FROST & SULLIVAN

Partner with Diversified Experts in Automated Material Handling Solutions

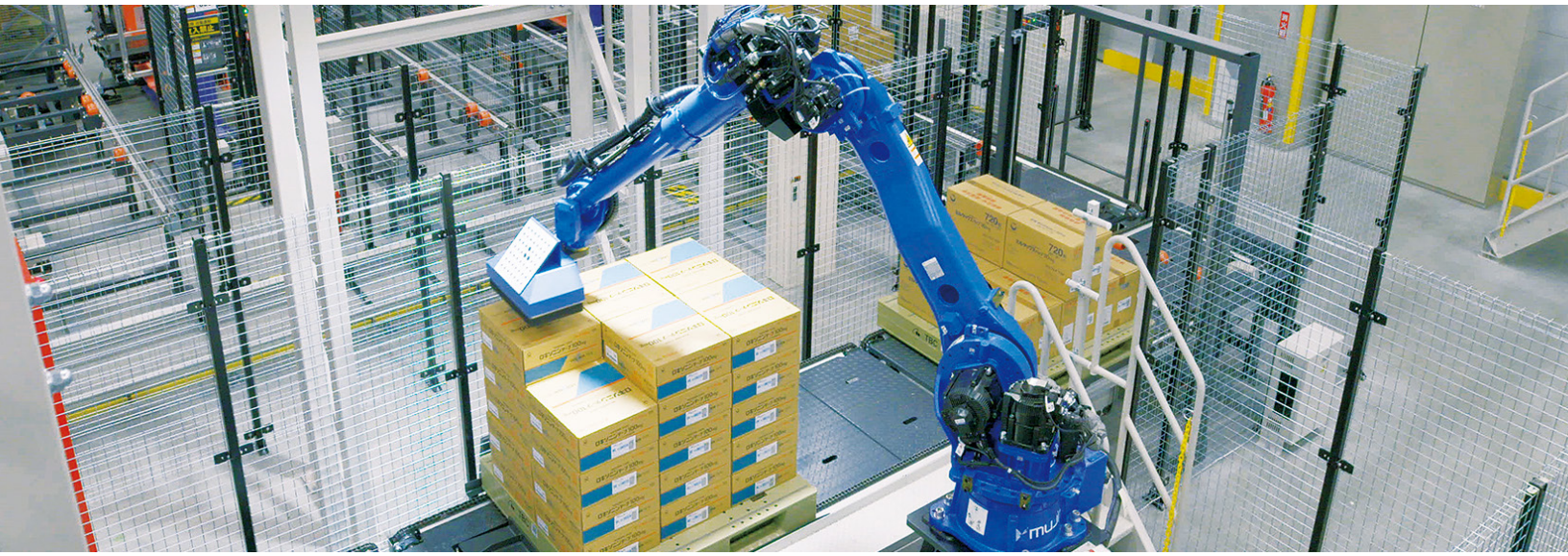
Remain Agile During Macroeconomic Instability and Capitalize on Market Disruption

FROST & SULLIVAN EXECUTIVE BRIEF

The Current State of the Material Handling Industry

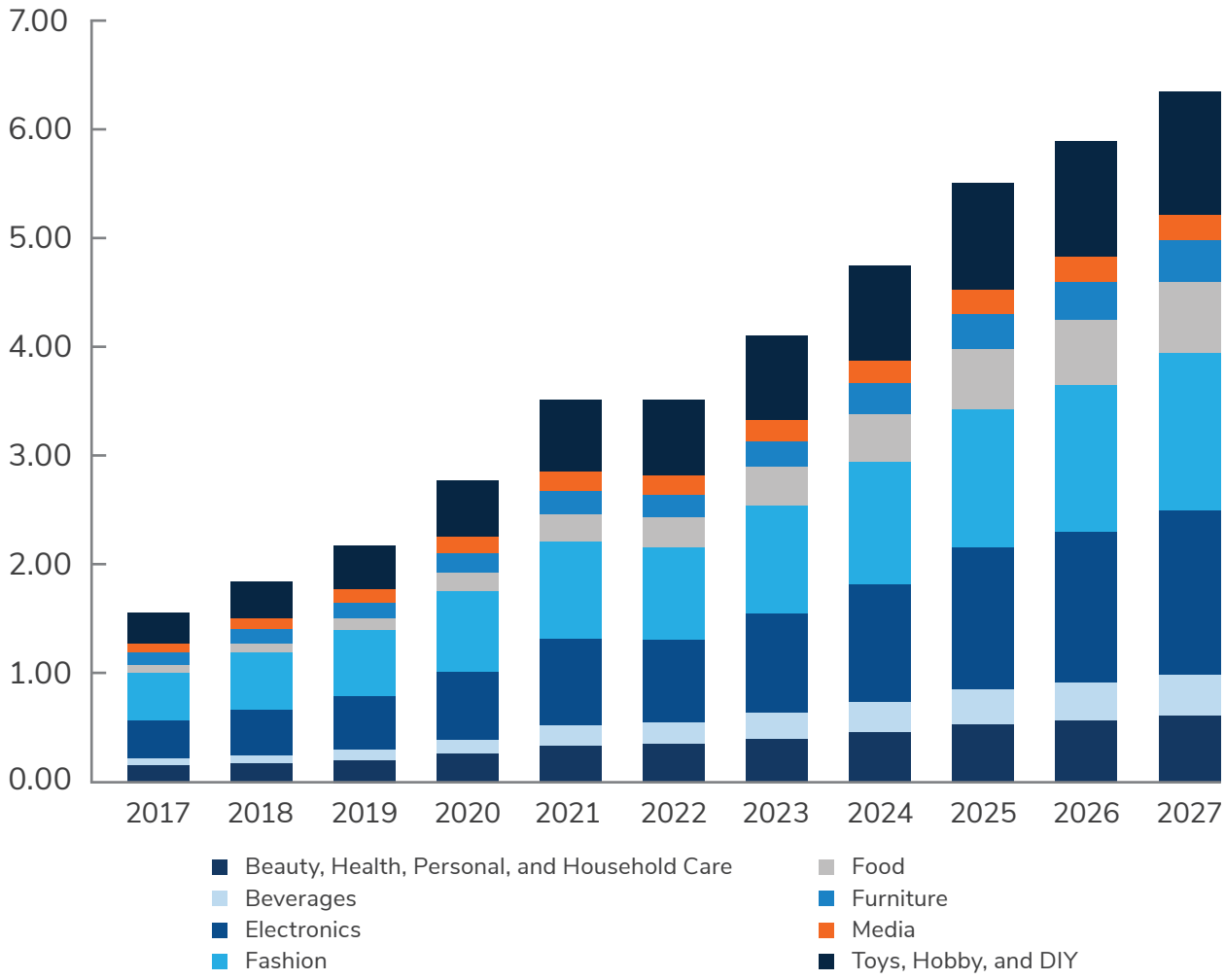
The automated material handling industry has experienced significant growth in recent years, driven primarily by the global expansion of eCommerce and the shift toward omnichannel retail. The COVID-19 pandemic solidified the shift to online shopping, with 26% growth from 2019 to 2020,[1] and boosted demand for efficient and reliable material handling equipment. Even after the pandemic, eCommerce is projected to grow at a moderate rate of 11.5% by 2027,[2] and manufacturers continue to adapt their business models to account for new advanced material handling trends. At the same time, consumers expect a seamless shopping experience across different channels, leading retailers to embrace omnichannel strategies that require flexible and adaptable material handling systems.

To keep up with rising demand and improve accuracy, speed, efficiency, and productivity, warehouse operators from various industries have turned to automated systems and advanced warehouse equipment technologies, such as robotics and artificial intelligence (AI), in material handling. Additionally, the food and pharmaceutical industries continue to grow consistently, each at a compound annual growth rate (CAGR) of about 5% in the last five years.[3] As these industries expand, the need for efficient and precise material handling solutions has become even more critical.



1 "Annual Retail E-commerce Sales Growth Worldwide," *Statista*; Ethan Cramer-Flood, "Worldwide Ecommerce Forecast Update 2022," *eMarketer*.
2 "Digital Market Insights: eCommerce," *Statista*.
3 "Consumer Market Insights: Food," *Statista*; "Health Markets Insights: Pharmaceuticals," *Statista*.

FIGURE 1: Global eCommerce grows at a moderate CAGR of 11.5% (2023–2027), with a market volume of US$6.35 trillion by 2027.[4]



However, the many challenges various labor markets face have spurred demand for automated warehousing. These trends have attracted the attention of investors, technology start-ups, and warehouse operators, making the automated material handling industry both dynamic and promising. As the industry becomes more and more competitive, solution providers will continue to develop advanced equipment and technologies that will improve their offerings and differentiate them from their rivals.

4 "Digital Market Insights: eCommerce," Statista.

Who Are the Leading Players?

The material handling industry has undergone significant changes in recent years, marked by a surge of mergers, acquisitions, consolidations, joint ventures, and partnerships among service providers. Leading forklift companies Toyota Industries, who entered the global automated material handling market with its purchase of Vanderlande and Bastian Solutions in 2017, and Kion Group, with its acquisition of Dematic in 2016, are excellent examples of companies involved in material handling that are expanding their presence in the automated intralogistics realm. Midea Group's (China) acquisition of Kuka and Swisslog in 2016 and Weichai Power's (China) gradual accumulation of Kion Group shares over time indicate continual interest in the industry. SSI SCHAEFER, a privately-owned company with German roots, became the majority shareholder of SWAN GmbH, the SAP logistics specialist, in 2021; and Daifuku Co., Ltd. (Japan) acquired India's Vega Conveyors and Automation in 2019. All of this activity exemplifies industry-wide shifts.

As the industry changes, some companies will adapt and thrive while others may struggle to keep pace. Industry players cannot take success for granted and must constantly innovate and adapt to new technologies, customer needs, geographical markets, and regulatory environments to stay ahead of the competition. It is worth noting that Daifuku is unique in the industry, where its core business segments are all related to automated material handling, and it has autonomous decision-making capabilities. The company also has the transparency that comes with being publicly traded, which can assure potential customers of its focus and future stability, a value that sets it apart from industry competitors.

Innovating Simple Steps for Exponential Impact

Labor shortages, labor costs, and challenges with availability and reliability continue to push the need for autonomous solutions in warehouse operations to reduce dependency on human workers and simplify tasks for those who work in these spaces. Additionally, ever-increasing urbanization, with 56% of the world's population living in urban areas as of 2021, is driving the development of innovative and cost-efficient models for using distribution solutions, such as putting warehouses closer to consumers. These warehouses must operate in smaller spaces while handling products of varying sizes, weights, and shapes.

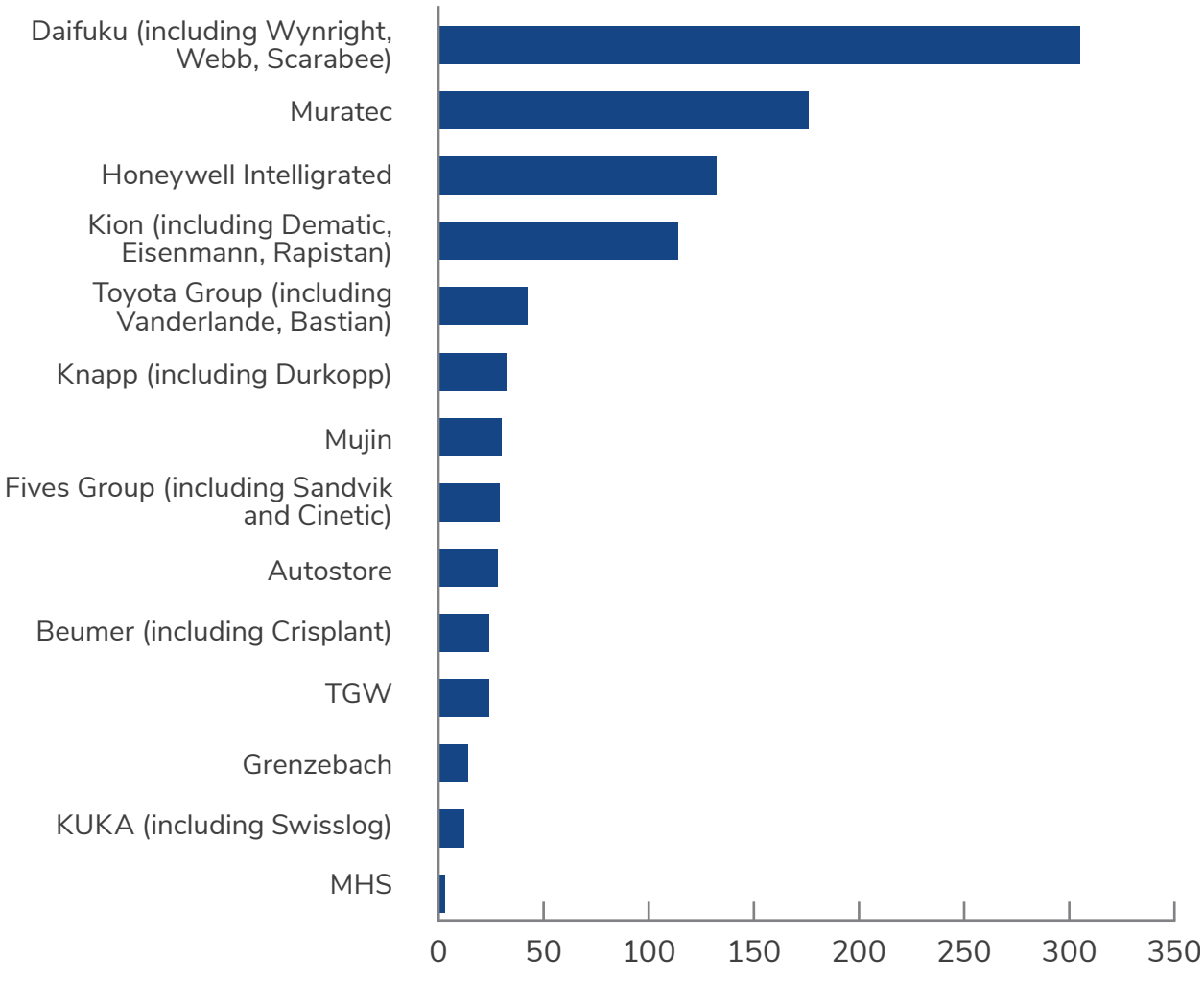
The challenges brought on by labor shortages, labor costs, and availability and reliability issues could be overcome by introducing innovative automated storage and retrieval systems (AS/RS), automated guided vehicles (AGVs), and automated handling equipment, in general.

These advanced technologies would provide efficient and cost-effective solutions to meet the growing demand for industrial and logistics services.

Top material handling equipment companies are revolutionizing warehouses with their cutting-edge technologies through AI and more sophisticated automation, including autonomous mobile robots (AMRs), purpose-specific automated storage, and innovative picking/consolidation methodologies.

The complexity of product offerings increases stock-keeping unit (SKU) granularity while the consumers' appetite for ever-faster delivery remains insatiable. Companies are looking for ways to meet these competing requirements by investing in equipment that provides the necessary storage, transport, and sorting functions while being flexible enough to handle shifts in future business needs. The systems should also facilitate management strategies to reduce costs, such as zero inventory management, and include standard preventive maintenance that workers with little experience can complete. Addressing these challenges requires significant research and development (R&D) and innovation. The number of US patents held by substantial players in the intralogistics automation realm reflects this R&D and innovation activity.

FIGURE 2: Key material handling companies and groups hold many valid US patents under the B65G patent code covering transport and storage devices.[5]



5 "The Internet patent information retrieval service JP-NET Web", JPDS Japan Patent Data Services Co.

CASE STUDY

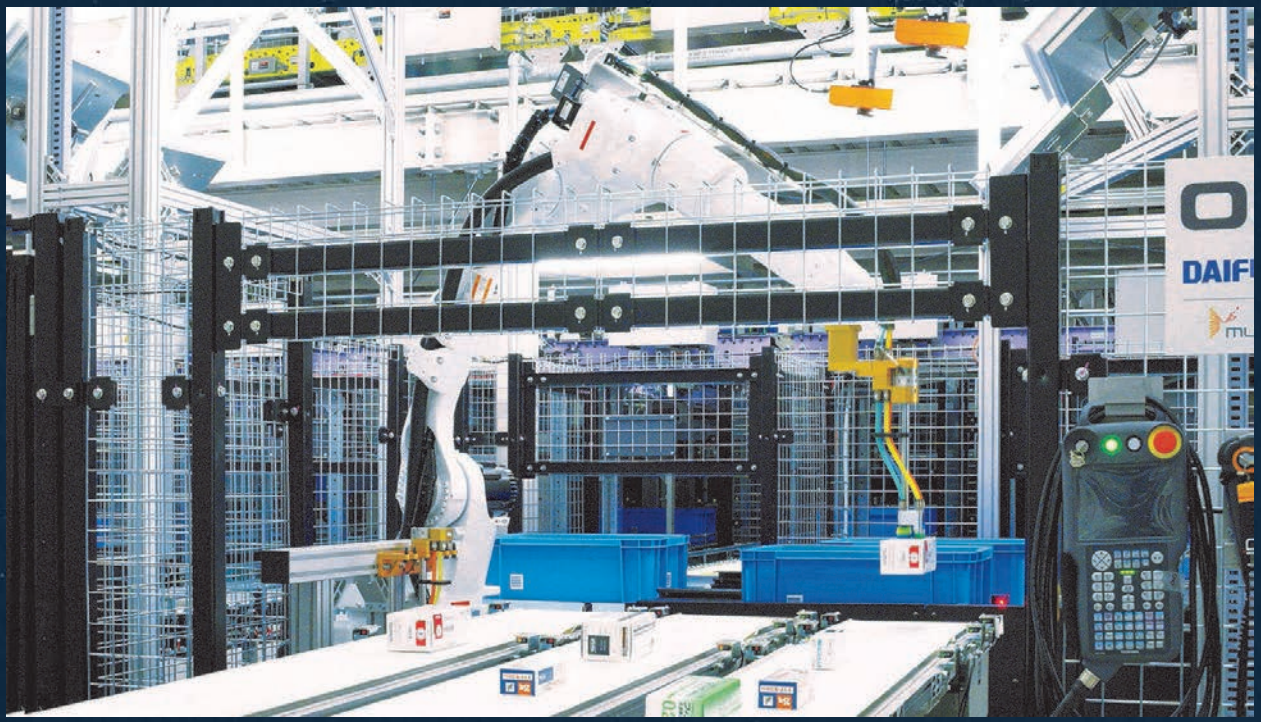
TOHO PHARMACEUTICAL: AUTOMATED DISTRIBUTION AND DISASTER CENTER

In 2020, Toho Pharmaceutical, a leading distributor of healthcare products in Japan, established TBC Dynabase, a highly automated distribution center. The company created TBC Dynabase to enhance its distribution capabilities and ensure a stable supply of pharmaceuticals, even during disasters.

Daifuku, known for providing solutions with 99.99999% shipping accuracy, was selected by Toho Pharmaceutical to automate TBC Dynabase. The end-to-end automation led to significant benefits, including improved shipping accuracy, smooth flow of goods, and the ability to function effectively during any major event. The system facilitates 95% automation of piece-picking operations, with two automated storage and retrieval systems acting as buffers.

The material handling systems, combined with real-time temperature management and an earthquake-isolated building structure, make TBC Dynabase a reliable and secure distribution center for the delivery of essential medicines.

Robots pick individual boxes and deposit them on the conveyor, after which they are consolidated into customer orders.



Taking Action in the Intralogistics Market

The COVID-19 pandemic has accelerated the growth of eCommerce and spurred innovation in multiple industries, leading to new opportunities and greater efficiency. Increased use of laptops, home devices, and smartphones for remote work and online learning caused a rise in demand for products from the semiconductor and display cleanroom industries, which are significant users of automated material handling systems. Conversely, the pandemic has severely hampered the aviation sector through border closures and travel restrictions, which throttled growth-related airport expansions yet spurred automation projects related to security that is done more easily with the reduced load on airports. These unprecedented events impact each industry differently, leaving companies focused on automated material handling while maintaining their presence in diverse business segments. Daifuku has done just that, demonstrating the resilience needed to survive fluctuations in multiple markets.

> The post-pandemic era has forced the global economy to undergo another significant shift, featuring new trends such as nearshoring and diversifying manufacturing locations.

While many key industry players, including Daifuku, Dematic, and Intelligrated, already have manufacturing bases in established markets such as the United States and China, many seek to minimize risks by increasing their manufacturing footprint in more regions, with emerging markets such as Vietnam, Thailand, and Malaysia gaining particular attention for their combination of cost-effectiveness, skilled labor, and proximity to key markets. India, too, is poised to be a key beneficiary of these trends. With a large consumer market and a skilled labor force of more than 450 million, India is well-positioned to capitalize on the changing manufacturing landscape.

With its forward-thinking strategy, Daifuku has already invested in India and is about to set up a second manufacturing facility. The company's early investment in India made it a forerunner among foreign companies and a trailblazer in the Indian market. Similarly, German material handling company Körber has a joint venture with Indian Godrej, a local leader in material handling, to bring in cold chain supply chain solutions for the food and pharma industries' increasing needs. Further, the Indian conveyor company Armstrong announced a partnership with American material handling systems software company Dematic in 2021.

Conclusion

The innovative culture of an automated material handling company is central to its success by allowing it to revamp its old business models and capitalize on the dynamic waves of disruption transforming the industries that depend on material handling automation. Automation prowess across various business sectors and critical geographic markets provides numerous synergies that diversity offers, both technical and from an overall business resilience position. These factors enhance competitiveness. Furthermore, key players in the material handling industry that stay at the forefront of technological advancements and emerging trends will be uniquely positioned to continue to drive growth and future success.

Verifying Solutions While Saving Time with Digital Twin Technology

Complex projects typically require simulation solutions, such as digital twins, to proactively and cost-effectively verify if a proposed solution will meet the stated requirements. Yet digital twin technology is also a powerful tool that can support the execution and maintenance phases of a project.

Understanding Customer Challenges in the Process of Implementing Complex Material Handling Projects

Pre-Implementation	During Implementation	Post-Implementation
• Will the design meet the required throughput? • How do operational changes affect the efficiency of the proposed solution? • Are there any bottlenecks?	• Are the many low-level controller programs all operating correctly? • Are expected communications with the warehouse control system (WCS) being handled properly?	• Is the visualization system accessible to all those who need to use it? • Is the visualization system user-friendly so that warnings and faults are displayed and easily found even for complex layouts?

Complex projects that involve moving, storing, and controlling materials require an end-to-end solutions provider that will enable safe, efficient processes and asset management from system pre-implementation to post-implementation. Digital twin technology is a crucial innovation for complex automated material handling systems and prototyping by helping to test and refine the systems in a controlled environment. Daifuku is a leading company that utilizes its in-house digital twin technology, SYM3, for all complex projects. The company continually develops software to ensure the utmost client support. SYM3 consists of three modules, each dedicated to a specific project phase.

1. Pre-Implementation: The **Simulation module** reflects design solutions to critical customer issues and enables an actual working 3D model of the system.
2. During Implementation: The **Emulation module** allows connections with the actual controllers of the equipment as well as upper-level software (e.g., WCS). Human interaction is also implemented, and all troubleshooting can be done virtually from the desktop using as many loads and operators as needed, allowing pre-testing of all controls and software in the conference room, independent of the actual site readiness.
3. Post-Implementation: The **Visualization module** helps identify defective parts quickly and then orient/scale by a single operator.

Image Source: Daifuku

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