer demand. These have significantly enhanced our delivery capabilities and helped us fulfil customer order in 100% serviceable pin codes in India. Our measure of success is when we are able to deliver exotic tea or designer wear or even Pampers to a customer residing

Our single-minded focus globally and in India is working backwards for the customer, and innovating on their behalf. We have adopted many global best practices, but have also built many India first initiatives to within our last mile operations.

in Bhuj in Gujarat or Port Blair in Andaman & Nicobar Islands.

Amazon's long term plans for last mile connectivity in India:

In line with our vision to ensure fulfilment of customer orders across the country, we have introduced several India-first initiatives such as **'I Have Space' (IHS) and Delivery Service Partner (DSP)** program, in our last mile operations. These programs have enabled us to expand our reach into deep regions of India. Under the DSP program, we partner with SMBs to deliver packages to Amazon customers. Through the IHS program, we partner with local store owners across different cities to deliver products to customers within a 2 – 4 kilometer radius of their store. Additionally, this year, we launched Amazon Flex, which enables individuals to make part-time deliveries.

We are invested in India for the long-term and will continue to incubate innovation within our last mile operations to magnify our reach and ensure a seamless delivery experience to every customer in the country. Indian e-commerce space is still at a very nascent stage with significant potential for innovation and growth. We believe growth is at an inflection point and there is a tremendous opportunity. We believe there is room for multiple formats, players and most importantly, for innovation. Over the last six years, we have built India's largest online store with over 200 million products; created a delivery footprint across all 100% serviceable pin codes in India and enabled over 500,000 sellers from across India to take advantage of the digital economy.

For Amazon in India, it's still 'Day 1'. We have just got started.

Global Kaleidoscope — Envisioning warehouse of the future

Globally, the population is becoming more urban and incomes are rising. In developed countries, the population is aging and the workforce is shrinking while those trends are reversed in developing countries where birth rates are higher. There are significant technological developments emerging today that will, in all probability, shape the warehouse of the future. Compiled with excerpts from Colliers International Group report

THE term omni-channel is here to say with the highly evolved form of e-commerce that has developed over the last decade. Consumer behavior has evolved as the purchase patterns include moving across channels seamlessly, browsing and making a purchase based on the circumstances. There may also be a greater demand for personalization and customization with a lower tolerance for delays in delivery. There will surely be a time when delivery is expected to be made within a day, or even on the same day.

Let's Talk Figures

As per one of the recent report on warehousing by Technavio, the global warehousing market estimated to be as high as $475 billion in the year 2017 and it made up roughly 8% of the market for transportation services. It was tagged the 5th largest market in global transportation services market in the same year.

Warehouses are now being designed to be consolidated and being fashioned into multi-story storage facilities in urban areas and expensive land parcels. A multi-story warehouse is fashioned to increase the amount of usable floor space per square foot of a piece of land. It helps improve the overall efficiency and results in a superior land utilization rate. Warehouses such as these have been a massive success in countries like China and Singapore where the population is dense and the costs for the land and construction are high, adding to the limited availability of industrial land.

The growing demand for refrigerated warehousing due to developing frozen food industry is a major factor driving the growth of the market. Frozen dinners, fruits and vegetables, and ice creams require refrigerated warehousing for their storage before they are distributed to the retail stores or sold directly to consumers through e-commerce. The growing demand for these products will increase the need for refrigerated warehousing. Usually, frozen food is perceived as an alternative to fresh and home cooked food as well as canned food. The frozen food market is growing because it includes ready-to-eat meals that are convenient food for individuals with busy schedules. Furthermore, rising urbanization is also driving the growth of the global frozen food market.

According to the Technavio report, the general segment, which occupied the largest market share of 70% in 2017 is expected to decrease by almost 1% in 2022. However, the segment is expected to dominate the global market throughout the entire forecast period. In the year 2017, APAC was the leading region for the storage market, accounting for roughly 39% of the market, followed by the US and EMEA. APAC is predicted to clock the fastest growth during the years 2018 through 2022.

According to a senior analyst at Technavio for research on warehouse and storage, "The frozen food market is growing because it includes ready-to-eat meals that are convenient food for individuals with busy schedules. Furthermore, rising urbanization is also driving the growth of the global frozen food market. Vegetables such as green peas are being consumed all year round, owing to the emergence of refrigerated storage."

Mega Distribution Centres of Today

Distribution centres can vary quite significantly

in size and location requirements, depending on delivery factors like the catchment area, expectations and the share of online sales that have been conducted. It is commonplace to see a range of distribution centre sizes in the global logistics markets. However, it is noteworthy that there is a rationalization process afoot which is leading to the creation of mega-sheds as the first point of dedicated distribution.

Modernizing with the Help of Technology

As the e-commerce sector is booming, the demand for these facilities is constantly increasing, and this demand is driven by increasingly sophisticated distribution needs. To improve their operational efficiency, logistics companies have been actively engaging with mobile and analytic technologies which can be termed as spin offs from their internal digital platforms to help further facilities that are mainly process-driven.

One of the proven features of e-commerce is Radio Frequency Identification or RFID being progressively incorporated and is proving effective for managing and receiving stock, among other activities like sorting, security, picking-packing, inventory control, conveyance and shipping. This is proving useful for logistics providers to help link up the various parts of the supply chain, thus helping provide a more accurate read on the inventory management reporting. It also aids in the collection product characteristics of their customers, which in turn translates into business analytics that help serve customers better. It has become easier to facilitate deliveries from distribution centres to high-street shops and malls that are closer to the sub-markets where the customers reside.

Consolidation of the Distribution Centres

A recent trend of consolidating distribution centres has been noted in the pan-national distribution or regional markets. In several markets, especially where the customer base is diversified and labour is short, automated systems are enabling higher rates of productivity and better delivery times. Automation has become a major part of running an efficient operation, reducing returns and losses due to faulty products as compared to manual systems.

More Flooring, More Gadgets.

Thanks to the growth of e-tailing and the rise in space requirements, there is a trend observed in the market of increasing floor area in the storage facilities, whereby many of the modern first mile distribution facilities comprise of a floor area as large as 100,000 m2.

It is now commonplace to see a facility in China that measures up to 150,000 m2 with a massive headroom of 10 metres. Although there have been sizeable developments observed with floor areas exceeding typical benchmarks around the world. GLP Pak Lingang in Shanghai, for instance, is 185,000 m2 and Logistic Republic in Taipei will be 264,000 m2.

As a matter of fact, the demand in the e-retailing sector is growing so fast, that many facilities in recent times have been designed keeping in mind the possible need for expansion even before the facility is ready. In several markets around the world, this is putting significant pressure on the already tight land and planning conditions.

The Green Factor

Sustainability is one of the major factors of designing new, cutting-edge distribution centres. Factoring in sustainability has become one of the key elements in design and many top-tier DCs are now providing a number of green features.

There are three types of DC, which will take the dominant form in years to come: Mega-sized Regional/National DCs; Mid-sized, Crossdocked City DCs; Small, flexible urban warehouses/access centres. Size wise, these formats fit a ratio of 100:10:1, based on examples across a variety of global markets. Looking forward, while Mega-sized DCs will continue to show a pattern of consolidation, a proliferation of their Mid-sized and small cousins is expected as urban logistics continues to grow in scale and importance.

Quite a few facilities around the world are being built in compliance with LEED (Leadership in Energy and Environmental Design) certifications. Logistic Republic - Taipei Park in Taipei and 4 Pandan Avenue in Singapore are also, and rightfully so, certified as sustainable developments.

The New Face of DCs

A new trend that has been observed in designing DCs is the increase in height. For traditional distribution centres, it has been done to facilitate the use of automated racking and to incorporate a higher proportion of office area, typically with mezzanine flooring considering that most of the manual work is in the form of programming and managing technology. It is a different story in Asian countries. As DCs have become increasingly larger, the Interlink facility in Hong Kong deserves a special mention. It is the world's tallest facility and is also located in one of the most densely populated parts of the world. Facilities like this 24-story Distribution Centre are definitely a thing of the future as cities continue to urbanize further and land prices become more and more competitive.

The Saga of Urban Last-mile Delivery

Delivery in urban environments is particularly challenging for logistics companies. Last mile- which accounts for a sizeable portion of shipment costs and complexity, is also the most inefficient. Low load factors are the reigning reason for the inefficiency in urban areas. Individual delivery requirements and long dwell-times at fulfillment centres also add to the inefficiencies of urban deliveries.

There has been increased pressure among logistics providers to reduce pollution and improve load factors. There is also an uptick in the requirement to lower noise emissions, fulfillment times and congestions. To keep up with these pressures, there has been an increase in the usage of environment-friendly alternatives such as electric and hybrid freight vehicles. It is also why cross-docked DCs on the edges of towns and cities are growing as a go-between nation/pan-regional DCs and the variety of urban logistics and retail fulfilment options which are sprouting up across cities globally, by servicing them with smaller transit vans as opposed to larger trucks.

Urban Warehouses

E-commerce retailers have started implementing urban warehouses in their game plan to limit deliveries to the shortest possible routes. This means the inclusion of smaller warehouses in the networks in order to shorted routes and to facilitate quicker deliveries, especially to online customers.

The warehouse that is used to store the customers' goods must move closer to where the customers reside in order to improve delivery efficiency. There is a growth predicted in the use of such set ups which are made responsible for staging products for users, making it a seamless and convenient experience to shop online. The most glaring challenges would be the limited availability and the high real estate costs in the urban markets. This will mean running compact warehousing which carry limited inventories that are run with the help of elements such as predictive analysis and new-age technologies like 3D printing.

There may also be an increase in the implementation of the shared space model in which sellers share space in the same storage facility with products consolidated in a similar fashion to how parcel shippers consolidate their packages.

The modern warehouses developing in the urban areas need to be equipped for production, storage and shipping products. With the continuous improvement in newer

technologies like 3D printing and the furthering of customization requirements, urban DCs may soon be in a position to 'print' products on demand on demand, which could be packaged and delivered just as they do from inventories.

Urban DCs must be equipped with appropriate technologies to facilitate same-day deliveries or customer pickups. They can do this by leveraging new-age technologies like autonomous vehicles, robotic picking and loading, drones and mobile pickup points.

Technology is sure to play a vital role in delivering the efficiency that the system demands while moving products from large regional warehouses to the smaller urban DCs, thereby enabling faster picking, loading and delivery.

The Advent of Parcel Lockers

The popularity of parcel lockers is also on the increase in Europe, and the network of lockers across the country is expanding quickly. Particularly in Germany, the Netherlands, Belgium, France, Poland and the UK. Around 11% of Polish online customers choose collection from parcel lockers. Similarly, the adoption of lockers is also a growing trend in AsiaPac, to solve the last mile problem particularly for individual cities with large and diversified populations. In Beijing, the 'Parcel Cube' service has been provided in office sub-markets, residential districts and universities. It is essentially a self-serve automation arrangement where users can store and pick up their products in cabinets through the identification of specific passcodes.

Smart, Urban Warehouses

Smart, Urban Warehouses are also growing across mature and more evolving markets. In Vietnam, urban warehouses are becoming an integral part of the last-mile delivery, with new smaller facilities (than the average traditional set up) being planned closer to key urban locations. It is Colliers understanding that these warehousing facilities will be more sophisticated and tailored made to specific occupiers.

What's Happening in the Market Today

As the demand for sophisticated storage and distribution facilities increases, owing to the expanding volume of e-commerce, the trend of joint ventures between retailers, freight and logistics providers, developers and institutional real estate is poised to be a trend to watch out for in the future.

There may be a rise in the number of logistics specialists who will compete in this space, provide support for a logistics system which is becoming more and more complex every day, thanks to the cost controls, the need to manage returns and to keep up with customer expectations.

Currently, it is only the markets like North America, UK, Australia and the Nordic countries that can be considered at the advanced stage of 'Strategic Alliance.' All the other markets-including the more mature markets like the South Asian countries, are yet to reach a level that can be considered at par with these. Markets such as India are still at their beginning stage in earnest, alongside locations in south-east Europe, Africa and the UAE.

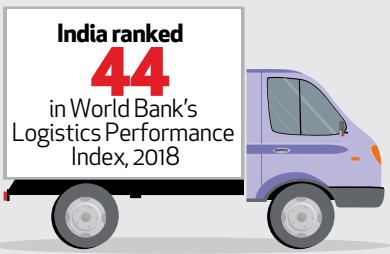
As and how these markets evolve, we can expect to see each location advance, some at faster rates than others, to a level that can be considered top-notch. The Chinese markets, particularly the ones located on the coast, are poised to reach this phase first, alongside Taiwan, Hong Kong and Singapore. It is expected that even the Southern European markets will be aspiring to this level by the year 2020, markets where competition is intensifying and logistics players have been going for more service differentiation in order to secure their market share. These locations also offer some of the best inland intermodal hubs to efficiently serve pan-European operations over the long term, so alliances may evolve to include rail freight operators.

Owing to the size and scale of China and the PRD region, alongside Africa (sub-Saharan), India, Mexico and Brazil, these markets are expected to remain in the growing sector for about another decade before they reach a consolidation phase of any sort. Countries like Russia, Japan and China may most likely reach that phase first, although thanks to the rate of growth of the e-retailing market in Brazil and Mexico means that their major cluster cities could reach the consolidation phase as operators move in to acquire market share.

Thanks to the major strides towards progress in all arenas, the logistics arena is all set to create a plethora of opportunities for every party involved in the supply chain business for years to come.

India's Warehousing Sector Review

The year 2018 saw Indian Warehousing Sector coming of age, outshining some of the conventional real estate asset classes and attracting global investors. As per a study by JLL India Industrial Services, 2018 witnessed a 22% y-o-y growth in total stock in Grade A & B warehousing space in top eight cities at 169 mn sq. ft. compared to 138 mn sq. ft., a year ago. Interestingly, absorption clocked an unprecedented growth of 63% y-o-y growth to 31.8 mn sq. ft. last year from 19.7 mn sq. ft. in 2017. The robust growth in absorption reflects demand outstripping supply and vacancies dropping below 10% level for the first time ever. Here's a snapshot of the key trends by by JLL India Industrial Services.

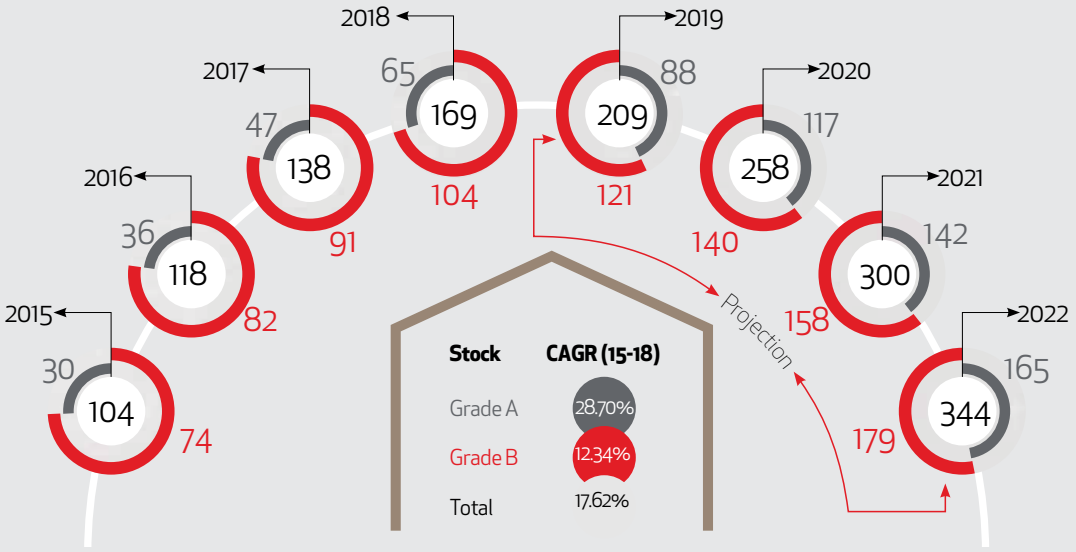


What Was New In 2018

First Container Movement on National Waterways 1 (NW1) between Kolkata and Varanasi started

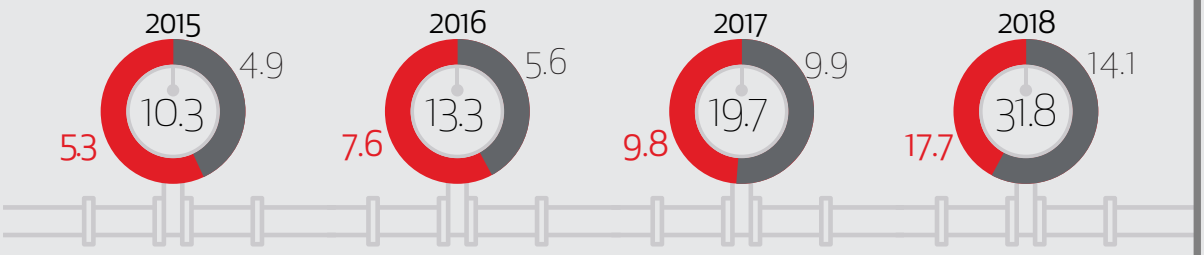
Trial run of **300+ km** in **WDFC** (First Phase) near **Delhi NCR**

Warehousing Stock (Cumulative Supply)



Demand Outstripping Supply

Grade A Takes The Centre Stage



Strong Demand / Absorption

Stock	CAGR (15-18)
Grade A	52.90%
Grade B	38.17%
Total	45.61%

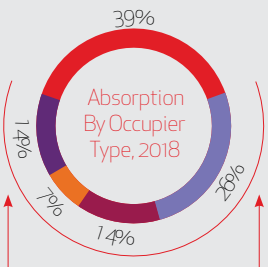
Absorption by Type

	2017	2018
BTS*	30%	26%
Ready Built	70%	74%
Total	100%	100%

*BTS = Built To Suit

Absorption By Occupier Type

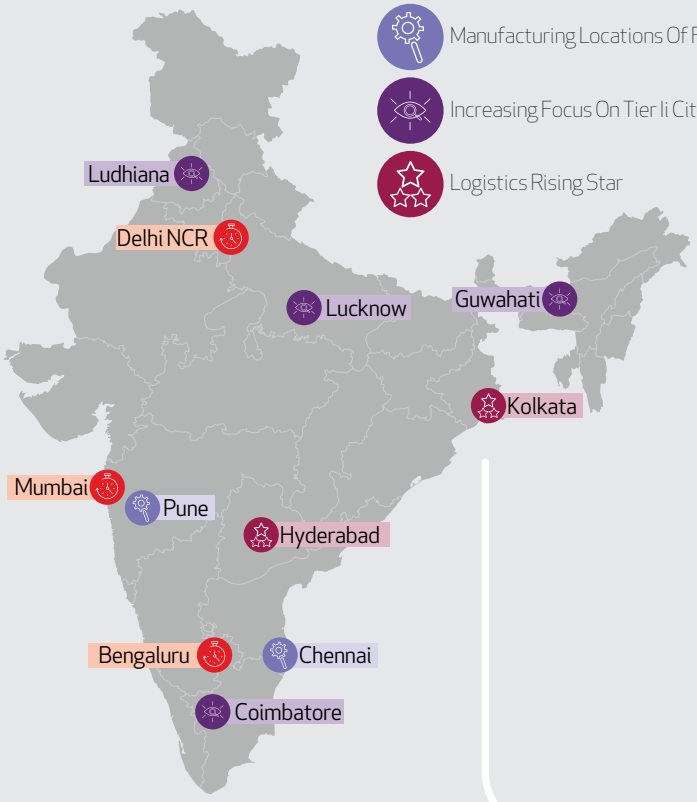
3PL / Logistics players takes the lead in 2018, yet again



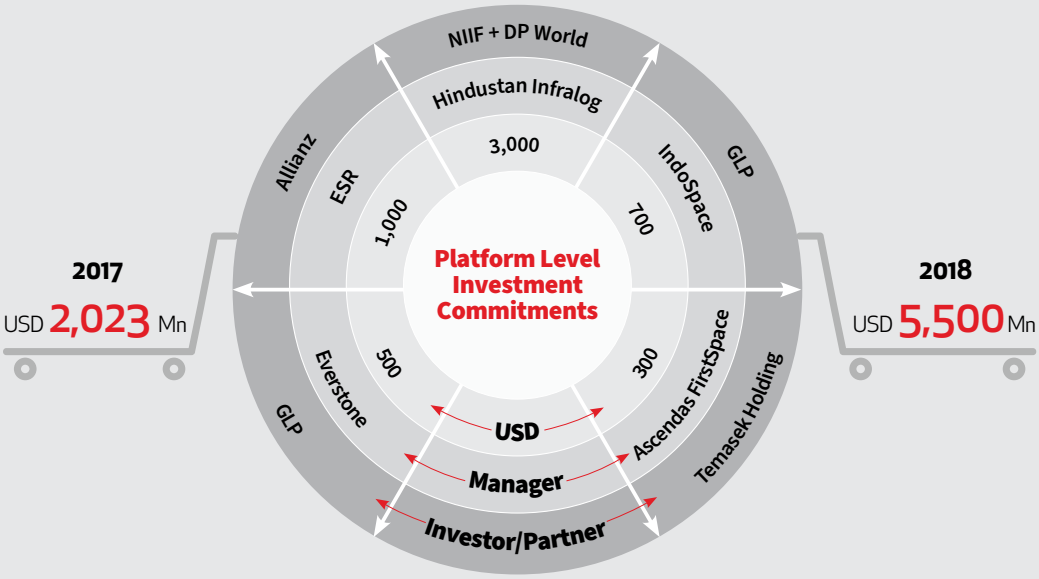
60% of the demand / absorption coming from 4 types of Occupiers

- 3PL/Logistics
- Ecommerce
- Auto & Ancillaries
- FMCG/Retail
- Others

- Most Active Transaction Markets
- Manufacturing Locations Of Focus
- Increasing Focus On Tier Ii Cities
- Logistics Rising Star



Investment Climate



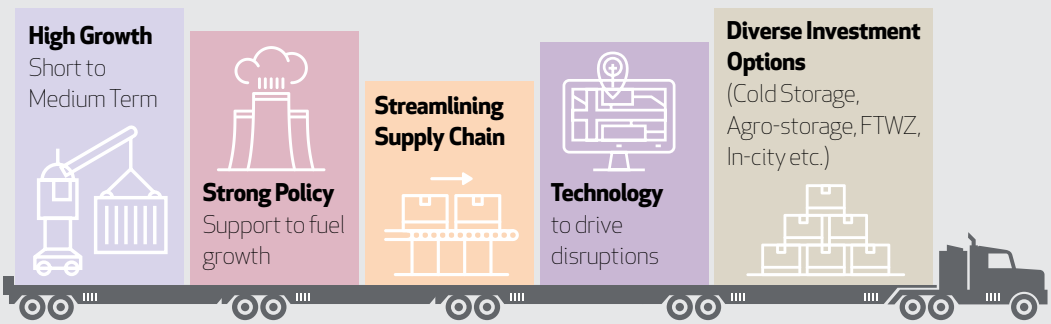
Project Level Investments

Investor	Investee
Morgan Stanley	KSH (Pune)
Altico	Renaissance (Mumbai)
Proprium	Mussadilal Projects (Multiple)
Ascendas FirstSpace	Sun Logistic Park (Chennai)
ESR	Prakyyat (Mumbai)
IndoSpace	Crystal Logistics Park (Ahmedabad)
LOGOS India	Casa Grande Distripark (Chennai)
Hindustan Infralog	Continental Warehousing Corporation (Multiple)

2018 Take Away

*HESS = Health, Safety, Environment and Security

Way Forward...



Government policies – growth enablers

The government's initiatives to promote the growth of warehouses in the country through measures such as enactment of the Warehousing Act, 2007, investments in the establishment of logistic parks and Free trade warehouse zones (FTWZs) together with the introduction of Goods & Service Tax (GST) regime augurs well for the industry's growth. Sensing the tremendous growth potential of the warehouse sector, the private players (including both domestic & international) have ventured with a view to bridge the gap between cost and efficiency of operations, writes Saurabh Bhalerao, Associate Director, CARE Ratings.

Saurabh manages the industry research services at CARE Ratings. Saurabh has over a decade's experience in managing the delivery of research services and has familiarity in dealing with global teams consisting of analysts with different cultural backgrounds and ramping up teams from an initial pilot phase to a steady state. He has been associated with companies such as Dun & Bradstreet.

Warehousing primarily refers to the storage of goods to be transported, whether inbound or outbound. The Warehousing and Storage industry includes establishments operating warehousing and storage facilities for general merchandize, refrigerated goods and other warehouse products. Warehouses are one of the major segments of the rapidly growing logistics industry. Currently the segment has evolved from providing not only custody for goods but also offering value added services such as sorting, packing, blending and processing. With evolution of an organized retail sector modern warehouses for the storage of perishable goods have become indispensable

In 2017, the global warehousing and storage market was estimated to be around $475 billion. The global warehousing and storage accounted for approximately 8% of the overall logistics market in 2017. The warehousing and storage market was the fifth largest market in the global logistics market in 2017. North America is the largest geographic region accounting for nearly 28% of the global market.

Globally, warehousing has moved ahead from single storey to multi-story warehouses in densely populated cities and expensive land spaces. A multi-story warehouse consists of more than one floor and is designed to increase the available floor space. It results in better land utilization rate and enhances operational efficiency. Multi-story warehouses have been successful in densely populated cities predominantly in Asian countries such as China, Japan, Hong Kong and Singapore, due to high land and construction costs, small site areas and limited industrial land availability.

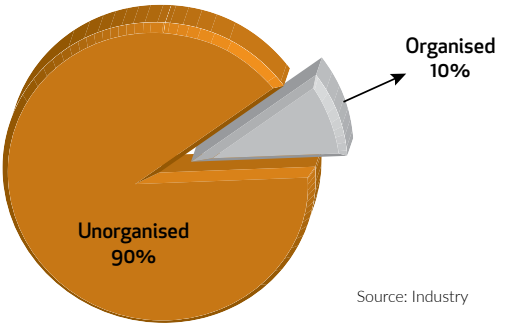
Domestic Scenario

The warehousing market in India is highly fragmented with most warehouses having an area of less than 10,000 sq.ft. Approximately 90% of the warehousing space in the country is controlled by unorganized players with smaller sized warehouses which have limited mechanization. Fragmented warehousing footprint results in higher average

inventory holding, in addition to resulting in higher storage and handling losses, driven by lower level of mechanization.

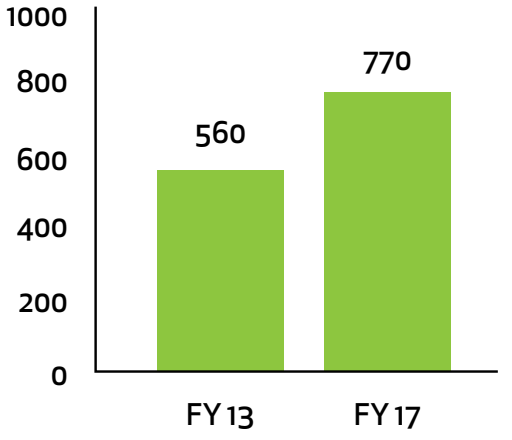
Nearly 60% of the modern warehousing capacity in India is concentrated in the top six cities namely Ahmedabad, Bangalore, Chennai, Mumbai, NCR and Pune, with Hyderabad and Kolkata being the other major markets. This is driven by concentration of industrial activity and presence of sizeable urban population around these clusters. Going forward, due to factors like quality of infrastructure and availability of labour, these advantages are likely to remain with these cities. In all the segments of warehousing industry barring the agricultural segment, the majority of the capacity is controlled by the private sector. In the agricultural segment, approximately 3/4th is controlled by different Government entities. The primary objective of a majority of these warehouses is to only store food grains and ensure food security.

Warehousing Industry: Organised vs Unorganised (%)



Source: Industry

Indian Warehousing Industry Growth (Rs bn)



Source: Industry

Types of Warehouses

Traditionally, warehouses were broadly classified into public-private, bonded, government and co-operative warehouses. Lately, cold chains, container freight stations (CFS) and inland container depots (ICD) are gaining importance.

Private Warehouses: These warehouses are owned by private entities or individuals and are used exclusively for the goods owned, imported by or on behalf of the licensee. The warehouses are usually constructed at strategic locations to cater various manufacturing, business and service units. They are flexible enough to be customized in terms of storage and placement, according to the nature of the products.

Public Warehouses: These warehouses are licensed by the government to private entities, individual or cooperative societies to store goods of the general public. They are rented out against a fee and usually set up at transportation points of railways, highways and waterways, providing the facilities of receipt, dispatch, loading and unloading of goods. The government also regulates the functions and operations of these warehouses used mostly by manufacturers, wholesalers, exporters, importers, government agencies, etc.

Bonded Warehouses: These warehouses are licenced by the Government to accept imported goods for storage until the payment of customs duty. They are located near the ports. They are either operated by the Government or work under the control of customs authorities. The warehouse is required to give an undertaking or 'Bond' that it will not allow the goods to be removed without the consent of the custom authorities. The goods are held in bond and cannot be withdrawn without paying the customs duty. Such warehouses are very helpful to importers and exporters. If an importer is unable to pay customs duty immediately after the arrival of goods he can store the goods in a bonded warehouse. He can withdraw the goods in instalments by paying the customs duty proportionately. Goods lying in a bonded warehouse can be packaged, graded and branded for the purpose of sale.

Container freight stations (CFS)/inland container depots (ICDs): CFSs/ICDs are custom-bonded facility with public authority status for the handling and storage for containers. These depots are equipped with warehousing space, adequate handling equipment and IT

Warehouses have become one of the major segments of the rapidly growing Indian logistics industry. Today they do not only provide custody for goods but also offer value added services such as sorting, packing, blending and processing. With evolution of an organized retail sector, modern warehouses for the storage of perishable goods have become essential.

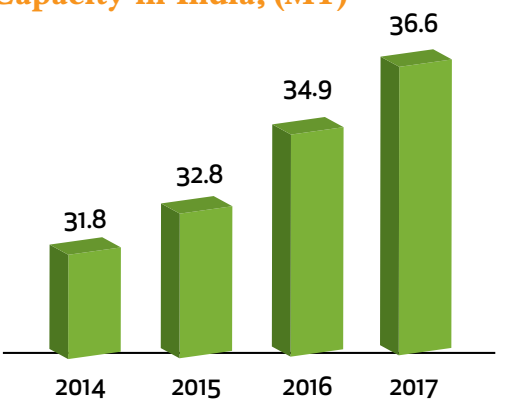
infrastructure.

Government Storage: The primary objectives of any government storage are 1) to ensure food security, and 2) enable trade movement both within and out of the country. Consequently, the Central Warehousing Corporation operates 431 warehouses (storage capacity of 100.28 lakh MT) including 44 custom bonded warehouses, 29 CFSs/ICDs, 3 Air Cargo Complexes (ACCs) (5,961 MT) and 3 cold storage warehouses (2,419 MT). Further, various State Warehousing Corporations (SWC) manage a total capacity of 283.34 MT across 1,831 warehouses. The Food Corporation of India (FCI) works for holding agricultural produce to meet the requirements of various government schemes. FCI has its own storage capacity but also hires capacities from CWC, SWCs and the private sector.

Cold Storage: A cold storage is a temperature controlled storage space catering mainly to agriculture and food industries. Cold stores are used for the storage and distribution of perishable goods such as fruits and vegetables, dairy products; frozen foods such as meat and ice cream, and temperature-sensitive pharmaceutical products. Given that India is primarily an agriculture country, cold storage has huge potential in India.

There are over 7,700 cold storage warehouses with a capacity of over 36 million MT in India with a significant portion of the facilities being privately owned. India's cold storage capacity is unorganized and dominated by traditional cold storage facilities. The distribution of cold storages is highly uneven with majority of the cold storages located in Uttar Pradesh, Gujarat, Punjab and Maharashtra. Further nearly two thirds of the total cold storage capacity is used for horticulture crops including potato. Despite the above storage capacity, the Central Institute of Post-Harvest Engineering and Technology

Cold Storage Capacity in India, (MT)



Source: JLL

Storage Capacity for Central Pool Food Stocks

Year Ending	Capacity with FCI	Storage Capacity Other Agencies	Total
FY11	316.10	291.32	607.42
FY12	336.04	341.35	677.39
FY13	377.35	354.28	731.63
FY14	368.90	379.18	748.08
FY15	356.63	352.59	709.22
FY16	357.89	456.95	814.84
FY17	352.71	420.22	772.93
FY18	362.50	480.53	843.03

Source: FCI

estimates that close to 15%-16% of fruits and vegetables perish as cold storages are located near consumption centres rather than farms. The cold storage segment is driven by growth in trading of perishable products both agricultural and others (e.g. pharmaceutical).

Regulations

Warehousing Development and Regulatory Authority (WDRA) Rules: Warehouses (especially agricultural) in India are regulated and governed under The Warehousing (Regulatory and Development) Act, 2007. The main objective of this Act is to develop and regulate warehouses, negotiability of warehouse receipts, establishment of Warehousing Development and Regulatory Authority and for related matters.

The Act gives directions on the following:

Registration: The Act makes it compulsory for a person to carry on warehousing business as a business and issue a negotiable receipt to obtain a certificate of registration.

Warehousing Receipt: The warehouse would issue receipts only after ascertaining quantity, quality / grade and other particulars as may be mentioned in the receipts.

Authority and Powers under the Act: Some of the authorities and powers conferred under the Act are granting registration and cancellation / renewal of registration, specifying qualification of warehouseman, and regulating rates, advantages, terms and conditions that may be offered by warehouseman in respect of warehousing business.

Offences under the Act: Failing to ascertain quality and quantity, failing to surrender negotiable receipt by depositor or endorsee and payment of all his lawful charges and cancelation of encumbrances endorsed on the receipt to deliver the goods represented by the receipt are some of the offences under the act.

Penalties: The offences committed under this Act shall be punishable with imprisonment of a term of up to three years or with fine of Rs 1,00,000 or both.

The industry also remains governed by various acts such as: Multimodal Transportation of Goods Act, 1993, Foreign Trade (Development and Regulation) Act, 1992, Customs Act, 1962, Carriage of goods law etc. regulating the movement of goods and allied services. Various policy changes have impacted the warehousing sector in India. These include the introduction of the Goods and Service Tax (GST), National Policy on Handling, Storage and Transportation, and increasing Public-Private Partnerships (PPP). Following are a few such policy measures:

- **Goods and Services Tax (GST):** GST has consolidated the tax regime across states which will result in cost and time efficiencies across the supply chain. GST will also hasten the consolidation of warehouses thus accentuating the formalisation of the largely unorganized warehousing sector. For most logistics services like e-commerce logistics, warehousing and air freight (export), the tax rate is 18%, which is an increase from the earlier rate of 15% which includes service tax and cess. Services like ocean freight and road transportation are in the 5% slab. Under GST, the tax on warehouse, storage and other labour services has increased from 15% to 18%.

- **Logistics Parks Policy:** Launch of multi-modal logistics parks and the grant of 'industry' status to the logistics sector would enable better access to finance.

- **Domestic manufacturing emphasis:** The focus on "Make in India" is expected to increase domestic manufacturing and increase the requirement for associated activities such as warehousing.

- **Agri-warehousing** activity covered under Priority Sector Lending by RBI

- **Subsidy schemes** such as 1) Grameen Bhandaran Yojana - a capital investment subsidy scheme offered by the NABARD, which ranges from 15% to 33% of project cost, depending on the location and operator, 2) National Agricultural Renewal Fund. Govt. of India - encourage private investment in the creation of agriculture infrastructure

- **Tax incentives** such as 1) Tax relief under 80(I)(B): tax holiday on warehousing income, 2) Investment-linked deduction under Section 35AD: 100% upfront depreciation for tax purposes

The government permits 100% FDI under the automatic route for all logistics services except

Negotiable Warehouse Receipts (NWR) issued by registered warehouses enables farmers to seek loans from banks against NWRs and enables them to extend the sales period of modestly perishable products beyond the harvesting season. Consequently, NWRs can avoid distress sale of agricultural produce by the farmers in the peak marketing season.

courier and air transportation services. In case of courier services, 100% FDI is permitted subject to the approval of the Foreign Investment Promotion Board (FIPB) while FDI up to 74% is permitted under the automatic route for air transport services including air cargo services. Further according to media reports, the government is working on a policy to create new logistics hubs by preparing an integrated logistics plan. The new integrated logistics plan would be prepared by the logistics division in the department of commerce in consultation with various stakeholders.

Trends

- **Warehouse consolidation due to GST:** With the advent of GST and the consequent redrawing of supply chains, there will be significant consolidation of warehouses by companies in the consumption space. A bigger warehouse in an appropriate location would be able to better serve a larger area. This will lead to development of large modern technology based warehousing operations and rapid modernization of unorganised godowns. Smaller local developers and property owners are expected to exit the space by selling out to the large institutional developers in existing clusters.

- **Reduction in inventory holding costs:** Further the combining of smaller warehouses into a single larger one is also expected to reduce the inventory level requirements which are expected to positively impact the companies as inventory carrying cost is a significant share of costs.

- **Technology usage on the rise (IT, automation, and robotics) (Smart warehouses):** With the increase in the warehousing and storage market there has been a concurrent increase in technology usage especially in the grade A/B warehouses. These warehouses use internet of things (IOT) to track a product in the warehouse and also helps in increasing efficiency and speed across supply chains. Variety of devices such as wearables, sensors and radio frequency identification tags are used to locate the products in the warehouse. This reduces the

Details of NWRs issued and loan financed against NWRs as on 31.07.2018

Sr. No.	Year	No. of NWRs issued	Value of commodities deposited against NWRs (Rs. cr.)	Total loan against NWRs (Rs. cr.)
1.	FY12	8,056	1,356.3	591.0
2.	FY13	8,242	416.3	105.7
3.	FY14	6,121	583.0	108.0
4.	FY15	16,993	1,160.7	388.4
5.	FY16	15,178	845.1	203.5
6.	FY17	19,350	719.1	148.4
7.	FY18	12,313	510.2	118.5
8.	YTD FY19	12,015	490.9	37.8
9.	Total	98,268	6,082.4	1,701.2

Source: Warehousing Development & Regulatory Authority

time to deliver the product to the customer and increases accuracy.

- **Rise of Direct Port Delivery (DPD):** DPD involves the delivery of a shipment directly from a port to the consignee instead of initially holding it at a CFS (Container Freight Station). The DPD initiative under 'Ease of Doing Business' has witnessed steady growth in terms of proportion of total containers handled. At JNPT, the share of Direct Port Delivery (DPD) has increased from 5.4% in April 2016 to 39.2% March 2018. This is likely to have an impact on the CFS. However, shortage of space at warehouses poses a challenge to service DPD clients efficiently.

- **High Tonnage trucks sales are expected to rise:** Supply chain realignment and check post discontinuation has led to a reduction in the travel time as well as fuel costs. This has led to a demand for larger more efficient trucks as warehouses are consolidating and larger loads are required at lower number of locations. Despite the higher upfront costs, such trucks are expected to reduce overall shipment costs by carrying a larger load per trip.

- **M&A to rise:** Various PE firms and foreign players are making inroads in the sector via joint ventures, mergers and acquisitions. Below are a few key instances of M&A activity reported in the sector:

Negotiable Warehouse Receipts

Negotiable Warehouse Receipts (NWR) issued by registered warehouses enables farmers to seek loans from banks against NWRs and enables them to extend the sales period of modestly perishable products beyond the harvesting season. Consequently, NWRs can avoid distress sale of agricultural produce by the farmers in the peak marketing season. However, NWRs have not witnessed substantial growth due to 1) low levels of registered warehouses with WDRA, 2) minimal concession from banks for loans against NWRs, 3) presence of other collateral based lending entities, which do not require registration under WDRA.

Gaining grounds

The warehousing industry will grow at a rate of 13-15% in the medium term driven by the growth in manufacturing, retail, FMCG and ecommerce sector. Growth in overall production and consumption, organized retail, logistics outsourcing, and regulatory interventions such as WRDA Act and GST, private investments in logistics and other infrastructure developments such as Dedicated Freight Corridor (DFC) have also improved prospects of the organised professional warehousing segment. Further the implementation of GST is eliminating inefficiencies arising out of the erstwhile complex tax structure as well as interstate taxes. Additionally, the government's decision to allow FDI in retailing with emphasis on backend infrastructure such as modern warehousing space is also expected to provide further impetus to the sector.

- Industrial warehousing is expected to grow due to various factors including the anticipated increase in global demand, growth in organized retail and increasing manufacturing activities, expansion of e-commerce options and growth in international trade. This segment is expected to witness significant activity as the presence of the unorganised segment which is dominant in the segment is also expected to significantly reduce and the companies would also be rationalising and consolidating their space requirements based on time to serve the market and not taxation.

- Demand for agriculture warehousing is expected to grow moderately on account of high base and expected normal monsoons.

- Integrated models, diversification across end-user industries are expected to drive growth of cold chain segment. Significant demand is also seen coming from storage of fruits and vegetables, and pharmaceutical segments.

- The container freight station (CFS)/ inland container depot (ICD) industry although on a growth curve is expected to be under pressure due to the growth of Direct Port Delivery (DPD) and profitability is expected to be hampered with the anticipated loss of volumes and consequential lower utilisation.

However, the overall growth potential is limited by several key challenges like limitations in infrastructure connectivity, need for large capital and issues related to land acquisition which would need to be addressed for ensuring sustainable growth.

Locational Advantages – Springing benefits for organized warehousing in India

The implementation of GST has had far-reaching implications on the warehousing and logistics sector. GST has resulted in the abolition of state-level VAT check-posts, which in turn, has reduced transit time. Corporates are gradually consolidating into larger warehouses to reduce their total number of facilities, which in turn reduces the operational cost and improves efficiency, highlights Jasmine Singh, Senior Executive Director – Advisory & Transaction Services, India, CBRE.

Jasmine spearheads CBRE's Industrial, Logistics and Land (ILS) transactions business in India. He also leads the Business Development and Account Management initiative for the vertical. Based out of Gurgaon, he has over 26 years of work experience of which 16 years has been spent in the logistics & supply chain industry. With his multi-disciplinary exposure and experience, Jasmine has won and managed varied assignments including leasing of Built-to-Suit industrial and logistics assets, express distribution centers, repair and return facilities, as well as acquisition and disposition of land. Jasmine is a Bachelor of Business Studies from Shaheed Sukhdev College of Business Studies, University of Delhi.

INDIA has off late started gaining global attention as being the largest growing economy and the next investment destination. Government's effort to create business friendly environment has placed country in the potential list of global investors. World Bank's Global Economic Prospects report released last year, India after conceding its position as the fastest growing major economy to China for a year in 2017, was likely to reclaim the position in 2018, with growth to 7.3% last year and 7.5% for the next two years, making it the fastest growing country among major emerging economies.

While sectors such as engineering and manufacturing, mining have already positioned themselves, logistics and warehouse is becoming a front-runner in the economy. With the growing transparency and favorable business environment, various domestic and international players have already started investing or evaluating in the sector to reap the growth opportunity the sector has to provide. Also, to promote and expedite investments in the sector, central as well as states governments are putting their best effort and eastern states are no exceptions.

The BIG GST Impact

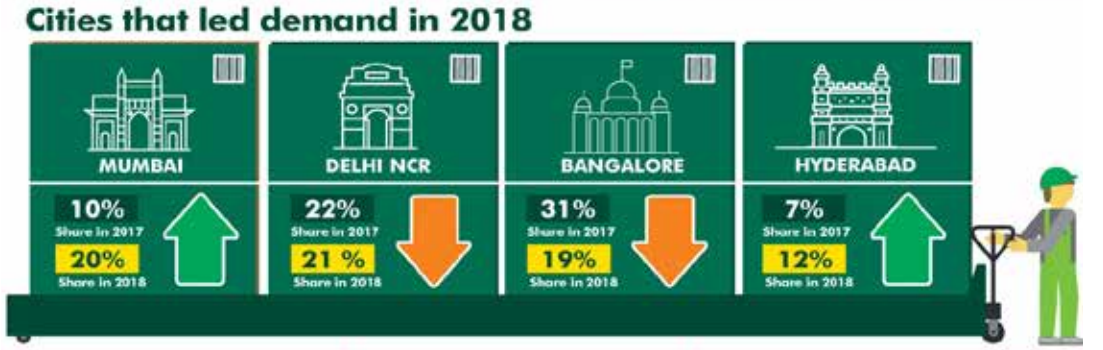
Recording a growth rate of more than 40% compared to 2017, the implementation of GST led to far-reaching implications on industries, more so in the warehousing and logistics sector. Overall in 2018, Mumbai, followed by NCR, Bengaluru, and Chennai dominated leasing, accounting for more than 70% of the space take-up. The second half of 2018 witnessed robust leasing activity with about 14.3 million sq. ft. of space take up, a 46% increase on a half-yearly basis. Mumbai dominated leasing activity with a share of about 21%, followed by Delhi-NCR (20%) and Chennai (16%).

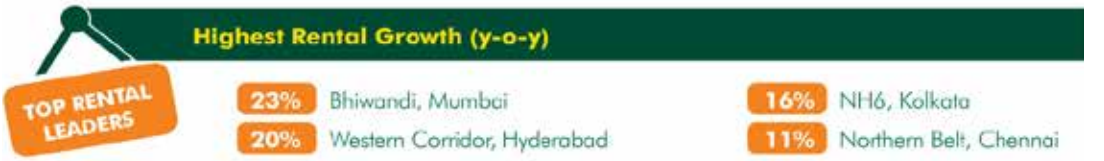
CBRE

INDIA MARKET MONITOR

2018 / 2019

LOGISTICS





KEY TRENDS EXPECTED IN 2019

- Growth of the sector will be boosted by government initiatives such as Make in India and Digital campaigns.
- Strong leasing momentum is likely to continue throughout the year; 3PL and e-commerce players are expected to drive demand for logistics space.
- Key factors which are expected to drive demand across the country: consolidation and expansion by existing players and entry of new players.
- Large and better-quality warehouses are more in demand; leasing trajectory in tier II and smaller cities likely to pick up.
- Indian logistics players are going to continue to adopt automation and robotics to revolutionize their operations.
- In the coming year, foreign participation in the Indian logistics market likely to propel the development of tech-enhanced warehouses across the country.
- The sector is likely to observe increased levels of institutional funding and more formal sources of capital – prominent private equity firms and developers are already indicating interest to acquire land parcels across various locations.

CBRE REASERCH

This report was prepared by CBRE India Research Team, which forms part of CBRE Research---a network of preeminent researchers and consultants who collaborate to provide real estate market research, econometric forecasting and consulting solutions to real estate.

Sectors that contributed to the growth of leasing activity in H2 2018 was majorly led by The overall demand for logistics and warehousing space was largely concentrated in Mumbai (21%), Delhi-NCR (20%) and Chennai (16%), closely followed by Bangalore (15%). Hyderabad and Kolkata accounted for 14% and 9% respectively; while the cities of Pune and Ahmedabad collectively held a 5% share in overall demand. When compared on a half-yearly basis, almost every city witnessed a growth in leasing activity. While, Chennai witnessed a growth of about 104%, Hyderabad and Kolkata witnessed growth of 93% and 73% respectively. Other cities such as Mumbai (54%), Delhi-NCR (41%) and Pune (17%) also witnessed growth.3PL service providers with a share of about 40%, followed by engineering and manufacturing (22%), e-commerce (21%). Sectors such as retail, FMCG, electronics also contributed to the overall leasing activity.

Rentals continued to appreciate for several micro-markets across cities. The Western corridor in Hyderabad observed the highest rental appreciation at 20% on a half-yearly basis followed by the Western and Northern belts in Chennai; with rental increments of 8 - 11% on half-yearly basis. Meanwhile, other micro-markets such as NH-8 in Delhi-NCR, the Northern Corridor in Hyderabad, and NH-24 in Ghaziabad, reported a rental appreciation of 1-3% on a half-yearly basis. The increase could be attributed to sustained demand and regular enquiries from various occupiers. Rentals in other micro-markets across cities remained stable during the review period.

City Highlights – H2, 2018

Delhi-NCR

- Delhi-NCR reported strong demand for warehousing space during the second half of 2018 as leasing activity grew by about 41% from H1 2018

- Driven by the 3PL (46%), E-Commerce (29%), and Retail (25%) sectors, leasing activity was concentrated across independent developments in the micro-markets of Farukh Nagar, Taoru Road, Binola and Jamalpur in Gurgaon

- No supply addition was recorded during this review period. The city witnessed rental appreciation in the range of 1-3% on a half-yearly basis in the micro-markets of Gurgaon and Ghaziabad

Mumbai

- Mumbai continued to witness robust leasing activity during second half of 2018, with the closure of several medium to large-sized transactions

- The city witnessed with a nearly 54% increase in absorption levels in comparison to H1 2018. Although 3PL players dominated space take-up (leasing approximately 71%), occupiers from other sectors such as e-commerce (8%) and paint & chemicals (8%) were also active across micro-markets

The overall space take-up in the logistics and warehousing sector crossed 24 million SQ. FT. IN 2018 – AN ALL-TIME HIGH. Recording a growth rate of more than 40% compared to 2017, the report said that implementation of GST led to far reaching implications on industries, more so in the warehousing and logistics sector. Overall in 2018, Mumbai, followed by NCR, Bangalore and Chennai dominated leasing, accounting for more than 70% of the space take-up. The second half of 2018 witnessed robust leasing activity with about 14.3 million sq. ft. of space take up, a 46% increase on a half-yearly basis. Mumbai dominated leasing activity with a share of about 21%, followed by Delhi-NCR (20%) and Chennai (16%)

- The city witnessed supply addition of about 2.1 million sq. ft. during the review period. In addition, the city also witnessed new project launches of approximately 0.9 million sq. ft. Rental values remained stable during the current quarter

Bangalore

- Leasing activity in Bangalore largely remained stable during the second half of 2018 vis-a-vis H1 2018. Space take up was largely concentrated in West Bangalore, followed by East Bangalore and South Bangalore
- Demand was largely dominated by retail players, followed by 3PL, manufacturing and e-commerce companies
- Rental values remained largely stable across (H-o-H) North, East, West and South Bangalore

Chennai

- Chennai continued to witness robust leasing activity during second half year of 2018 with several large to medium scale leases getting concluded
- The Northern Industrial Belt dominated overall leasing with a share of more than 52% of total absorption during the review period
- Leasing activity was driven by engineering & manufacturing, 3PL, electrical & electronics and e-commerce corporates
- The city also witnessed new supply addition (dominated by Northern Chennai) of about 0.6 million sq. ft. with small – medium sized warehousing developments witnessing completions
- Owing to limited supply and increased demand from engineering & manufacturing, 3PL and electrical & electronics occupiers, rental increments of about 8-11% were witnessed in core locations such as Western and Northern belt

Hyderabad

- Hyderabad witnessed a marginal increase in demand for warehousing space during the second half of 2018 in comparison with H1 2018
- Northern Corridor dominated total space take-up during the review period by contributing to about 76% of overall leasing. Leasing was largely led by occupiers from e-commerce, FMCG and 3PL segments in independent developments across micro markets
- The Southern Corridor accounted for about 13% of the leasing activity followed by Eastern Corridor (6%) and Western Corridor (5%)
- During the review period, FMCG players led the leasing activity and accounted to about 33% of the total space-take up, followed by 3PL (19%), e-commerce (18%), Electronics (10%) and Engineering & Manufacturing (7%)
- The city also witnessed supply addition of about 0.25 million sq. ft. in the Southern Corridor during the review period

Pune

- Pune witnessed an increase in leasing activity during H2 2018 compared to H1 2018
- Majority of the transactions were concluded in the medium to large-size formats; primarily by occupiers from the engineering and manufacturing, automobile and e-commerce sectors
- On the rental front, values remained stable across all micro-markets

Kolkata

- Kolkata witnessed a significant increase in demand in H2 2018, as leasing grew by about 70% when compared to H1 2018
- During the review period, the city witnessed two small sized development completions by local developers on NH 6, totaling 55,000 sq. ft. Rental values remained stable across micro-markets
- Demand was led by occupiers from the e-commerce, telecommunication and engineering and manufacturing sectors; followed by 3PL and retail

Ahmedabad

- The city continued to witness significant traction during the second half compared to H1 2018
- Leasing activity was concentrated in the micro-markets of Aslali and Bavla, primarily led by engineering and manufacturing firms, followed by e-commerce
- The city did not witness any new supply addition during the review period. Rental values also remained largely stable across micro-markets
- Tech innovation to shape the future of the sector
- The use of fleet management software (provides live tracking of goods), RFID systems for inventory identification and automated pallet storage is growing quickly, as is the number of start-ups aimed at bridging the technology gap. The widespread deployment of IoT is expected to revolutionize operations by creating smart warehouses that improve supply chain efficiencies.

The rise of Eastern cities

In early 2000s, Kolkata was the only eastern city to offer large warehousing space while acting as the gateway to the North East. Most of the Tier II city's distribution was managed by the C&F network. However, with the phenomenal growth of e-commerce in the past few years and with a robust economy, new opportunities have materialized in the Tier II markets, such as Patna, Guwahati, Ranchi, Bhubaneswar and Raipur with Patna & Guwahati leading the pack.

From a city perspective, the warehousing activity in Kolkata is primarily concentrated in the micro markets of Dankuni, Dhulagarh and Uluberia. However, other locations such as Madhyamgram (East) and Maheshtala (South West) are also coming up as new warehousing destinations of the city. The tenant profile comprises mostly of companies from verticals such as E-commerce, 3PL, FMCG, Consumer Electronics, Industrial amongst others.

The current rentals in the city remained in the range of INR 15 – 25 per sq. ft. per month, depending on the quality of the warehouses. Rentals (per square feet per month) in the micro market of Dankuni remains in the range of INR 18 to 25; Dhulagarh warehousing assets are being quoted in the range of INR 16 to 18 and Uluberia in the range of INR 14 to 16. Assets in the upcoming markets of Madhayamgram and Mahestala are being transacted in the range of INR 15 to 18 and INR 17 to 25 respectively.

The other eastern cities which are establishing their presence in the sector and growing as prominent warehousing markets are Patna and Guwahati. These cities are witnessing high demand from occupiers across sectors, which are concentrating on consolidation and expansion post implementation of GST. Currently, the ongoing market rental in these cities are in the range of INR 18 to 25 per sq. ft. per month for Patna and INR 16 to 24 per sq. ft. per month in Guwahati. Various government initiatives in terms of infrastructure development and policy reforms are also likely to provide an impetus to the growth of these cities as logistics hubs.

Modern warehouses to drive demand

Leading real estate developers have begun acquiring large land parcels for the development of warehousing facilities – a trend likely to continue through 2019. This would lead to an increase in the supply of modern warehouses over the coming years. While cities such as Mumbai, Pune and Chennai would remain major investment destinations, Delhi-NCR and Bangalore are also likely to be on the investors' radar.

Increased participation from private developers and institutional funds

As the sector moves towards a more systematic mode of operation, the inflow of institutional funding and formal sources of capital have started to increase in the sector. As domestic players with larger warehouses emerge; deployment of capital in these fewer, better quality assets are likely to become easier.

Rental appreciation anticipated

Rental values for warehousing spaces across various micro-markets are anticipated to appreciate in short to medium term. Considering persistent demand levels coupled with expected advanced developments by organized players is likely to enhance rental values across various micro-markets. Also, the growing demand for industrial spaces in various cities is also likely to fuel rental appreciation in forth coming quarters.

Outlook

Development of logistics-related infrastructure such as dedicated freight corridors, logistics parks, free trade warehousing zones and container freight stations are expected to improve efficiency. The development of new warehouse facilities by organized players are likely to propel demand as occupiers will focus on expansion and consolidation. We foresee Indian e-commerce companies, 3PL players and online grocery chains to increasingly use innovative tech solutions to improve inventory management. The sector is also likely to observe increased levels of institutional funding and more formal sources of capital as private equity firms and developers are already indicating interest to acquire land parcels across various locations. We are very positive about the government's vision to increase the sector's contribution to the overall GDP; through more incentives for players and streamlining regulations.

With technology permeating the logistics sector, coupled with the government's push to the sector; corporates will be driven to opt for large, modern warehouses as they would seek to leverage the new GST regime as well as consolidate and expand their operations. This demand we feel, would further be boosted by the entry of various private equity firms and foreign players in the Indian logistics market. The world of logistics is fast changing in India with infrastructure projects of the central government such as Bharat Mala and Sagar Mala. These are aimed at strengthening the road and port infrastructure across the country and will boost the growth in these eastern cities.

GOI's steps to streamline work process and support business groups under ease of doing business, allowing 100% FDI for development of logistics infrastructure will also assist in development of large & modern warehousing parks. A prime example is E Shang Redwoods buying 70 acres of land in Uluberia, Kolkata for building a large integrated logistics park.

Digitalization & Automation Cogs in the wheels of Progress

In any industry, there is a significant delta in the choices of technologies & solutions available and what gets used on ground in reality. So, while it's good to know about the latest that is being offered, there is more merit in devising a realistic plan to take your operations to the next level while also trying to keep up with the changing trends in the industry. Through this article, Vineet Baid, MD, Precision Pyramid Private Limited outlines the criticality of automation and stages of automation in warehousing. It also dives deeper into the root causes of slow pace of improvement in the way warehousing is performed in India.

Vineet is a supply chain and technology professional with diverse experience in retail, e-commerce, automotive and automation. He is a Certified Supply Chain Professional from APICS and Masters in Industrial & Systems Engineering from the University of Florida. Vineet is the founder & MD of Precision Pyramid Private Limited. Founded in 2015, Precision Pyramid focuses on solving supply chain problems through the latest in technology.

WAREHOUSING industry is going through an interesting phase in India. Prior to GST, warehousing or stocking decisions were governed more by tax optimization rather than supply chain optimization. With the introduction of GST, there is an opportunity to consolidate numerous small warehouses into a few larger facilities, which can result in better planning, controls and cost reduction.

Secondly, with proliferation of e-commerce, today's increasingly mobile customer has been spoilt for choice and service levels. The same customer now expects wider and quick availability of products even in traditional channels. This is pushing companies to keep their stocks closer to the customers to provide prompt service. This builds the case for decentralized warehousing decisions.

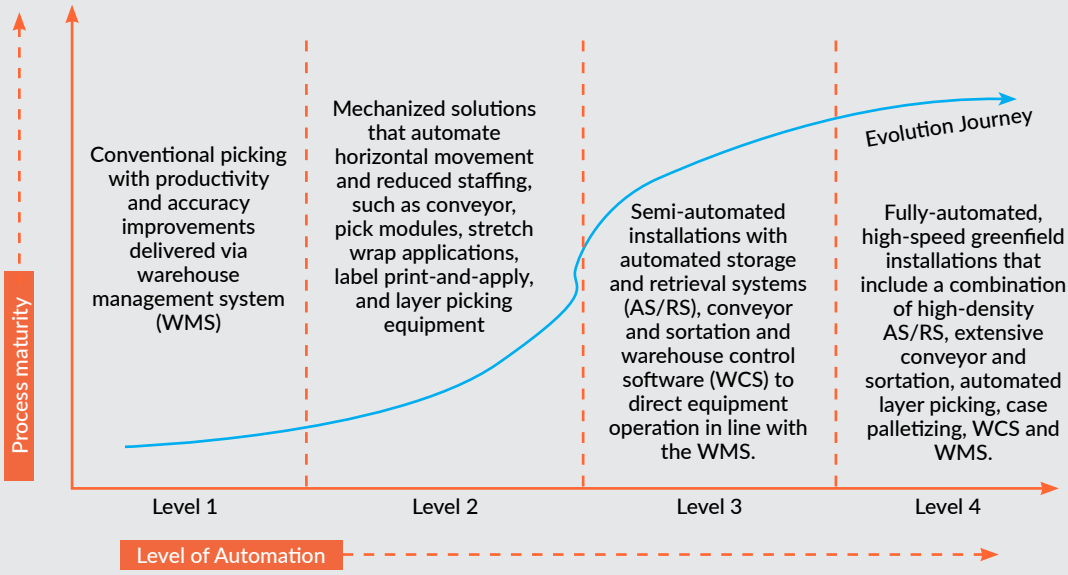
Lastly, the variety of SKUs in any product segment is increasing very sharply. Think of the number of segments and models of cars available today compared to what existed just 5 years back. It's the same story with FMCG, durables, electronics, etc. To ensure timely and correct availability of products and spares across such SKU width is a planning nightmare.

Many companies are trying to find the right balance, which helps them optimize this typical supply chain trade-off between service levels and costs.

The developments above have clearly created ripples in the transportation industry with some well known startups building large scale businesses. Alongside, there is significant change happening in the warehousing industry too.

Organized warehousing is on the rise. Nearly

Levels of Automation



200 mn sq ft of warehousing space is expected to be added in the next 4-5 years in India, which will more than double the current capacity. Along with capacity augmentation, the size of warehouses and quality of construction is also getting enhanced. Slowly and steadily, the share of organized warehousing is increasing in India.

Level 1 - Warehouse Management System (WMS)

A significant part of Indian warehouses is still at Level 0 – without a Warehouse Management System (WMS). These warehouses use either spreadsheets or paper for recordkeeping. Use of location management is sporadic, there is low level of transparency in operations. There are several companies operating with best of breed ERP solutions to enable their business operations, but their warehouses still run on spreadsheets.

Lack of WMS presents several problems for warehousing operations:

High level of dependency on human intelligence
Inability to track productivity numbers
Inability to track/optimize space utilization
Inability to track adherence to SLA
Rigid operations offering no flexibility

At the same time, there are many companies which use a WMS. The choice of WMS products may range from a domestic supplier to an international player. Implementation efficacy of WMS may vary with no particular correlation between the cost of the product and efficacy of implementation. Some companies use best of breed warehousing solutions at 50% of its potential, while some others have made effective use of less mature WMSs too. This is largely governed by the interplay between People, Processes and Technology. Broadly speaking, deploying a good WMS in the correct manner can easily deliver efficiency improvement of at least 20% in a manually run warehouse.

Level 2 - Mechanization

Post WMS implementation, the next stage of automation in a warehouse is introducing mechanization. Repetitive laborious tasks requiring very limited intelligence get mechanized with this kind of automation. Typical examples are conveyors, stretch wrap machines, automatic print-and-apply labeling machines, etc. Isolated mechanization is easy to adopt, it gives a point solution to a point problem and generally the Return on Investment is clear to the stakeholder based on volume projections.

Level 3 - Semi automation

Semi automation requires some integration of software intelligence with hardware. Repetitive laborious tasks which also require human intelligence are automated at this level. Typical

examples are ASRS (Automated storage and retrieval systems), sortation systems, intelligent conveying solutions etc. A good powerful WMS is a pre-requisite to deploy such kind of semi-automated solutions in the warehouses. If the technology choices are correct, typical ROI for semi-automation projects ranges from 2-5 years.

Large enterprise players in India have started adopting these solutions in the last few years. Early adopters have been e-commerce, e-commerce logistics and retail organizations where scale, complexity and velocity of operations has witnessed a tectonic shift.

Level 4 - Robotics

This level harnesses the improvements in sensor technologies, Artificial Intelligence and Machine Learning capabilities, communication protocols, machine vision, etc., to deliver robotics solutions to complex warehousing problems. Most robotics solutions make sense at very high volumes or complexity. ROI could range from 3-5 years if the volumes are supportive. Very limited companies in India qualify for such interventions.

Why didn't we optimize our warehouses?

Unless we are talking about creating new industry segments based on cutting edge innovation or by driving behavioral changes, any industry works out a solution when

a. the problem presents itself &

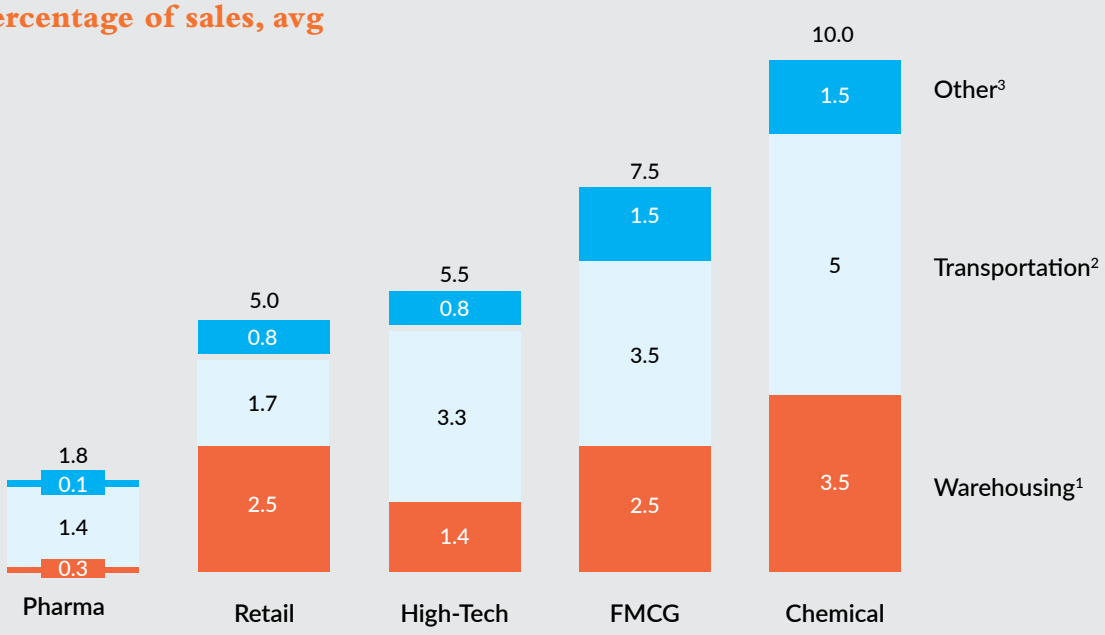
b. the technologies to solve the problems are available

Based on this hypothesis, the first two levels could have been easily achieved in India. However, the following roadblocks prevented the presentation of the problem statement itself for anyone to solve it -

Smaller warehouses

It requires a certain scale of operations for automation to make sense. Until very recently, the sizes of the warehouses and throughputs they were handling were relatively small.

Percentage of sales, avg



1 Warehouses (fixed and variable cost)
2 Outbound/inbound freight spend
3 All additional cost related to supply chain planning, admin
SOURCE: McKinsey, 2009, SupplyChain Champions

A lot of warehousing is common sensical. Specialization of this skillset only gets appreciated when scale or complexity is high. Until companies reach that threshold, they keep running warehouses utilizing collective intelligence of their teams. While these teams may succeed pushing shipments out the dock, maybe sometimes with brute force of excess capacity, but seldom such companies end up bringing about any competitive differentiation based on operational excellence.

Warehousing costs as a percentage of revenue

Warehousing costs contribute a small percentage in the revenue waterfall of an organization. This is one of the principal reasons for lack of focus on optimizing warehouses erstwhile. But now with rising cost pressures to remain competitive, companies are looking at warehousing costs much more closely to spot areas of optimization.

Availability of skilled manpower

Each warehouse is unique in its own way. The nature of operations varies vastly with number of SKUs, inventory turns, volumes being shipped, size and nature of SKUs, etc. Hence, there is no standard template, which can be applied to optimize a warehouse. In absence of a standard template, the onus of analyzing and optimizing warehouses falls on the shoulders of operations managers and supply chain managers.

Skilled and analytical supply chain resources have been in short supply erstwhile. With many institutes focusing on supply chain specific programs coupled with increasing interest of prospective employees in this field, this problem is gradually getting addressed. Success of supply chain start-ups has definitely contributed to the increase in interest in this field.

Fulfilment complexity

Until a few years ago, most warehouses were handling case in case out operations. With e-commerce, modern trade and introduction of several digital businesses, the percentage of piece level fulfilment has increased significantly. Piece level fulfilment is complex and needs to be supported by robust systems and processes.

It's common sensical

A lot of warehousing is common sensical. Specialization of this skillset only gets appreciated when scale or complexity is high. Until companies reach that threshold, they keep running warehouses utilizing collective intelligence of their teams. While these teams may succeed pushing shipments out the dock, maybe sometimes with brute force of excess capacity, but seldom such companies end up bringing about any competitive differentiation based on operational excellence.

How does one take warehousing automation decisions?

In any industry, there is a significant delta in the choices of technologies & solutions available and what gets used on ground in reality. So, while it's good to know about the latest that is being offered, there is more merit in devising a realistic plan to take your operations to the next level while also trying to keep up with the changing trends in the industry.

This requires a detailed assessment of the warehouse, throughput patterns, nature of product, size of orders, average inbound and outbound quantities per SKU, per transaction, etc. Only after a detailed analysis, meaningful warehouse automation recommendations can be arrived at, and the solution could very well be a mix across multiple levels of automation, as illustrated.

Autonomous Warehouses Meeting next generation fulfillment requirements

The warehousing space has been undergoing massive upgrades recently and it seems like this trend has quickened in the last few years, thanks to the constant evolution of the supply chain and logistics industry. In a bid to keep up with increasing pressure and time-sensitivity of deliveries, investing in autonomous warehousing solutions has proven an efficient move to complement the workforce. Anirban Mazumdar, CEO, Thinklink offers an invaluable perspective into the warehousing business and how it is being morphed into a modernized industry of the future.

Anirban has worked across industry supply chains, over more than 18 years, helping improve their performance. As an industry and consulting professional, he has experience of working with multiple sectors like FMCG, Retail, Healthcare, Pharma, Industrial products, Auto and Logistics. He has worked on supply chain strategy, supply chain transformations, performance improvement, developing and driving growth agenda for organizations. Currently, as ThinkLink's CEO, he is focused on helping customers understand and adopt the concept of Warehouse 4.0 and help them improve their performance in this space.

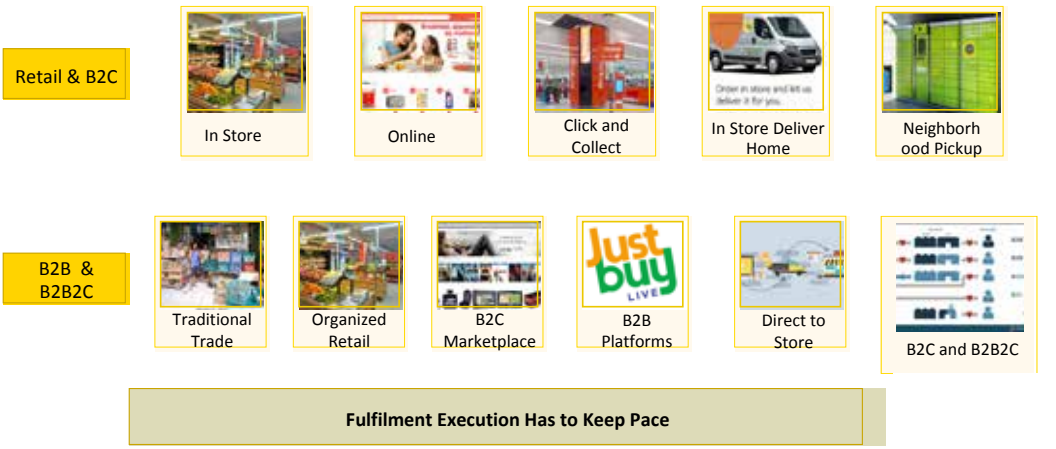
WAREHOUSING has evolved over the past decade with the changing landscape in how we do businesses. This evolution has become more prominent in India than ever before. There are two big drivers for this change in the warehousing environment in India – Introduction of GST, which has led to consolidation of warehouses; and the rise of ecommerce and omni channel fulfilment for modern businesses.

Globally, and indeed here in India, customers are gravitating towards businesses that allow them higher flexibility and this has impacted how businesses view warehousing. Benefits in supply chain are seldom localized and optimization is required across the entire value chain to realize gains. Hence, warehouses cannot be viewed as a simple cost center anymore but a vital cog in the wheel of modern fulfilment.

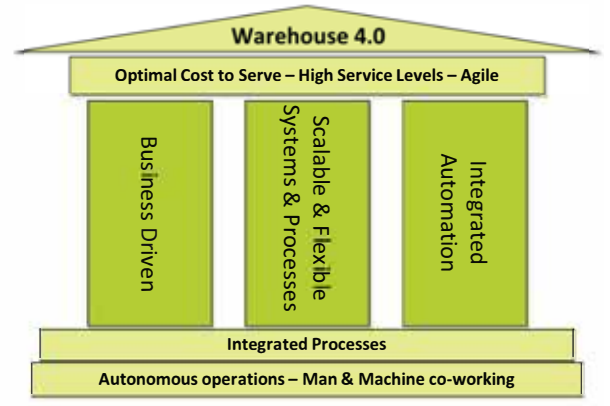
Autonomous – evolution beyond Automation

So what exactly do we mean by "warehouse automation"? Warehouse automation can be broadly defined as "Replacing/ Complementing human beings with automated equipment & software in material handling processes inside warehouses (Factory, Distribution, Fulfilment)".

While industries have adopted warehouse automation in various processes as per their specific requirements, the emerging needs of supply chains present a very different challenge now. This is driven by High SKU range, Rapidly changing order mix patterns, Demand surge during day/ week/ month, High demand skews created by 'sales days' and targeted promotions, customer service level offerings like 'same day delivery', 'express delivery', etc. These and other factors have highlighted the limitations of just automating processes.



Thus emerged the need to deploy Autonomous Warehouses – warehouses, which are not just automated but also can flexibly respond to changing demand and fulfilment requirement. What this calls for is using intelligence in managing the processes while using integrated and modern automation in executing the processes.

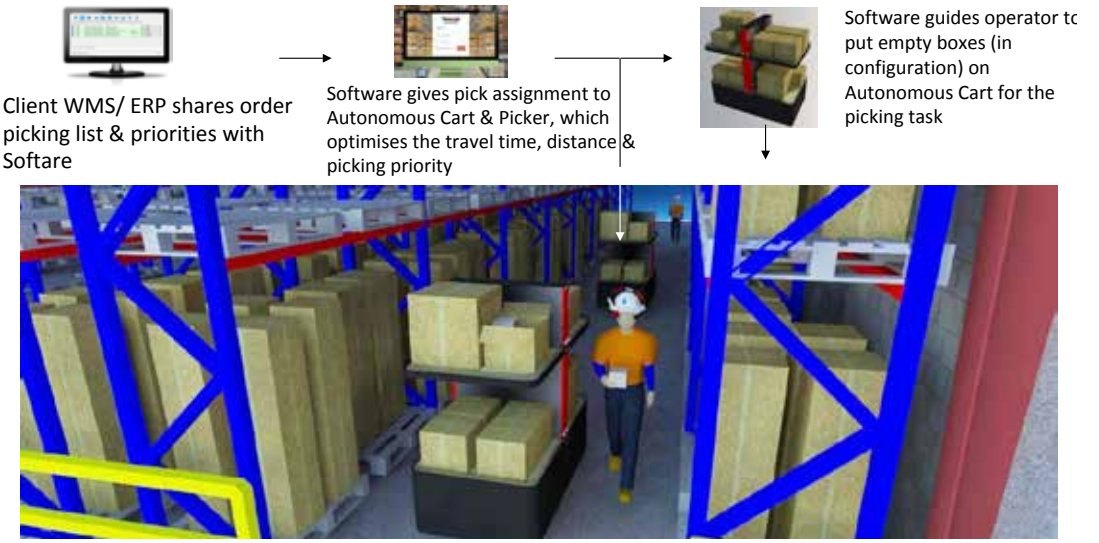


Autonomous Warehouses – required to meet next generation fulfilment requirements – are based not just on automation of processes but also Artificial Intelligence driven most optimal decisions, Self-learning & auto-correcting algorithms, IoT based control of machines and automation hardware and an integrated approach to managing men, equipment and processes.

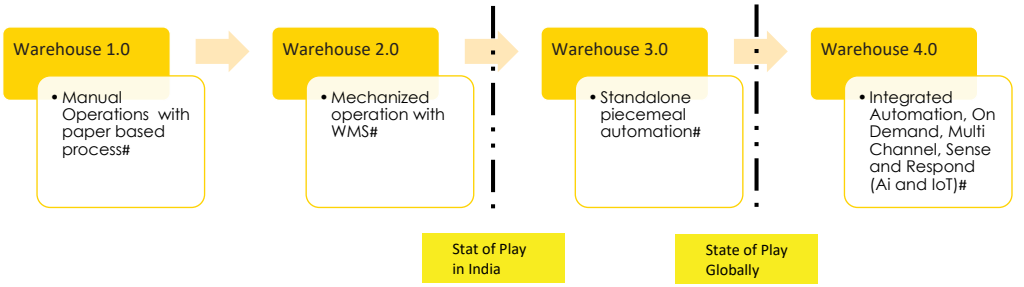
Meeting Fulfilment objectives

We should, ideally, look at warehousing automation through two disparate lenses, a solution for Business to Business (B2B) fulfilment and another for Business to Consumer (B2C) fulfilment. Automation is not a one size fits all approach and any attempt at automating with this approach is bound to fail.

Indicative depiction of an autonomous picking process at warehouse



B2B Warehousing and Fulfilment The chart below depicts how Automation has evolved in Warehousing and how the need for moving towards Warehouse 4.0 or Autonomous Warehouses is fast emerging.



The traditional B2B warehousing space is typified by –

1) Full pallet or case handling

2) Space constraints in supporting larger throughputs

3) High manpower cost

4) Piece meal automation in the form of conveyors and RTs

5) Concentration on improving Vehicle TAT

The B2B segment has been significantly impacted by GST. Companies around the country have been looking to consolidate warehouses which were earlier disparate and spread across a larger geography. This has impacted warehousing in two primary setups –

Express Logistics – The Express Logistics sector in India comprises of several companies vying for business. The sector is marred with some repeated challenges which can be looked at as below –

a. **High manpower at hubs** – Unloading – Loading, Putaway and Picking form the bulk of manpower use in these hubs. Cost of supervisors in this operation is also a huge challenge as mistakes cannot be afforded with stringent SLAs.

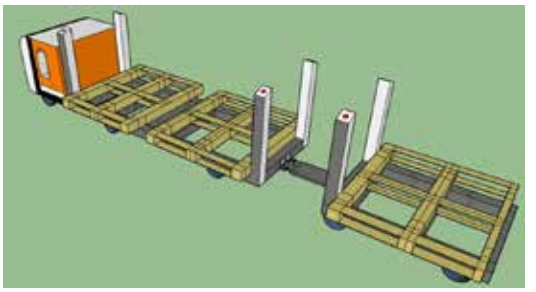
b. **Vehicle TAT** – Vehicles coming in and moving out of the hub often end up having to dock for 1.5 – 4 hours on account of slow loading and unloading activities and poor traceability (unlike racking in other B2B environments, Express Logistics hubs do not usually have racking). Express companies have increasingly sought to adopt IOT and AI to ensure optimization in logistics but this seldom results in realizing the full returns of these gains as a result of manual archaic operations at the hubs

c. **Space Utilization** – Space utilization is always a challenge at hubs owing to the extremely fast turnover of all received goods. Hence optimizing space with a non manual approach leads to better utilization and indeed traceability.

d. **Throughput** – It is imperative for companies to plan for the future in this rapidly growing business in order to optimize for the line haul capacity. The overall productivity of manual workers means that scalability is a challenge since congestion needs to be considered when you keep adding more manpower in these hubs.

Ideally, there are several different solutions that can and should be implemented in order to alleviate the challenges described above. They can be described as below:

1) **Telescopic Conveyors** – A number of different solutions that exist today help in reducing the effort and time that goes into loading and unloading. Telescopic conveyors are ideally suited



to automate the loading and unloading challenge here and can result in significant gains in productivity. Coupled with hydraulic lifting arms, an entire truck can easily be stuffed or unloaded by just two people and in a quarter of the time it originally required for a lot more manpower to achieve this target.

2) **Autonomous Carts** – Autonomous Carts allowing for multiple mixed pallets to be picked together are a great way to automate and improve productivity and TAT while reducing dependency on manual workers.

3) **Racking with system guided putaway** – A simple racking solution can help hubs immensely in optimization of space and improve traceability.

B2B warehousing – The B2B warehousing in India has seen a massive shift as a result of GST with consolidation of warehousing across companies. This has thrown up various challenges in the scale of operations required and has rendered manual operations unfeasible. The major challenges faced here are –

a) **Land Requirement** – Huge B2B warehouses need to optimize for land and use vertical storage. This is not possible when we default to manual operations and height of racking gets restricted to operable height of RTs

b) **Manpower** – Manpower requirements cannot scale to efficiently sustain operations in a very large warehouse. Requiring hundreds if not thousands of workers inside the warehouse, manual operations amount to overheads and operational inefficiencies which can only be mitigated by using automation

c) **Productivity and TAT** – Any business looking to consolidate and operate warehouses cannot hope to employ hand pallet trucks and other manual assisted picking operations to effectively operate these spaces.

Some of the solutions for the challenges stated above have been tried and tested across the world and are reliable technologies available across the

board. Indian companies have now begun to adopt some of these solutions and the sheer scale of distribution within the country dictates that these would be looked upon even more closely in the coming years.

1) **ASRS** – Automated Storage and Retrieval Systems have been a staple for large scale

An extremely important thing to consider when looking at Automation in warehouses is the fact that invariably a company looking at a fully automated solution would be looking at multiple vendors to help them in this journey. This results in different hardware products with different PLCs needing integration with a central software to run processes effectively. This leads to a greater need for an open standard software enabling multiple integrations with a host of different integrators. Companies embarking on a journey of automation ought to keep this as an important agenda at the forefront of their planning.

automation across the world. They allow high rise racking thus optimizing space and the automation also allows for high throughput allowing businesses to manage a higher load in the warehouse. A number of companies in India have already adopted ASRS automation and this trend is likely to grow as we move forward.

2) **Skate and Track systems** – Loading unloading in B2B businesses require fast turnaround of truck and this can be easily achieved by Skate and Track systems which allow pallets to easily be moved in or out of vehicles. This is a simple yet novel solution which is bound to appeal to a host of companies going forward B2C and B2B2C Warehousing and Fulfilment

E-commerce has made in necessary for companies to handle omni-channel fulfilment from their warehouses. This presents a challenge as operations for e-commerce and traditional retail vary significantly and companies find themselves at cross roads to engage in automation that allows for multichannel fulfilment, which is flexible to the changing needs of businesses. There are some traditional challenges involved in operating these warehouses while a number of new challenges have arisen as a result of modern business operations. Some of the major challenges we have seen are:

a) **Productivity** – Picking in these environments tend to be either in the form of full boxes or even individual pieces. Piece picking environments tend to be worker intensive and this results in extremely low productivity with most businesses recording anywhere between 50 – 150 picks per hour per worker. This has led to higher cost of fulfilment for businesses.

b) **TAT** – Next day deliveries and quicker fulfilment has dictated the need for same day picking and this has been a struggle for a number of businesses trying to keep up with maintaining stringent SLAs promised to the customers.

c) **Loading / Unloading** – Businesses in this space have to deal with loading and unloading boxes from trucks on a daily basis. This is also a worker intensive process as a result of no or very low palletization.

d) **Errors** – Manual picking leads to errors in a number of instances. To reduce this error, companies tend to have intense QC processes that slows fulfilment and also adds extra manual labor into the process.

Automated solutions tackling omni-channel environments need to be flexible, allow rapid integration and assist workers in enhancing productivity. There are various solutions, which fully automate some of these processes, specially picking, but they end up making the automation extremely rigid and pose a challenge in being relevant when the businesses grow or when there is a change in the business model. Keeping these things in mind, the following automation solutions can be a great solution for businesses:

1) **Auto -** Autonomous cart based man assisted picking – Piece picking has seen a number of solutions automating the process. Over the past few years, a number of e-commerce companies have implemented goods to man solutions (shelves being brought out to a worker to pick from) and this has started

to gain traction in India as well. However, we have increasingly seen businesses opting for a man to goods system, which is assisted by Autonomous Carts to make this system more flexible and less intensive (numerous companies in the US have successfully replaced the goods to man system with similar man to goods system instead). This has resulted in Autonomous Cart based solutions which allow multiple orders to be picked by humans using Autonomous Carts to enable

faster movement within the warehouse. Traditionally, ~70% of the picking time is spent in walking while only ~30% is spent on picking. This solution allows this ratio to be inverted and improved significantly with

~80% time spent on picking and only ~20% spent on walking instead directly resulting in 3x – 4x productivity.

2) **Sorters** – Businesses in India have become increasingly aware of sortation systems. These are ideal for e-commerce environments and allow anywhere between 2000 – 20000 sorts per hour, which would have been impossible to implement in a manual environment.

3) **Telescopic Conveyors** – As described earlier in this article, Telescopic conveyors are a great way to automate the loading / unloading requirements for businesses and enable higher TAT for vehicles coming in and going out of the warehouse.

4) **PTL** – Pick to Light or Put to Light systems enable quicker picking but more importantly reduce errors to ~0%. This helps in streamlining the process and negate the need for intensive piece wise QC later on

Software to power fulfilment

An extremely important thing to consider when looking at Automation in warehouses is the fact that invariably a company looking at a fully automated solution would be looking at multiple vendors to help them in this journey. This results in different hardware products with different PLCs needing integration with a central software to run processes effectively. This leads to a greater need for an open standard software enabling multiple integrations with a host of different integrators. Companies embarking on a journey of automation ought to keep this as an important agenda at the forefront of their planning.

AI, ML and IOT to power automation

Much like a host of other industries, warehousing is ripe for reaping advantages brought about by modern tech. One of the greatest advantages in implementing learning algorithms inside a warehouse pertains to the ease of data collection and a somewhat closed environment where specific models can be built more easily. IOT enabled automation monitored by AI/ML logic can easily replace then need for having an army of supervising personnel across the warehouse.

Preventive maintenance of automation hardware, better scheduling, work management and resource optimization can easily be enabled by AI, ML and IOT. Constant supervision is not required and all decisions regarding prioritization and scheduling of work and employment of resources to perform a certain task can be more data driven with a much higher likelihood of meeting required performance standards.

In essence, we strongly believe that automation in warehousing is going to make a tremendous headway within the next few years and the fundamental premise of how we work and drive efficiencies around fulfilment while creating a competitive advantage from the warehouse.

Warehouse Automation – The next frontier in optimizing warehousing productivity

The pace of change has never been as fast as it is today, and those changes will ultimately influence the warehouse of the future. From demographic shifts and increasing urbanization to drones and 3D printing, social and technology changes are putting pressure on supply chain managers to move goods closer to consumers and develop warehouses with the flexibility and speed to support local, faster delivery through multiple channels. In conjunction to this, technology, such as automated storage and retrieval systems and AGVs, are improving material flow and delivering significant improvements in speed and productivity. Rupesh Narkar, Director of Sales for Logistics Automation Company in USA, offers insightful vision for how emerging automation solutions will help you meet the demands of the future.

Rupesh is a seasoned professional with extensive experience in the field of logistics automation. He has a Master's in Engineering Management (USA) with Bachelors in Mechanical Engineering (India).

He is currently the Director of Sales for Swisslog Logistics, Inc. His areas of interest include designing, selling and implementing logistics automation solutions throughout Americas. He has authored articles and spoken at events for logistics automation industry in USA.

WAREHOUSING processes and technologies worldwide are looking radically different today than what they looked 25 or 30 years ago. Automation is a buzzword in this industry. Over the last few years, automation has been seeping in to replace manual monotonous processes with an aim to unlock productivity, bring in reliability and accuracy in warehousing operations.

In the western world, the warehousing process scenario has changed even more drastically thanks to the ever-increasing productivity, demand, expensive labor situation and rise of fulfillment needs on account of uptake in e-commerce business. Also, thanks to the competition around the world, the entire warehousing and order fulfillment industry is taking huge strides towards adopting automation. Large, medium and now even smaller warehouses and fulfillment centers have implemented automation systems to unlock substantial gains in productivity, accuracy and throughput putting them ahead of the curve in comparison to rest of the world.

Indian economy is poised to overtake developed economies like United Kingdom in the near future. Constantly growing middle class, growth in consumption, record transactions in e-commerce and successful GST implementation are few key reasons fueling growth of economy. For any emerging economy, its blood veins are the logistics and transportation industry. In the recent times, the transport, logistics and warehousing industry has gained prominence with the government granting infrastructure status to these industries.

GST has greatly simplified the complex tax structure levied on movement of goods across borders. Post GST, the logistics sector is booming, thanks to faster movement of goods from point of manufacturing to destination. Warehouse (WH) and Distribution Centers (DC) are the backbone of logistics. GST has totally changed the warehousing scenario in the country. Warehouse operators are consolidating multiple smaller warehouses into larger ones and focusing on improving the productivity to achieve economies of scale. The biggest beneficiaries of this shift are the warehouse and logistics automation businesses. As per Analytics India, the Indian market for warehouse automation is projected to grow at a CAGR of 10-12% during 2018-2020.

Yet, the adoption of logistics automation in India hasn't been up to the mark as compared to other parts of the world, for various reasons. A common mindset is that automation is more suitable for economies where labor cost is substantially higher and it would be difficult to justify the ROI in a cheap labor market like India. The labor costs though comparatively lower than other parts of the world are still on a rise year on year, thanks to the rising inflation. The other important aspect to take into account is the productivity match. If a comparison is drawn to manual operation, automation would be clocking in at least 60~70% higher productivity from the get-go, which is an arduous and costly ramp up for manual operations to catchup. In order to match the same levels of productivity as automation, manual operations would at least be adding 70~80% more cost to the operations.

Let's understand the need and basis of Automation for Indian warehousing scenario…

The fundamentals for unlocking productivity and improving operations lies in the basic concept of gaining more visibility, improving tracking and thus gaining a control on processes. Only after you track, you can control. Only after you control, you can optimize.

Gaining Control of Inventory and Movement

Historically, manufacturing industries have always strived hard to monitor, track and control their processes in order to rectify, optimize and cut out process waste. There has been an obsession in automotive, food processing, equipment manufacturing, textile, etc., industries to optimize the processes. State-of-the-art manufacturing automation is implemented to achieve desired results. Unfortunately, this obsession has only been limited to production/manufacturing zones, thus creating islands of highly productive and automated manufacturing processes but no continuation down the line into intralogistics or warehousing. This is where the disconnect is.

Why is control in warehousing processes so important? It is important:

1. To gain better visibility and traceability of processes
2. To attain better accuracy and elimination of re-work
3. To unlock higher productivity and optimize operations
4. To reduce operational cost and attain higher profitability

Automation puts the control back in the process. Technology such as Automated Storage and Retrieval systems (AS/RS), Automated guided vehicles (AGVs), Autonomous Mobile

Dramatic changes to the warehouse are just beginning. Data-driven, flexible and robotic automation solutions help improve performance today while retaining the agility to adapt to tomorrow's changes. With a greater thrust to make the warehouses and DCs GST complied, logistics automation has been seeping into the Indian warehouses slowly but surely. Warehouse operators mostly running manual operations today are rethinking their ability to extract full capacity and efficiency out of the current setup and the obvious answer lies in warehousing automation.

Robots (AMRs) are improving the material flow and delivering significant improvements in speed, accuracy and productivity. These solutions also deploy a warehouse management system (WMS) that effectively monitors and controls each step in the process.

Digitalization of processes is the corner stone of automation. Intelligent, reactive, data driven and flexible software (or warehouse management system) forms the backbone of digitalization. Software is the glue that holds the processes and automation together. In addition to providing the tools, the WMS also provides the business a competitive edge by automating compliance and statutory requirements. Automated receiving, accurate identification, easy tracking in the process, optimization, inventory control, assured order fulfillment and reliable operations are all made possible at a finger's click using the warehouse management software.

The software can integrate with the existing enterprise system to provide two key capabilities:

Positive Inventory Control: Optimizing, regardless of any other technology deployed, requires control of all inventory from receipt through storage and transport. Using software that has been proven in demanding material handling applications, warehousing operators can achieve full, positive and transparent control of inventory through automated or manual processes.

Intelligent Material Flow: Many of the challenges associated with warehousing process involve material movement. While part of the solution is automation, the real difference is brought by the software that provides intelligent control of material flow. By orchestrating the flow of materials to eliminate congestion while prioritizing flows based on demand, schedules, the software eliminates unnecessary or inefficient movements thus increasing the productivity of personnel and equipment supporting material movement.

Flexible Automation

The challenges for Indian markets in adopting automation are not only limited to cost. There

has been a lot of stigma regarding the right fit of automation solutions for differing situations. Until recently, the automation solutions available for enhancing material control and movement were expensive and inflexible. A modular and scalable approach was absent and it was assumed even if one undertook the expense and implemented automation, the systems couldn't adapt to changes in process configurations or new products. This was a base hurdle for investments in warehouse automation and marked as a high risk. Owing to this apprehension that investment in automation might fetch negative returns, warehousing community took an "if isn't broke, don't fix it," approach.

Automation solutions today are flexible, modular and scalable. Since no two warehouses are same nor do they deploy the same business strategies, there isn't one size fits all in automation. Anyone can start with basic automation solutions fitting their needs and scale as and when the need grows. Today's automation solutions are powered by intelligent, data driven and modular systems that can be easily implemented, adopted and scaled at any point in time. The warehouse management software has the power to integrate various components together to improve visibility, tracking and material flow across multi-stage warehousing operations.

Industry 4.0 Capabilities

With Industry 4.0, the process landscape is completely overhauled. Now, there is an ability to use the feedback from processes to analyze and improve. In an established warehousing process, plenty of data is generated at each point. Opportunity lies in capturing, harnessing, analyzing this data to build a guiding system that can help to rectify and optimize processes. Industry 4.0 is making this a reality. Automation clubbed with intelligent software system will be an essential requirement for organizations seeking to employ Industry 4.0 capabilities.

For example, consider a simple warehouse storage and retrieval process with a desire of storing and retrieve 2000 pallets per shift. Add to this some complexity on account of expiry of product, batch storing & shipping, optimizing the space to achieving maximum storage density and retrieving in a set sequence for ease of shipping. Imagine all this in a manual process environment where there is no feedback from the system. Fork trucks or high reach trucks shuttling pallets back and forth, shuffling the storage for hunting

space and then struggling to retrieve the right batch, first expiry with the right sequence in the defined time, all these based on a manual stock keeping record. Now add the growth factor as the operations would grow eventually. The current inefficiencies would grow exponentially.

Now, in an automated system, the pallets would be first tagged with an identification during induction (such as 2D labels or RFID tags). From this point onwards, an intelligent warehouse management system will always track the pallets throughout the processes. In addition, attributes of the pallets such as receiving date, contents, expiry, destination, storage precautions etc., can be added to the identification. Based on this tracking and continuous feedback through the process, the automated storage retrieval system will determine the optimal storage space per the batch, maximizing rack utilization, retrieving per the expiry, batch and correct sequence. All these happen with surety that the pallets reach the right destination, in desired time (throughput), consistently without errors. As the operations would grow, the system could be scaled too. By using software system to intelligently manage the warehousing processes operational efficiency is effectively increased several folds.

Conclusion

The waste in the process is becoming increasingly unacceptable in today's hypercompetitive, dynamic markets. The core competency of automation is to better manage movement and control of inventory between various warehousing processes. The technologies, in the form of intelligent warehouse management software and flexible automation technologies, are available today to provide the positive inventory control and intelligent material management required to optimize inventory levels, productivity and warehousing capacity. Warehousing automation solutions are creating competitive advantage by reducing costs, increasing throughput and responding faster to changes in market demand.

Enhancing Productivity with Warehouse Management

Companies must enhance warehouse productivity and visibility if they are to remain competitive, protect their profitability, and position themselves for continuing growth, informs Jonathan Wood, General Manager, India, Middle East, and Africa (IMEA), Infor.

Leading the IMEA (India, Middle East & Africa) practice from Infor's office in Dubai, **Jonathan** is tasked with overseeing the New York-based tech firm's customer-centric strategy through the enhancement of direct customer relationships and formation of new strategic alliances – while leveraging Infor's new digital transformations hub established in the UAE.

RISING costs, increased complexity, and growing customer demands are all intrinsically linked challenges that manufacturers and distributors face. As globally expanding supply chains put operational and cost pressures on companies, so do expanding omni-channel markets that are forcing manufacturers and distributors to not only change how they sell to customers, but to even redefine who their customers are. Customers are exerting further pressure with demands for customization and personalization of products. And with global expansion, comes the challenge of maintaining visibility into inventory, shipping, and tracking—often across borders, continents, and oceans. Naturally, this all makes for much more complex warehouse operations. As a result, many manufacturers and distributors are finding it difficult to remain competitive, keep costs down, and maintain profitability. Ineffective order management, excessive labor costs, and inefficient asset use just exacerbate the problem.

Market drivers

These increasingly complex—and often costly—factors are forcing manufacturing and distribution organizations to reconsider how their warehouse management practices, processes, and systems need to change in order to improve warehouse productivity and visibility.

Over the last few years, customers have grown increasingly powerful and are making more demands on manufacturers. Customers want orders delivered more quickly, more accurately, and more specifically tailored to their needs—all at lower cost. Manufacturers and distributors are expected to turn around orders on shorter notice than in the past.

Companies can even be punished with fines and chargebacks if orders are improperly labeled, packaged, or delivered. More elaborate packaging has become common as retailers demand more in terms of boxing and delivery formats. Unfortunately, heavy competition and big box retail power mean that suppliers are unable to pass on the added costs associated with these added demands.

Manufacturers and distributors are scrambling to keep up with expanding reaches to markets they might not have previously served, such as online, counter sales, mobile apps, cross-industry, EDI, and even B2C.

Meanwhile, supply chain management has become increasingly difficult as companies source products, components, and materials on a global scale. Manufacturers that once sourced their materials regionally or nationally, now turn to

Asia, Latin America, Eastern Europe, and other overseas locations. Similarly, they are distributing their goods more globally as they seek to penetrate new and growing markets. That means products must travel far greater distances and be stored in more locations, exacerbating the challenges of visibility and threatening perfect order delivery.

Regulatory challenges also loom. With high-profile recalls on everything from toys to dog food to peanut butter, manufacturers are clearly under growing pressure to track their products with even greater precision. They must have immediate access to data on everything from lots to serial numbers to shipping locations if they are to avoid crushing costs—and legal penalties—in the case of a recall. Lengthening supply chains further contributes to the risk of expensive recalls.

Given these factors, manufacturers and distributors are faced with escalating costs and complexity, driving demands for greater productivity in warehouse operations. For these companies to remain competitive and profitable, they must find ways to drive warehouse performance to new levels. However, their existing ERP systems often lack the automated capabilities necessary to increase visibility into operations, enhance market agility, and boost warehouse productivity.

Business challenges

The limitations of many companies' warehouse operations often come from these three factors: orders, labor, and the warehouse assets themselves. To drive performance and productivity gains in warehouse operations, manufacturers and distributors must confront the inadequacies of how these issues are handled:

INEFFECTIVE ORDER MANAGEMENT —Today's customers are more demanding than ever—they expect the "perfect order." The Warehouse Education and Research Council's (WERC) definition of the perfect order metric is one that is delivered complete, on time, damage-free, and with the correct documentation and invoicing. Most companies, however, fall short on these key performance indicators. They allow service levels to diminish, and are vulnerable to fines and chargebacks from powerful retail customers. More perfect orders mean fewer imperfect orders; and it's the costs of correcting those imperfect orders that eat into margins. Premium freight costs, excessive overtime, and extended cash-to-cash cycle times all damage overall profitability.

EXCESSIVE LABOR COSTS — Given the increasing complexities associated with today's customer and supply chain relationships, companies are struggling to meet performance expectations without adding labor resources.

INEFFICIENT ASSET USE — Yet another factor limiting the performance of today's

A mobile warehouse technology can help increase warehouse efficiency, improve inventory data accuracy, and even reduce picking errors. It does this by freeing warehouse workers from fixed terminals and time-consuming, cumbersome, and error-prone paperwork.

manufacturers and distributors is the tendency to underuse assets such as equipment and warehouse space. Considering the growing demands they face, the natural tendency is to spend more on warehouse equipment such as forklifts, pallet racks, and conveyors. Companies are also likely to contract for more warehouse space—often at premium rates.

Rather than better utilizing the assets they currently possess—and keeping costs in check—companies instead see costs rise as they acquire more assets. As a result, they are likely to be out-maneuvered by high-performing competitors with the ability to generate more from less.

Underlining the challenges of all three of these factors—orders, labor, and assets—is an absence of clear visibility into operations.

Most manufacturers and distributors still use legacy ERP systems that lack detailed inventory tracking capabilities, which makes it difficult to support the same product housed in different discrete locations within a warehouse. Different pallets become one bundle of inventory or lot in their systems. They are unable to track the lots and expiration dates of those pallets.

Space optimization is another problem, resulting in workers failing to put products in appropriate bins or supporting the proper rotation of products out to customers. Principles such as first in, first out (FIFO) and first expire, first out (FEFO) become difficult, if not impossible, to follow. When warehouse employees grab the first product available, products expire in the warehouse and become obsolete.

Legacy ERP systems lack the capabilities necessary to proactively manage and monitor labor productivity. There is no way to direct activities in the warehouse for maximum efficiency to ensure that workers are performing in the most productive fashion. It's not possible to monitor a shift that a person has performed in a given day, accounting for time and attendance.

Manufacturers and distributors that intend to remain competitive—driving warehouse productivity to best-in-class levels—must move beyond their existing ERP systems and adopt advanced capabilities.

Business solution: advanced warehouse management

By investing in advanced warehouse management solutions, manufacturers and distributors can maximize product placement strategies, prioritize tasks, implement productivity standards, and increase logistics efficiency. These warehouse management solutions use criteria such as item, location, quantity, and order information to manage stock.

While conventional warehouse management systems typically concentrate on merely locating inventory, advanced systems manage the whole process of material flow: receiving, put-away, cycle counting, picking, replacement, packing, and shipping. These advanced warehouse management solutions can help manufacturers and distributors reach new levels of warehouse visibility, agility, and productivity.

Key capabilities of an advanced warehouse management solution include:

Inventory management

This allows identification and tracking of inventory with sufficient granularity to allocate, fill, and deliver orders as accurately as possible, as often as possible. Users can view and monitor the location, condition, and amounts of all finished goods, components, and raw materials in warehousing operations, as well as rotate inventory according to FIFO/FEFO principles and other relevant factors. Lot control, serial number capture, date code tracking, catch weights, inventory aging, and expiration dates all provide additional visibility and flexibility.

Order management

This allows transactions to be processed quickly and seamlessly—regardless of how and where a sale is taking place. Users can get easy access to the information needed to process orders and requests, including detailed customer sales history, product specifications, photos of various product offerings, and replacement products that are available to order.

Work and task management

This manages the ebb and flow of demand by balancing workloads and tasks with available resources. Multitasking enables increased productivity through the use of common workflows, customer requirements, and business processes. Task interleaving allows grouping of work orders and locations with similar or complementary attributes into batches and waves so that orders are received, picked, packed, kitted, and shipped in a timely fashion. Individual worker productivity improves by combining complementary tasks to increase output and limit travel time.

RF and voice direction

These capabilities help improve the productivity of distribution and fulfillment processes by using hands-free connections and advanced speech recognition technology to voice-enable order selection, replenishments, put-aways, transfers, and receiving. Workers can operate hands-free without reliance on cumbersome lists, labels, and scanners—vastly improving productivity and order accuracy.

Labor management

This helps maximize worker performance in the warehouse with workforce planning, staffing, and execution capabilities, as well as the ability to monitor direct and indirect labor and provide feedback to workers and supervisors as picking, packing, and shipping activities are completed. Real-time performance measurements give supervisors visibility into operations so they can identify bottlenecks, labor performance problems, and other barriers to productivity, and take corrective action.

By integrating warehouse management, labor management, transportation management, and third-party logistics (3PL) billing into a unified solution, manufacturers and distributors gain end-to-end supply chain visibility and an efficient execution system that can help them make better decisions and execute those decisions more quickly and profitably.

Slotting

This helps maximize productivity and minimize travel time from location to location by determining the most advantageous arrangement of SKUs within a range of pick faces or slots. It minimizes disruptions that result from demand variability by allowing adjustment of product placement according to seasonality, special promotions, and changes in customer order patterns.

Kitting and light assembly

This allows the adoption of postponement strategies and enables the mass customization of products at the time of distribution and fulfillment to ensure customer requests are fulfilled correctly at the lowest total supply chain cost. Kitting and light assembly facilitate personalization and other product enhancements, single and multi-station kitting and assembly, packaging and labeling operations for existing products, and complex final assembly operations for customer-specific products. As a result of these capabilities, companies can better accommodate changing customer tastes and product requirements.

Multiple benefits

Manufacturers and distributors can reduce costs, protect profitability, and enhance overall market competitiveness by remaining focused on the key performance indicators that drive warehouse performance. Through the implementation of an advanced warehouse management solution, companies can:

STRENGTHEN ORDER MANAGEMENT — With customers now demanding the "perfect order," manufacturers and distributors can take advantage of advanced solutions to reach higher order completeness, order on-time rates, and order accuracy.

INCREASE LABOR PRODUCTIVITY — With labor cost pressures rising in relation to new demand and supply changes, companies with advanced warehouse management capabilities can enhance workforce performance and accomplish more with less. Labor cost increases—which otherwise would have risen heavily—will be minimal or non-existent.

MAXIMIZE ASSET USE — Rather than investing more capital in equipment and warehouse space, companies can rely on their advanced warehouse management systems to fully deploy their existing warehouse assets.

REDUCE INVENTORY COSTS — With most ERP and legacy warehouse management systems, inventory identification is possible only by location. Advanced warehouse management solutions allow users to make inventory buying decisions based on visibility into inventory throughout the entire network, and help them make intelligent decisions on intra-facility movement of that inventory relative to buying more. Since inventory is a tremendous cost burden, companies can drive clear and compelling return on investment by addressing this area.

Winning in hypercompetitive markets

Enormous gains in warehouse performance can be realized through the implementation of an advanced warehouse management system. Manufacturers and distributors that invest in an advanced warehouse management solution can strengthen order management, increase labor productivity, and maximize their use of warehouse assets.

As customer demands rise and supply chains grow increasingly global, companies need to drive gains in warehouse productivity and performance to avoid crushing costs. These investments also promise to pay off in terms of greater warehouse visibility, agility, and productivity. They lay the foundations for profitable growth and market success in the hypercompetitive markets of today and tomorrow.

Consumer-Driven Supply Chains Changing the Shape of Warehousing

As consumer expectations on delivery time continue to grow more demanding and volumes grow, facilities on the outskirts of urban centers will no longer suffice. Last mile delivery, which can account for up to 50% of a good's logistics cost, has been a primary focus of industry innovators. Through this article, Mehul Shah, Chief Executive Officer, LOGOS India, shares as to how logistics developers are gearing up to meet the demands of the consumer driven supply chain.

Mehul has over 20 years' experience in logistics real estate, investment management and international business management. He was previously the Director and CEO of Parekh Integrated Services, an integrated logistics company with a presence in over 70 cities across India. As CEO, he was responsible for creating and implementing the company's long-term strategy, capital raisings and expanding into new markets.

For most of us, such large swings in the relative value of blue-chip companies only manifest as interesting pieces of news or figures in our investment portfolio. But this particular shift among corporate behemoths was indicative of a broader trend, the impact of which has been felt on a personal level by consumers across the globe: the empowerment of the consumer through the rise of e-commerce.

E-commerce has enabled goods to move efficiently through supply chains to the point where services are equally as quick and cost-effective as physically going to a store, while also possessing a significant advantage in opportunity cost. Such speed and cost parity are just the start of the e-commerce evolution, with the next phase to see an even greater power shift to the consumer through product customization.

The internet is obviously the catalyst for the emergence of the e-commerce industry, but just as important is the ongoing development of the supporting technology and infrastructure, which has enabled it to truly thrive. Warehouses, and the increasingly advanced technologies within them, are a great example of one supporting element that will play an essential role in the future development of supply chains to cater to ever-increasing customization.

Some forward-looking companies have already adapted their strategies to match consumer customization preferences. For example, an online grocer based in New York City, last year moved to a highly-automated 400,000 square-foot distribution center in the Bronx, just minutes from Manhattan. It offers its customers customization above-and-beyond standard grocery-store experiences by employing specialized food experts who assign ratings to all of the produce and seafood it sells. The online grocer is able to achieve this customization because its new distribution center reduces the time it takes to fulfill an order by 75%, allowing the online grocer to keep their food fresher and ensuring that its food ratings are still accurate by the time they reach the end customer.

The online grocer's new 400,000 sq. ft facility in the Bronx, New York City

The Future of Supply Chain Customization

While there are virtually unlimited forms in which future customization may play out, three broad concepts – the "batch-size 1" production model, "zero-inventory" model, and blockchain-enabled supply-chain visibility – are particularly interesting in regards to warehousing for the way they underlie the customization and decentralization of supply chains in favor of individual consumers.

The "Batch Size 1" concept is the logical end of ultra-customization; literally manufacturing just one single item for one customer. Some 3D printing may occur in homes or retail outlets but when significant scale is required, large fulfilment centres are a natural choice for this to take place. In these facilities, mass-produced products, or highly customized goods manufactured with 3D printers, may all be prepared for shipment together.

The dream of "Zero Inventory" is also becoming more of a possibility. The underlying idea is that holding inventory can drop to almost nothing as data streams allow for real-time forecasting and the underlying property, transportation, and manufacturing infrastructure are flexible enough to accommodate the mandates of these data streams. This goal is currently being pursued by global fast fashion brands as it would allow them to decrease costs throughout the supply chain while at the same time freeing up valuable real estate, manufacturing, transportation, and human resources to be deployed elsewhere. The increasing prevalence of high-bay warehouses to accommodate AS/RS systems across e-commerce, 3PL, and FMCG warehouse occupants reflects this movement towards faster inventory turns.

Lastly, by providing a tamper-proof history of a good's production, blockchain technology will enable consumers to have full visibility into the supply chain. This means not only that they will have full visibility into the good itself (allowing them to see the history of a given product), but also the supporting infrastructure and business processes along the supply chain that made the production of the good possible. Customers like never before will be able to vote with their wallets for which companies they believe best represent their personal values, thus transforming whole industries to meet their expectations.

As a critical node in supply chain infrastructure, warehouses will play a significant role in determining the carbon footprint and overall environmental sustainability of a given corporation. Cold chain facilities will be scrutinized by customers in their assessment of

As consumers' expectations for faster fulfillment times, visibility into shipment status, and painless returns continue to increase as part of the move towards customization, warehouses need to be more productive, with more throughput while using less space and workers. Diminishing marginal returns on additional workers dictate that in order to keep up with consumer expectations, new technologies and processes need to pick up the slack.

food safety and quality, energy efficiency, and environmental impact of the cooling agent. Developers will therefore be incentivized to give heavier weight to environmentally innovative facilities that will support their customers' bottom lines.

How warehouse facilities are evolving to accommodate the movement towards supply chain customization

As consumers' expectations for faster fulfillment times, visibility into shipment status, and painless returns continue to increase as part of the move towards customization, warehouses need to be more productive, with more throughput while using less space and workers. Diminishing marginal returns on additional workers dictate that in order to keep up with consumer expectations, new technologies and processes need to pick up the slack. In order to be in the game, logistics developers need to work closely with their tenant customers (who are ultimately accountable to individual consumers), to ensure they are well-positioned to meet the changing nature of supply chains.

One way we do this is through by support, and at times co-investing with our customers in emerging technologies for facility specific solutions. In our Xiasha facility in Hangzhou, China for example, we have co-invested with our tenant Nanjing Inform to provide the installation of a 24 meter-high cold storage Automated Storage/Retrieval System (AS/RS) for B2C operations of imported fish and meat. In Australia, we have developed a 20,000sqm purpose built high bay warehouse and office facility for one of the beverages companies in 2018, which included the provision of circa 12,000sqm of state-of-the-art high-bay AS/RS. This technology enables the efficient delivery of thousands of beverages to the beverage company's retail clients to ultimately improve its service to their end customer.

Future-proofing our buildings, from both a specification and location perspective, is also a key focus to ensure we can respond to these global trends. Flat and durable floors for the implementation of new technologies is a good example.

As consumer expectations on delivery time continue to grow more demanding and volumes grow, facilities on the outskirts of urban centers will no longer suffice. Last mile delivery, which can account for up to 50% of a good's logistics cost, has been a primary focus of industry innovators, not to be outdone by one another, Amazon and Walmart have both filed for patents for floating, blimp-like warehouses that would help overcome many of the land and transportation constraints currently confronting last mile delivery operators. Until such a day comes, however, last mile will require an increasing number of increasingly fulfillment centers located in close proximity to the end consumer.

Lastly, as consumers gain visibility into their supply chains and have more agency in purchasing goods with supply chains aligned to their values, bad practices such as poor working conditions during production, the use of environmentally damaging materials, or questionable food safety practices will be penalized by consumers voting with their wallets.

With e-commerce to continuing to transform our everyday lives by giving consumers more autonomy, warehouses and the related technologies and processes will undergo substantial change to keep pace. It is an exciting time to be in logistics and warehousing, and LOGOS looks forward to continuing to work with our capital partners and tenant customers, and the broader industry on responding to these trends to deliver business productivity and profitability for our customers, and ultimately help revolutionize this dynamic sector. Watch this space.

E-commerce – Spurring Growth of New Age Warehousing

E-commerce has had an undeniable impact on the shopping habits of consumers in today's economy. People who never shopped online before have discovered its incredible ease and its slated benefits in their daily life. People who used to buy one or two things online have now converted nearly all of their former shopping trips to convenient, home-based laptop sessions increasing online purchases. Adapting to these new trends, the distribution companies are finding that change is necessary.

Atul heads the Warehousing vertical at TCI Supply Chain Solutions. He has over 16+ years of experience in the Warehousing function. A specialist in warehouse planning and implementation, he has been closely working with many large clients with a global footprint for their warehouse site selection, designing and disposition requirements throughout India.

His interests are into reading and innovative technologies. He is also an active member of CSCMP (Council of Supply Chain Management Professionals) and also holds a six sigma green belt.

INTERNET, new-age communication technology and fast urbanization are revolutionizing retail, and it their wake, are transforming the warehousing business as we know it. In the retail business, logistics was more of an afterthought and resided in the back of the mind. Warehouses were planted in strategic locations where taxes were low, along with cheaper labour and land rates- which often meant remote locations, away from urban areas. Thanks to the constantly growing demand of e-commerce and the evolving consumer, warehouses of the last century have now evolved into modernized and technology-rich logistics facilities. For a growing number of companies, be they online retail giants, start-ups or brick-and-mortar chains building out e-commerce capabilities, logistics facilities already perform many of the functions of a store.

As B2B, B2C e-commerce grows further, manufacturers, distributors and all parties involved in the chain of business are going to be competing for more modern warehousing space. For every $1 billion growth in online sales, 1.25 million square feet of logistics space is needed in proportion. This means an increase in e-commerce logistics space demand to 184 million square feet by the year 2020.

But it'd be best that B2B and B2C companies be prepared to pay for better and automated warehouses, as the need arises. The e-commerce trade has been driving up the sales deals and warehouse leasing deals at an alarming rate in recent times. The sizes and costs of warehouses spaces leased by e-commerce companies are getting bigger by the day. In general, the size of the space for e-commerce companies leasing new warehouse space ranges from 500,000 to 1 million square feet, but in recent times, the cost per square foot for leasing a warehouse space has nearly doubled, thanks to the spike in demand.

We may soon find e-commerce companies to be fighting for acquiring new warehouse space among themselves and also against others. It may continue to be so for a while till the market sees a stabilization in terms of consumption. As much as the warehouse spaces themselves, e-commerce companies also need lots of parking space, higher ceilings and loading bays for the accommodation of newer logistics fulfillment technologies.

The shift towards modernization

Thanks to the e-commerce trade, there has been a noticeable shift in trends in the market today. Let's take a look at how the warehousing industry is

changing to accommodate the e-commerce.

New-gen Tech and the Use of Robotics

The need for the employment of robots is arising from the unpredictability of buying patterns. The traditional warehousing model falls short of capability to support these patterns and higher expectations of today's online shoppers. Robotics seem to be the logical choice to increase the overall productivity, accuracy, and efficiency in a number of distribution centers.

More and more facilities are increasingly relying on an automation system that has become a vital tool in warehousing operations. Warehouses must be more flexible in order to meet the needs of IT companies that are expanding their management systems and solutions in light of increasingly complex direct shipping to consumers and the geographical considerations that entails.

Varied Consumer Expectations and Behavior

It is common knowledge that the consumers who tend to shop online have different purchase behaviors than the ones who shop at retail stores. Consumers who buy online tend to return items at a higher rate than those who shop in stores.

This trend is a result of the evolution of the buyer and the changing buyer expectations. Online buyers expect quick fulfillments, low delivery fees and easy return policies thanks to the expectations raised by e-commerce giants around the world. What this translates into for warehouses is that they not only feel pressured to lower their costs and improve delivery but they must be prepared to accommodate an increased rate of returns.

The Unpredictability of Volumes

Due to the advancement in the e-commerce business, buying patterns have become highly unpredictable with online customers, with them expecting the goods to be shipped directly to their doorsteps. Before the advent of online business, sales patterns were more or less predictable and tended to remain relatively stable throughout the

Having logistics space closer to customers can play a big role in reducing transportation costs and time to deliver, which is vital for the highly competitive e-commerce industry. That's why many e-commerce companies and other retailers are finding "infill" locations—sites within urban areas that are repurposed for logistics, as opposed to greenfield exurban sites—are becoming a prime imperative.

year- barring the holiday rushes. Thanks to these changes, rapid adaptations by distribution centers are a necessity.

Higher levels of training and skilling will be a requirement for employees and fresh technologies and strategies will need to be implemented in order for warehouses to support the changing system.

Shipping Items v/s Shipping from Pallets

Used to be that businesses would ship products to other businesses on flats. With retail stores growing less popular, products are being shipped directly to the consumers' doorstep. Thanks to this unpredictability of shipping patterns, warehouses need to not only relook at shipping and picking technology, but also the method of handling inventory along with its storage arrangements.

Evolving Geographies

What is making the logistical locations prime is being increasingly affected by the rise in e-commerce and online shopping in general. Since the consumers expect fast deliveries, it makes it more important for warehouse facilities to be located in closer proximity to large cities, which is again one of the expectations raised by the international e-commerce giants.

The spike in e-commerce by the year 2021 is expected to be nearly double of what it is now. Due to this, warehouses should be prepared to adapt to the new shopping patterns and expectations resulting from the continually rising e-commerce. A major building block of business in a time like this is considered to be vested in a dependable company that understands every in and out of warehousing and how it is changing.

Worldwide dynamics

Due to the spike in urban demand, e-commerce and last-mile logistics providers seek storage and pick-up sites close to their customers and the demand is huge for warehouses near major cities. The cost of land development is also rising owing to the online retail giants and their third party logistics or 3PL partners, who are the driving trend in the business.

Customized design-built facilities tailored to the requirements of the companies are in the highest demands, especially those that are fully automated and incorporate newer technologies as tenants seek higher supply-chain efficiencies. Around the world, e-commerce and logistics companies seem to be capturing a growing share in the leases of warehouse spaces as there is a constant search for optimal sites for DCs.

The requirements of e-commerce logistics, distribution, and warehousing requirements are still driving the market and are almost in line with online retail sales. This strong demand has driven down supply, with developers becoming more and

more innovative with respect to increasing value through the repurposing of obsolete assets and exploring multi-level facilities in a growing trend that caters to demand for close-in warehousing and distribution.

This market sector is heating up across the globe. In response, investors are focusing on constructing brand new warehouse properties to try and meet the demand. The development pipeline remains strong, in terms of both product deliveries and new space under construction. These investors are attracted to both, the new warehousing facilities and distribution centres as well as finding value in older assets that are located in urban areas.

Last-mile logistics is responsible for an increased number of adaptive reuse projects industrial market around the globe continues to mark a very high supply growth as it adapts to the requirements of occupiers- whose needs evolve along with the modern-day consumer. In land-constrained metros, the redevelopment of obsolete assets around urban areas is a rising trend that caters to demand for storage, warehousing and DCs.

Reasons behind the success

The changes in the industry and customer expectations have driven warehouses to adapt in a tremendous way. Here's a look into where warehouses are finding success in this new system:

Superior technology

Going digital is essential to ensuring warehousing and inventory management systems are a success in today's world of e-retail business. Many new technologies have come up in recent times to keep up with e-commerce demand, making sure product tracking and similar activities are handled as efficiently as possible. The pen-and-paper systems of shipment tracking have come of age and won't do in today's world at all – being able to track a shipment's location immediately requires highly advanced inventory-management systems that make it easier to perform the task.

Skilling and training

In any successful business, the demand would continue to rise and the in-flow of orders would show no sign of slowing down. This makes it essential for the warehousing activities to perform like a well-oiled machine with employees that are properly trained in every activity in order to make sure that the warehouse never stops functioning. The staff following protocols and understanding warehouse technology is crucial to avoiding disruptions in the system.

The right material handling equipment

In warehousing, floor space is absolutely invaluable. Any room not properly utilized could prove to be space used to store more product. Thus, for warehouse productivity and capacity, the right equipment and workflows are paramount. Many

With e-commerce spurring rapid change in warehousing, retailers and logistics providers need to evaluate how inbound logistics can help optimize e-commerce fulfillment operations. Inbound logistics has a major impact on the customer experience—even if it is well hidden from the consumer's view. As an example, many online retailers promise two-day shipping, but that does not equate to two days for the retailer or logistics provider. Shipping, fulfillment, and inventory availability all play symbiotic roles in enabling two-day deliveries for customers. Given their symbiotic relationships, it is vital to evaluate the supply chain from a holistic point of view.

warehouses today a multistoried and require products and equipment to be moved from one level to another safely and efficiently. There are many options that can accomplish this ranging from elevators to spiral conveyors to manual employee labor. However, most warehousing operations opt for the most cost-effective, efficient, and safest option available.

One product that stands out is a vertical reciprocating conveyor, or VRC. These low-maintenance conveyors are more cost-effective compared to freight elevators and also carry the smallest footprint, making them a space-saving option for improving efficiency.

3 keys factors governing inbound logistics efficiency

Demand planning, modal selection, and product availability are the three pillars of inbound logistics enabling a superior e-commerce experience. For visitors, product availability is the most visible out of the three. If a product is unavailable for purchase, it stops dead in its tracks and there is a risk of losing the customer. Depending on the timeframe, a consumer may need a product, lack of availability could drive business elsewhere, opening the door for other retailers to take market share.

Modal selection is the factor that may be less visible to the customer, but in no way less important. It carries the potential to becoming a balancing act between optimizing profit and ensuring availability. Transportation leaders are being challenged by the ebbs and flows of the pricing environment, all while juggling the choice between less-than-truckload (LTL) and truckload.

Demand planning, which is the third aspect of inbound logistics, which carries the potential to relieve the pressure of pondering over the modality of product delivery. It is influenced by many different departments within an organization—with marketing being one of the top few. If demand planning and marketing are not integrated correctly, marketing initiatives can seriously disrupt fulfillment. A website may offer a bundle of products at a discounted rate, but the online special will result in many dissatisfied customers if a DC was not prepared with the appropriate stock for timely fulfillment.

The Future of e-commerce

In the future, retailers are set to thrive in mixed-use urban areas, population centers and near emerging transit hubs. The same holds true for virtual stores and the associated logistical facilities that service e-commerce. The ever-increasing e-commerce activities and the corresponding demand for real estate for storage and warehousing activities have enjoyed significant success in the last few years. In spite of immense growth, e-commerce infrastructure is still undeveloped, especially in the infill locations that facilitate last-mile delivery. Yet it seems to be only the beginning for retailers who are sure to scale up their operations and continue to experiment with a range of e-commerce concepts and innovative supply chain strategies.

E-commerce is the future for sure, and does not seem to show any sign of going away any time soon. Correspondingly, warehouses will not be rendered obsolete in this future either and will be sharing in the success of the e-commerce business in proportion. As the technologies advance and consumer expectations rise continually, warehouses will have to evolve as well and make sure they fit into the ever-changing landscape. However, if history is any indication, warehouses have proven to be more than capable to keep up.

Top 10 Trends in DC Design

1. 36- to 40-foot ceiling heights for stacking, racking, and e-commerce mezzanines
2. Flat and dry concrete slab surfaces for optimal rack layout, void of any moisture issues
3. Exterior and interior LED lighting systems, coupled with natural light from clerestory windows (in favor of traditional roof-mounted skylights)
4. Extra car parking areas designed to accommodate e-commerce employees
5. Deeper truck courts with 100% concrete surfaces and specific trailer storage drop areas
6. 'LEED-light' sustainable design, which includes white roof systems, indigenous plants material, recaptured rainwater, low-flow toilets, fewer blacktop surfaces, locally sourced construction materials, and bike racks to encourage alternative commuting
7. Wider column spacing (56 to 60 feet between support beams) to optimize staging for rack designs and conveyor systems common in e-commerce facilities
8. Narrow aisle widths to maximize storage capacity (modern materials handling equipment complements today's tighter aisle configurations)
9. Dock equipment tailored to the occupant's specific needs (edge-of-dock, pit-style, and mechanical load levelers)
10. Cross-dock building design to maximize throughput.

Building a Flexible e-Commerce Center

These are some elements of a flexible e-commerce warehouse/fulfillment center

- High-speed, multi-level conveyor systems (up to 25,000 units per hour)
- Goods-to-Person and Goods-to-Equipment fulfillment
- A warehouse execution system (WES) that syncs with existing WMS, ERP software, fulfillment picking, and materials handling equipment
- Robotic technology for order picking and retrieval
- Handheld applications for order accuracy and user mobility
- Value-added services, including product customization and postponement.

Creating the Warehouse of the Future

Warehouses are the most critical part of the supply chain, constituting about 60% of the function. They are the hubs for fulfilment and distribution services, and catalytic to ensure a seamless supply chain. Hence, with growing complexities in supply chain and evolving market trends and consumer demands, flexible warehouse automation is the need of the hour, highlights Vivekanand, Country Manager, India and SAARC, GreyOrange.

Vivekanand is responsible for building and executing a strategy for sustainable growth of business in India & SAARC region. He also handles the overall P&L responsibility of GreyOrange Business in India & SAARC region. Prior to this, he has worked with Barco India for almost 18 years, out of which he served as the Country Director for 2.5 years where he looked after sales, marketing and project management operations. He has extensive years of progressive experience in High End Technical Solution Sales within the B2B industry and the skills to drive business growth, capitalize on new revenue potential and manage all aspects of daily business operations.

IN today's day and age, industries are betting on innovation to progress and the supply chain function is not behind the curve. With fast evolving market trends and emerging new demands from consumers, supply chain needs to be well organised and optimized to keep up with these developments. Imagine an e-commerce player receiving millions of orders every day and then dispatching them within one single day! In order to meet these sheer volumes of orders, supply chain becomes a highly critical function across for such companies.

India's retail market is expected to increase by 60% to reach US$ 1.3 trillion by 2020. The phenomenal growth of e-commerce in a relatively short span of time and the rapidly evolving consumption patterns for consumer goods present a wide range of distribution challenges. There is stiff competition among players, more so, with the rise of new delivery patterns such as same day deliveries. With the advent of online shopping and the market expected to cross $170 billion by FY30, consumers today are looking for a more omni-channel experience. Furthermore,

the implementation of GST has propelled consolidation of warehouses at one given location, which will make the task to manage the soaring volumes and demands a massive one. These factors have propelled supply chain companies to move beyond traditional systems to meet these challenges.

Businesses today operate in a volatile and multi-SKU environment, handling large numbers of orders to be shipped every day. Increased volumes, cost pressures, and the need to run leaner processes make inventory management in supply chain much more complex than before.

So how are the warehouses evolving?

Convenience of instant gratification is only possible when the operations in the warehouses are driven by technology integration and automation. Retailers are now upgrading their warehouses with flexible automation as they race to meet the consumers' demands for faster deliveries and omni-channel experience. We are also witnessing a shift towards smart, flexible and agile distribution facilities, laden with applications of robotics, AI and machine learning that help optimize the warehouse functions.

Today, e-tailers and 3PL players are moving towards adoption of technology, which can help them overcome the challenges that supply chain operations encounter every day. These technologies are also environmentally and workplace friendly which is a huge consideration for businesses. Companies are reaping the benefits of the huge advantage and potential that such technologies offer such as flexibility, cost-effectiveness, enhanced productivity and effective space utilization. For instance, 'cobots' or collaborative robots have entered the current warehouse scenario where they work with a human operator to fulfil orders and enhance picking productivity. By combining AI and Machine Vision to revolutionise picking high-mix SKU inventory, these robots help improve the throughput multi-fold. Another example is where AI-driven autonomous robots are deployed to reduce order fulfilment and inventory replenishment time, thus enhancing business agility and growth as well as eliminating complexity.

As we move forward, we will see an uptick in this trend of adopting these technologies in warehouses to move up the value chain. More and more retail companies are now realising the advantages of these technologies and how it could help in reducing inefficiencies and operating costs in the warehouses. By providing the promise of agility, these technologies also help businesses tackle the growing demands and aggressive competition in the market. In the years to come, a company's supply chain will help define its success and how it keeps up with the ever-growing customer expectations, and how digital transformation and bot economy will lead to futuristic, agile and flexible supply chains to stay ahead of the curve.

Insourcing v/s Outsourcing of Warehouse Services – Making the right choice

Faced with the question of how to strengthen their relationships with their 3PL service providers, companies are in constant dilemma of choosing between their own traditionally managed warehouses (central warehouses or regional warehouses and depots) – insourcing – or opting for the new age, modern and super-efficient managed warehouses offered by the service providers – outsourcing. This nuanced article by Javin Bhinde, MD & CEO, SynCore Consulting, offers you insights to take the right business decision...

Javin, who is a Management Graduate from NMIMS, Mumbai in 1998, found himself quickly engaged in the depths of corporate India working for many industries in projects encompassing nearly all business functions. But the idea of being a "Corporate Doctor", someone who offers real and practical remedies to business issues through rigorous application of knowledge and people management, held much greater appeal to him. It is on this idea of a "Corporate Doctor" that he founded SynCore Consulting and imbued it with the same passion and values that guided him through his earlier years in Banking, Technology and Consulting.

WITH the advent of the modern times and changes in the supply chain structure in India, there has been a significant change in the outlook of the modern enterprise towards warehousing services. Traditionally, the warehousing services were dictated by the traditional supply chain structure and network in India. The 'general trade' structure dominated the scene. This structure encompassed the regular entities in the supply chain – the company ➤ the wholesaler ➤ the distributor / the stockist ➤ the retailer and finally ➤ the consumer. In the last 10 years, the scenario has undergone some changes with respect to the following:

Growth and proliferation of the online business or e-commerce in several industries – the e-commerce players have not only brought in new business models but also new supply chain capabilities as well as automated warehouses, distribution and logistics capabilities. The traditional hub & spoke models have transformed into distributed supply chain with several 'local' hub & spoke models emerging. The term 'fulfillment centers' denotes the points of distribution from where the e-commerce orders are fulfilled. The biggest change perhaps has been in the automation of the warehousing systems since the promise of 'one day delivery' or 'speedy delivery' has created the need for the e-commerce companies to be very agile and quick in the order processing and dispatch systems. This has created a huge need for efficient systems, latest technology and the need for the right talent as warehouses became more automated and efficient.

Introduction of the GST, which has enabled the supply chain structures to become more 'cost and service' focused, rather than simply 'tax focused'. The rationalization in the number of the traditional depots / CFA locations has created another massive change in the ecosystem where companies are continually looking to optimize

costs and increase service levels with consolidated depot structures.

Infrastructure specifics

The creation of the road infrastructures, the increasing number of start-up companies offering new technologies for vehicle optimization, route optimization and vehicle tracking systems, the advent of modern private sector players in the logistics space with intra-city and inter-city goods movement capabilities – all these have created a wonderful opportunity for the companies in various industries to capitalize on the developments and transform their supply chains into leverage points for customer service and profit enhancement.

The companies have long invested in the space, infrastructure, systems and manpower to run their supply chains. The decision of upgradation of the systems and the infrastructure – both physical and electronic – has always been a source of contention within the management of the organizations with a debate ensuing between capital expenditure and the time frame within which the ROI or savings will materialize.

The pace of development in the warehousing technology and the proliferation of players in the space make the choice of the right partner with the right solution for the end-user a compelling task, which enterprises need to decide based on several factors. Such a decision needs to be evaluated with a horizon for 4 to 5 years and should be dictated by the present and future needs of the enterprise.

Companies with a wide range of products with special storage and handling requirements like temperature control and adherence to good storage and distribution practices are more likely to go for their own warehousing requirements. Companies faced with the need to ensure very high service levels to their customers (like suppliers to OEMs) will to need to ensure quick turnaround times and therefore may choose to partner with a responsive and efficient warehousing service provider. There are service providers and consultants who help companies make the right decision on the basis of the right balance between costs and service levels on one hand and product mix, product range, customer reach required on the other.

India has one of the highest costs in logistics as a % of GDP (nearly 14% according to sources) and the need to contain this cost as the revenues increase and margins reduce, will be a prime factor for companies to consider shared warehousing service providers. With nearly INR 50,000 crores of investment expected in the warehousing sector in the next 2-3 years, the sector is poised for 'organized' growth and will lead to the removal of lot of inefficiencies hitherto present.

Tell us your opinion!

(The Dawn of New-Age Warehousing - Logistics Focus (Aug - Jan 2020)		Strongly Disagree	Somewhat Disagree	Neither Disagree Nor Agree	Somewhat Agree	Strongly Agree
S. No	Please select the appropriate rating:	1	2	3	4	5
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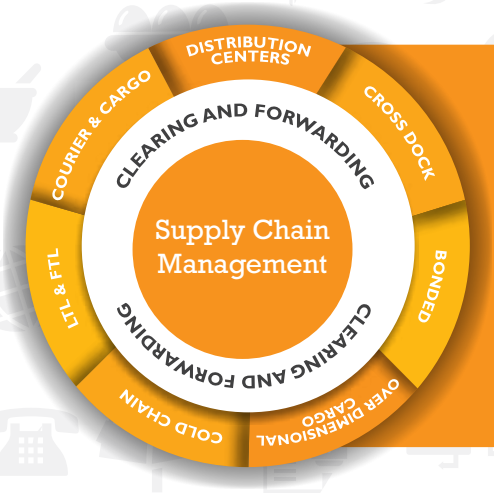

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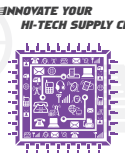

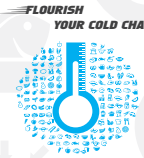

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