

Supply Chain Management Twin for Pharmaceuticals using AnyLogic

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World's fastest-growing IT services brand

Brand Finance 2025 Global 500 and IT Services Top 25 report

\$13.8B
Revenue

Operations in
60
countries

223K+
HCLTechies

Highlights

The **only service provider** to be **rated in the 'Customer's Choice'** quadrant for **all six active VoC reports** for IT Services by Gartner

Fastest growth among peers for the second year in a row, with FY25 revenue growth at 4.7% (CC)

No.1 India-headquartered company in TIME magazine's list of World's Best Companies 2024

Included in **S&P Global Sustainability Yearbook** for the third year in a row

#1 rank in 9 categories in Exel's 2025 Asia (ex-Japan/ANZ) Executive Team – Rest of Asia rankings

At a glance

Partner to
40%
G2000 enterprises

and
50%
G500 enterprises

167
Nationalities

Top Employer in
26
countries

Our differentiators

- Multi-disciplinary engineering expertise from chip-to-cloud
- AI-led cyber-physical engineering to deliver shared enterprise outcomes
- Global network of high-end labs and CoEs
- Engineering talent at scale across technologies

Engineering and R&D Services

Through chip-to-cloud innovation, we develop intelligent products, platforms, services and experiences that empower enterprises to achieve market differentiation, accelerated technology adoption and sustainable growth.

Key recognitions

- **Leader** in Zinnov Zones Digital Engineering and ER&D Services **for the last four years (2021-2024)**
- **Leader** in Everest Group's Semiconductor Engineering Services PEAK Matrix® Assessment 2024



Product Engineering

Product portfolio management

- Simulation and automation
- Concept to manufacture
- GTM acceleration
- Product sustenance and support

Digital Engineering

Smart and connected experiences

- Technology adoption
- Use-case validation
- Platform engineering
- Customer experience

Digital Manufacturing

Streamlined and optimized production

- Plant automation
- Smart Factory
- Connected platform
- Digital Twin/Thread

AI / GenAI

Intelligence & insights

- Intelligent products
- AI-augmented processes
- Edge AI
- SLM/LLM solutions

Semiconductor

Powering the core

- IP-protected SOC
- Chip Value Engineering
- AI Processors
- Embedded FPGA Platform

Agenda

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Supply Chain Industry Trends

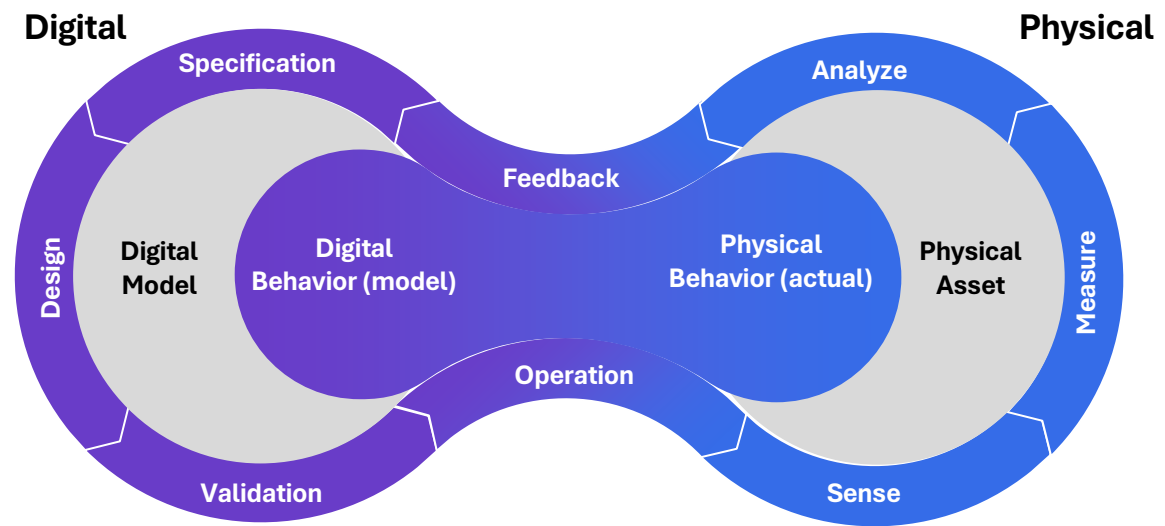
Business Trends

- End-to-end supply chain visibility across the suppliers & OEM – better monitoring & control
- Building resilient Supply Chain – quick recovery from disruptions
- Sustainable supply chain systems (Carbon footprint, energy consumption)

Technology-Driven

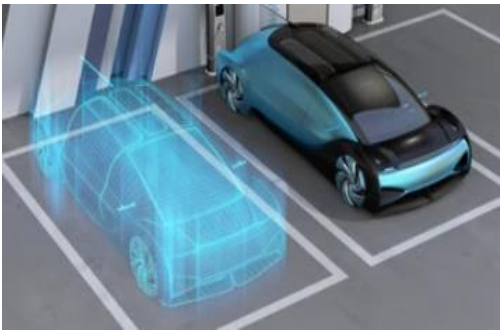
- Increased adoption of IoT based solutions – real-time data
- New technologies like AI & ML – demand forecasting, process optimization, accurate prediction
- Digital Twins – Virtual replica of physical assets & processes – What-if scenario analysis

Digital Twin Concept



“A Digital Twin is a connected virtual replica of a physical product, person, place or process”

Product Twin



Asset Twin



Process/Plant Twin

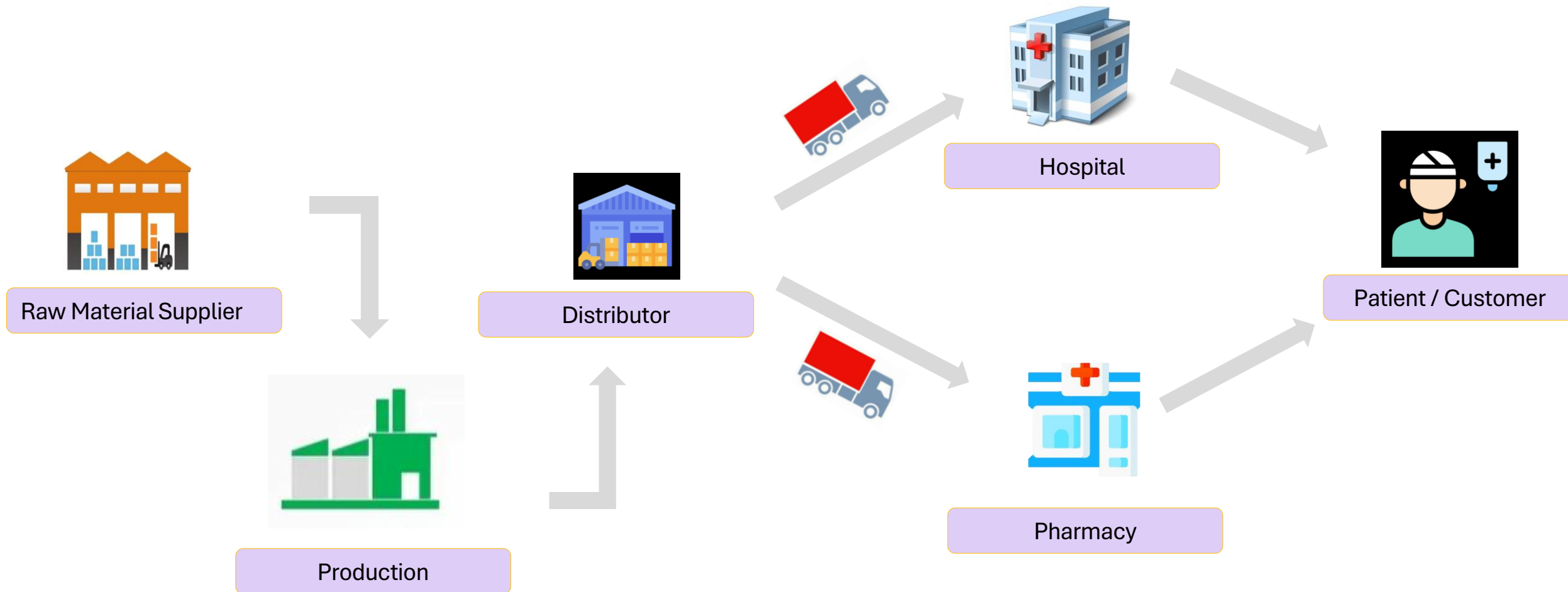


Infrastructure Twin

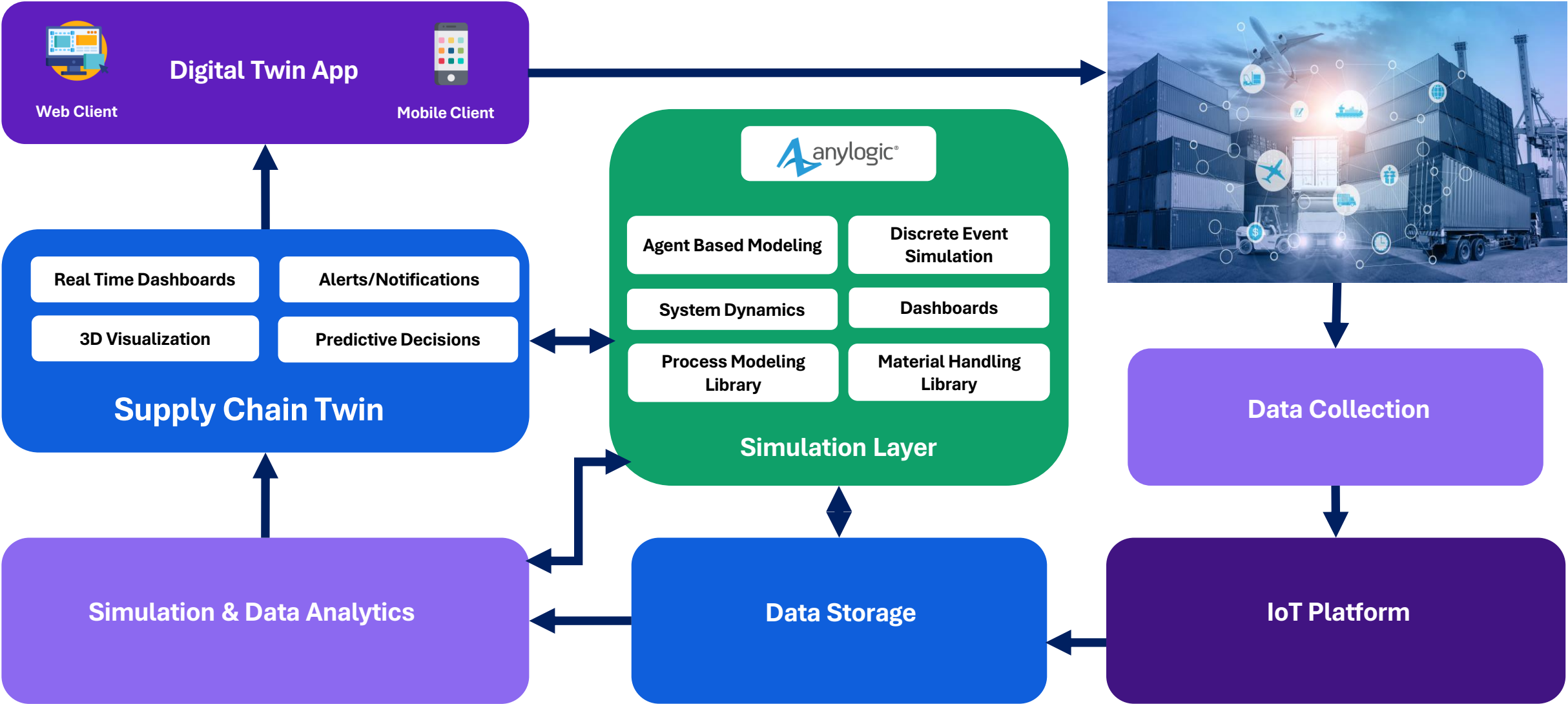


Twin Types

Supply chain in Pharma Industry



HCLTech Digital Twin Solution using AnyLogic



Hybrid Modelling Approach in AnyLogic

Agent Based Modelling

- Agents - Manufacturing Centers, Distributors, Retailers and Vehicles represent real-world entities
- Agent behaviors through state charts (e.g., truck moving, loading, unloading)
- Decentralized decision-making and dynamic interactions among supply chain entities
- Models demand generation at retailers & adaptive responses to supply availability
- Provides emergent behavior analysis (e.g., fleet interactions, demand fluctuations).

Discrete Event Modelling

- Processes like order handling, queueing, loading, delivery, and unloading represent structured flows of activities
- Production & distribution captured through process flowcharts (e.g., production → storage → delivery)
- Inventory processes track quantities produced, shipped and received
- Product movement handled as discrete batches/events across the supply chain
- Allows structured measurement of KPIs such as fleet utilization, and waiting time

Business Benefits

Improved supply
chain sourcing
resilience &
visibility

~25-30%

Optimize the
logistics cost for
suppliers &
manufacturers

~10-30%

Improved decision
making, self
healing based on
advanced analytics
& simulation



Conclusion

Hybrid supply chain digital twin powered by AnyLogic allows integrating agent-based modelling & discrete event simulation

Combine the strengths of both methods – The autonomous behavior and adaptability of agents with the process efficiency of discrete flows

As a result, we achieved:

- Realistic representation of **end-to-end supply chain dynamics**
- **Real-time monitoring** of products at distributors and manufacturing centers
- **Visualization** of material inbound/outbound flow
- **Scalable Digital Twin solution** for other industry & use cases



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