

Redefining Warehouse Efficiency

Best Practices on Automation
Strategies



Biography – Gwynne Richards FCILT

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23 years working for various 3PLs including DHL

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20 years as a logistics consultant, trainer, lecturer and author

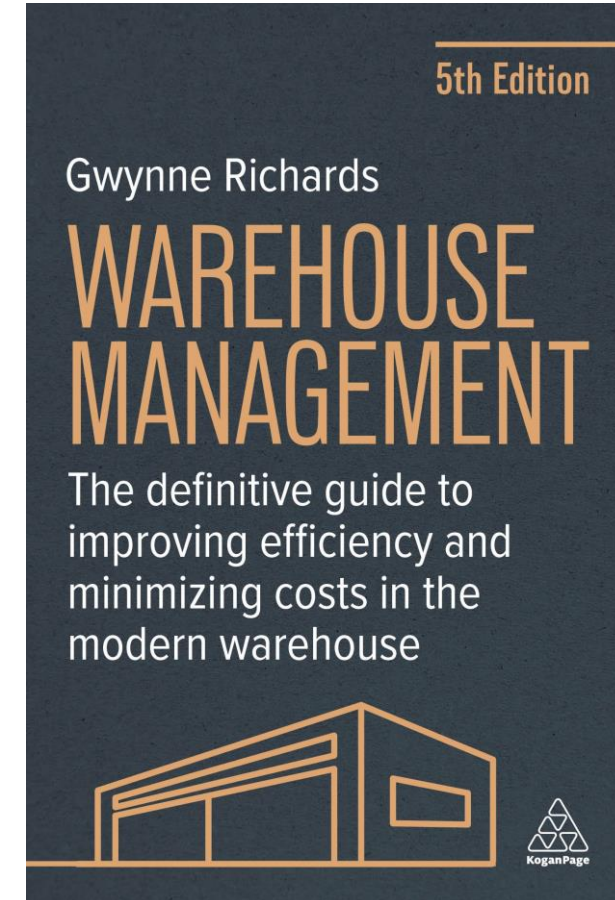
Lecturer at University of Warwick, Singapore Institute of Management, Chulalongkorn University and Hong Kong Polytechnic University

Author of Warehouse Management

Co-author of The Logistics Outsourcing Handbook and The Logistics and Supply Chain Toolkit

Training clients have included BT, Coca-Cola, DRB Hicom, IG Design, Pepsico, Robert Dyas, Tesco, Unipart, Royal Malaysian Airforce

Co-author of the Warehouse Manager CPC, accredited by CILT UK



Agenda

- Session 1 – The Future of Automation
- Session 2 – Navigating the Automation Ecosystem
- Session 3 – Mastering Automation Implementation
- Session 4 – Measuring Success: KPIs and Metrics for Automated Warehouses
- Session 5 – Closing remarks and Key Takeaways

Acronyms

- AGV Automated Guided Vehicle
- AI Artificial Intelligence
- AIDC Automatic Identification and Data Collection
- AMR Autonomous Mobile Robots
- AS/RS Automated Storage and Retrieval System
- B2B Business to Business
- B2C Business to Consumer
- IoT Internet of Things
- M to M Machine to Machine technology
- RaaS Robots as a Service
- RFID Radio Frequency Identification
- VNA Very Narrow Aisle Truck
- WCS Warehouse Control System
- WES Warehouse Execution System
- WMS Warehouse Management System Software

Session One The Future of Warehouse Automation



Introduction - Background

- According to Statista the robotics market will be worth \$73.01bn by 2029
- Revenue is expected to show an annual growth rate (CAGR 2025-2029) of 9.49%
- The digital twin market is expected to be worth \$26.06 billion in 2025
- The global market size in the 'Computer Vision' segment of the artificial intelligence market is estimated to reach 46.96 billion U.S. dollars.
- The global warehouse automation market was valued at over 23 billion U.S. dollars in 2023. It is expected that the market will grow at a CAGR of about 15 percent in the following years and reach the size of 41 billion U.S. dollars in 2027.
- Humanoid Market Development presumed to reach \$38BN by 2035 from c\$37m in 2025

Why is warehouse efficiency even more important today and why is automation and robotics centre stage?

- The growth in e-commerce has reduced order lead times and increased pressure on Warehouse operations to be more efficient, accurate and productive. Not only for B2C but also B2B commerce. Increasing staff numbers will work up to a point but congestion will occur and slow down operations. Also, the more staff, the more likelihood of errors.
- Quick and accurate order fulfilment ensures timely delivery, enhancing customer experience and loyalty.
- Efficient warehouse operations directly impact a company's bottom line.
- Efficient warehouses can better handle fluctuations in demand, seasonal peaks, and unexpected disruptions in supply chains.

How is automation revolutionising warehouse operations?

- Operational efficiency and Enhanced Productivity
 - 24/7 operation
 - Automating repetitive tasks
 - Ability to redeploy staff to more strategic roles
- Increased Accuracy, Real-time Data and Analytics
- Cost reduction
 - Fewer operational staff
 - Fewer errors
- Increased safety
- Ease of deployment - AMRs
- Scalability and Flexibility (RaaS) - Ability to rent as and when required
- Less space required
 - Cost of land is becoming more expensive
 - More warehouses being built closer to urban areas
 - Space savings are achieved primarily through storing SKUs higher and more densely

Artificial Intelligence, Digital Twins and the Internet of Things?

- AI applications include demand forecasting, route optimization, robot autonomy, vision systems for H & S and real-time decision-making.
 - Location determination
 - Ship from locations
 - Warehouse layout
 - Pick location density
 - Streamline workflows
 - Greater flexibility
- Digital Twins will help businesses simulate different scenarios to provide insights without the need to disrupt day-to-day operations.
- Internet of Things/Machine Learning
 - IoT sensors – temperature & humidity monitoring,
 - Connected devices
 - Predictive maintenance
 - Energy efficiency

Artificial Intelligence

Artificial intelligence (AI) is revolutionizing how grocery retailers forecast and plan for the future.

All grocery retailers know the big seasons like Easter or Christmas, but AI could help analyze small, local trends in the future. If, say, tomatoes are trending in a certain area due to a social media influencer, sales could be boosted.

By analyzing vast amounts of data, AI can identify patterns and predict consumer behaviour, enabling retailers (or any other company) to stay a step ahead.

Kai Tuomisaari, VP Corporate Sales at Cimcorp

When and Why to Automate?

- Mike Kosciukiewicz, Head of Supply Chain Development for Boohoo: *"If you continue with a manual operation whilst experiencing a rapid growth in sales, you reach a capacity ceiling that may limit sales growth. Therefore, you must automate to increase capacity and improve efficiency to get more out of the existing building."*
- Knut-Andreas Kran, CEO of ASKO OSLOFJORD AS: *"We wouldn't keep up with growth in our current space without automation, and we see it as an investment in the future."*
- *"Automation is necessary when repetitive tasks consume valuable time that could be spent on higher-value activities."* Anon.
- *"The best time to automate is before inefficiencies start impacting customer satisfaction."* Anon.

"Automation doesn't solve broken workflows—it amplifies them.

We've seen clients pour money into automating tasks that didn't need tech—they needed redesigning. When they finally optimised the process, they automated half as much and got double the results.

Automation isn't the answer. It's the tool you use once you've found the answer". Joshila Makan.

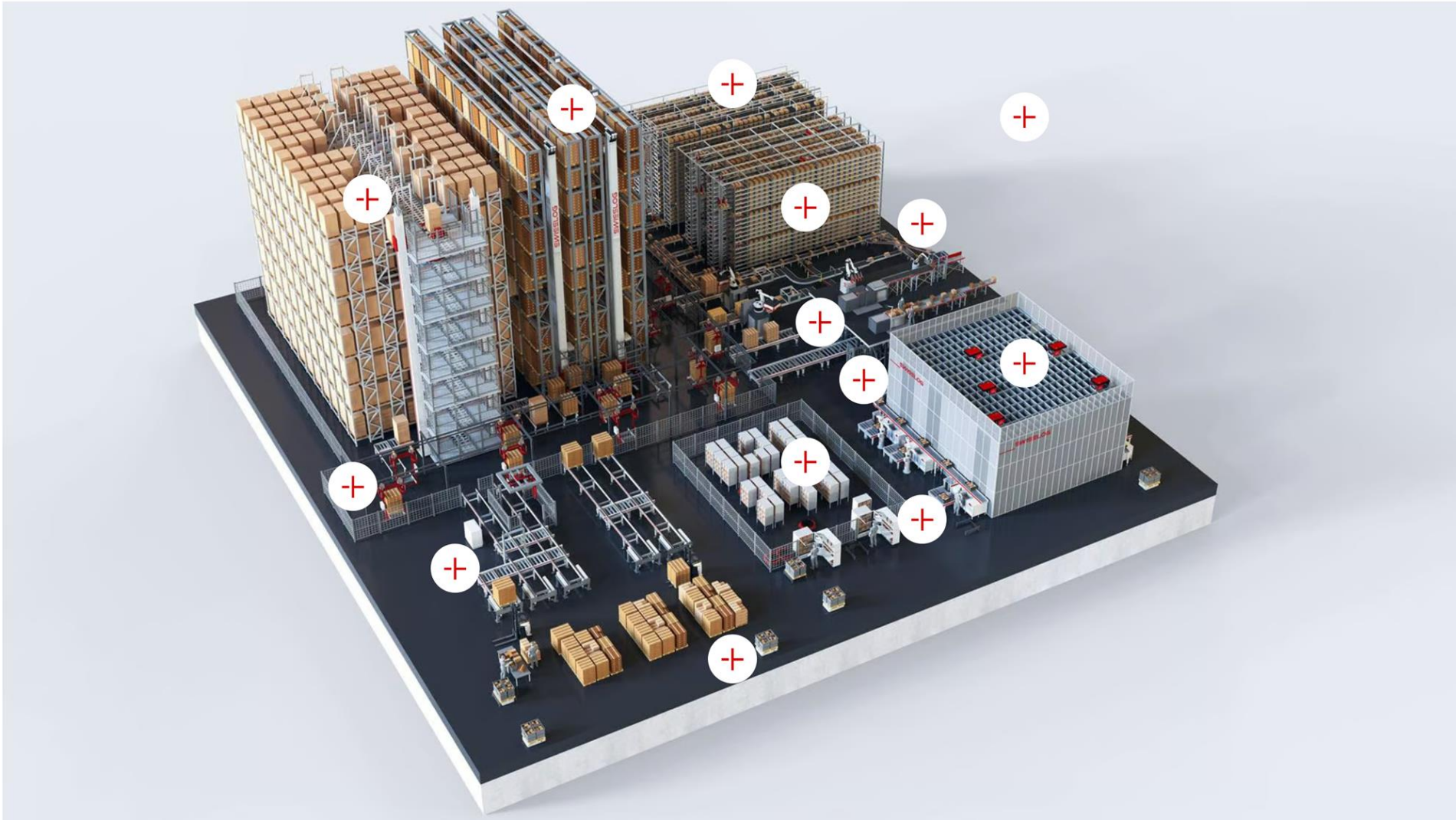
What are the challenges associated with introducing automation?

- Initial investment
- If you're a Logistics Services Provider – short contracts
- IT and power infrastructure
- Variety and size of product lines
- Cost of labour
- Availability of skilled personnel
 - Technicians and engineers
 - Ability to up-skill existing staff

The World Economic Forum (WEF) estimates that 44% of workers' skills will be disrupted in the next five years, and that six in 10 workers will require re-training by 2027. ([weforum.org](https://www.weforum.org)).

Session Two Navigating the Automation Ecosystem

What are the current automated and robotic systems?



Courtesy of Swisslog

HiBay pallet stacker crane

Mini-load system

WMS

Shuttle storage
Pallets

Shuttle storage (totes)

Small conveyor

Robot palletiser

Autostore grid system

Monorail

Pallet Conveyor

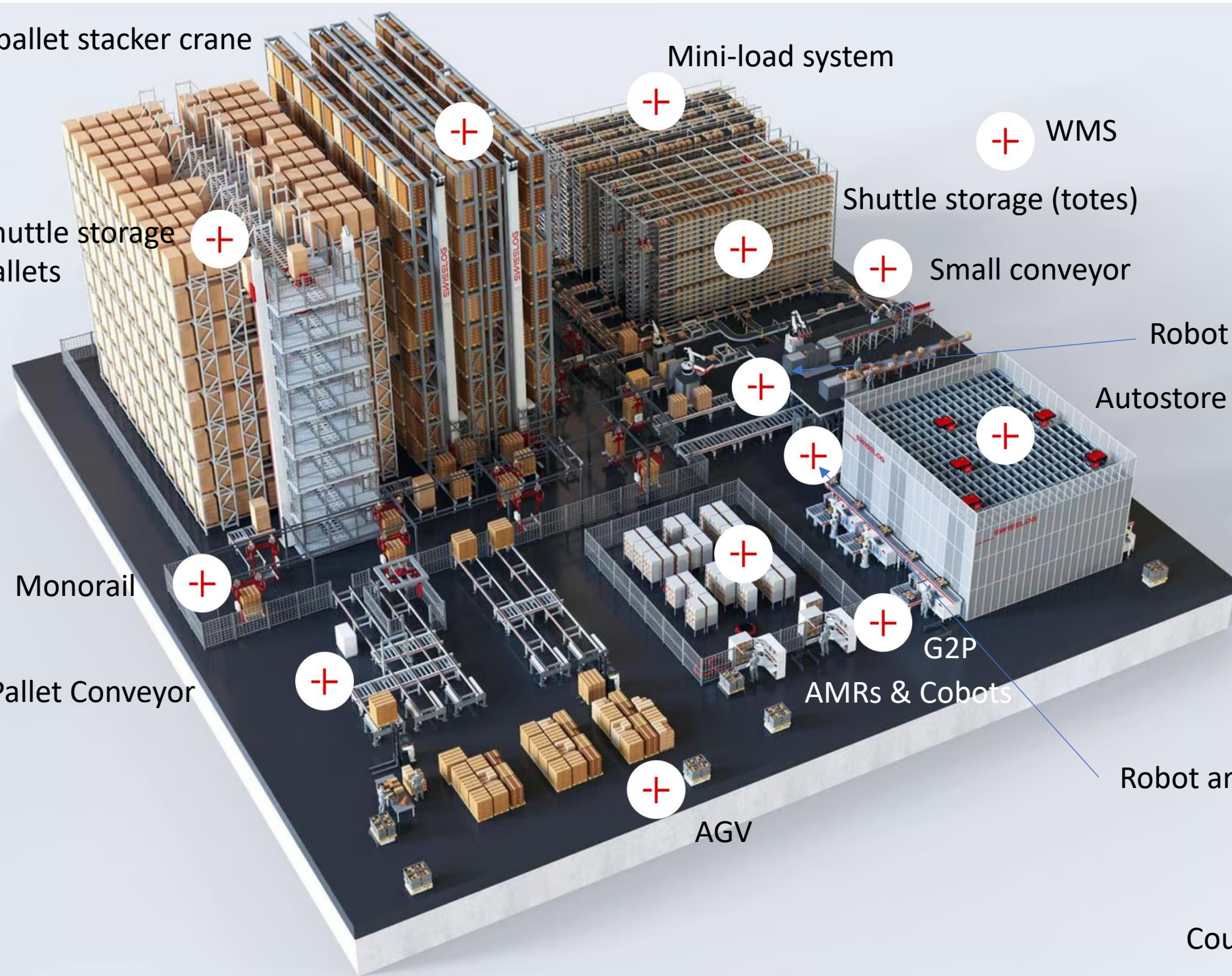
G2P

AMRs & Cobots

Robot arm piece pick

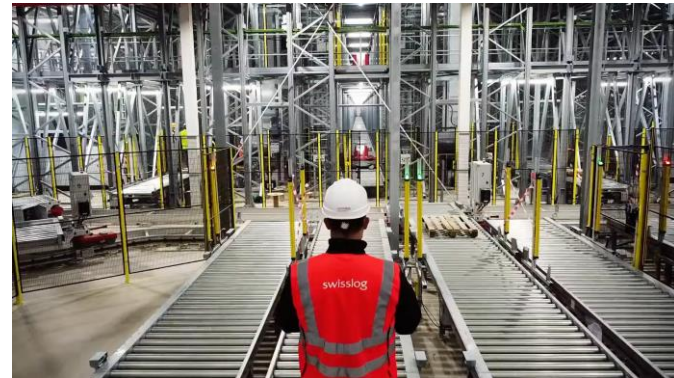
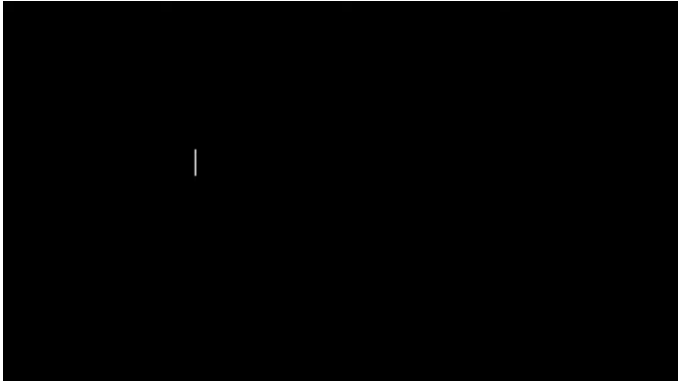
AGV

Courtesy of Swisslog



What are the different solutions on the market?

Example videos



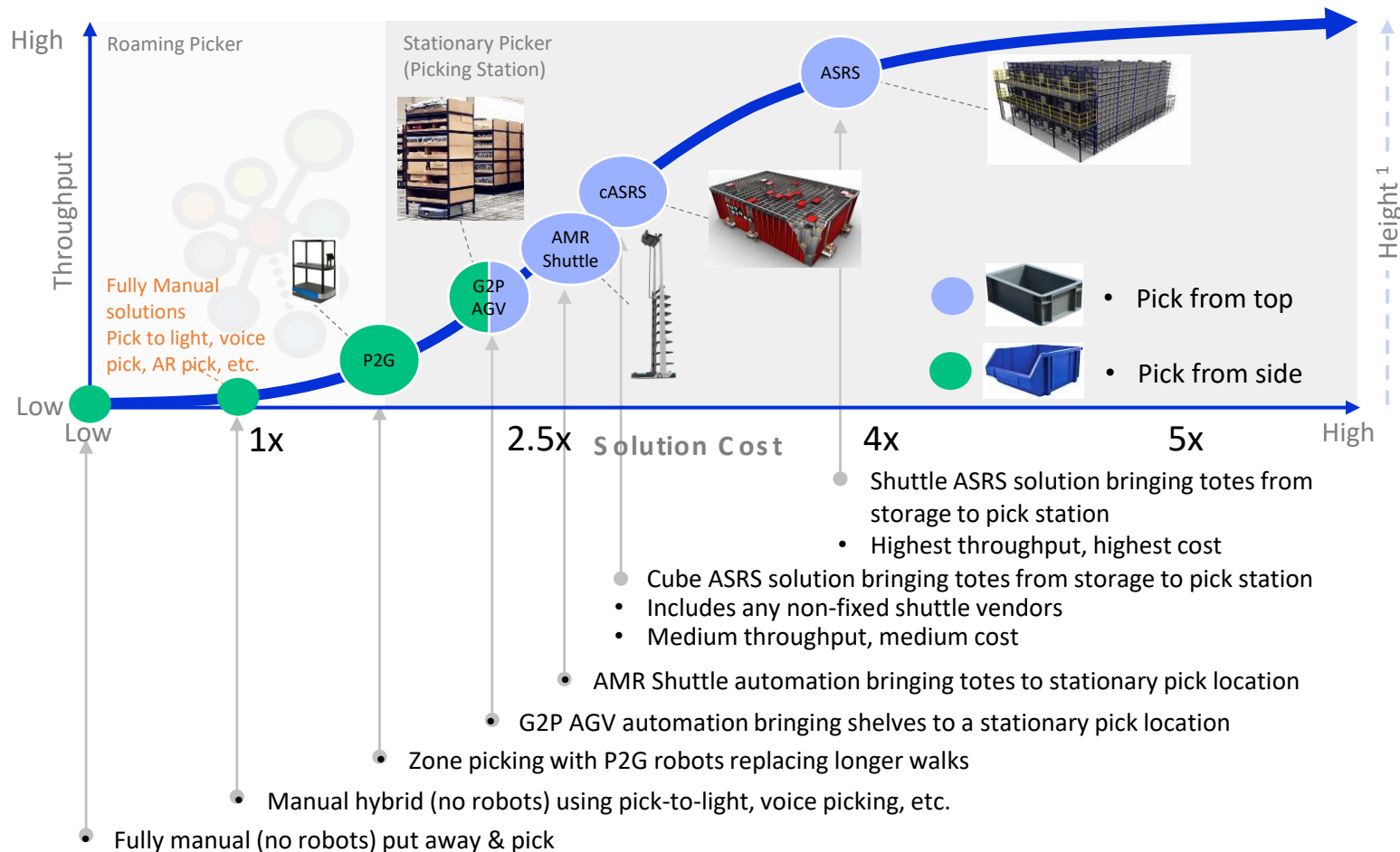
Drones



Verity drones can scan 1,000 RFID tags per second with an accuracy rate of 99.9%
RFID-enabled drones enhance visibility and real-time item tracking beyond traditional gate systems
Technology handles low-priority tasks, ensuring human roles remain safe for now, but the future is uncertain

Each G2P Solution Approaches Storage & Retrieval Processes Differently

HIGHLY SIMPLIFIED E-COMMERCE G2P SOLUTIONS THROUGHPUT VS COST



Source: STIQ Research & Analysis.

Note: Throughput depends on configuration

¹ AMR Shuttles exist that can store & pick from up to 8m height and G2P AGV solutions are increasing in height management

What are the alternative strategies for enhancing warehouse efficiency?

Alternative technologies

- Voice picking
- Vision picking
- Scanning and Radio Frequency Identification (RFID).
- Pick and Put to Light
- Carousels



Producing a successful Business Case for Automation

- Analyse current situation and define objectives
 - Identify the pain points within the business
 - Conduct a detailed assessment of current processes.
 - Quantify metrics – processing times, error rates, costs
- Propose the solution
 - Explain how the proposed solution will address the identified issues and align with company goals
 - Gain stakeholder buy-in, address concerns and emphasize long term value
- Quantify the benefits
 - Productivity gains
 - Cost savings
 - Revenue growth through customer satisfaction
- Estimate costs
 - Software, hardware, training, maintenance, *initial reduction in productivity*

Producing a successful Business Case for Automation (cont'd)

- Calculate Return on investment and Payback period
 - $(\text{Gain from investment (or savings made)} - \text{cost of investment}) \div \text{Cost of investment} \times 100$
 - $\text{Cost of Investment} \div \text{gains from investment or savings made} \times 12 \text{ months}$
- Identify the risks
 - Identify potential challenges such as implementation complexity, integration issues, employee resistance, or upfront investment concerns.
 - Propose mitigation strategies, such as phased rollouts or training programs.
- Provide case studies
 - Identify success stories or industry benchmarks to validate your proposal.
 - Highlight competitors or market leaders who have successfully implemented similar technologies.
- Produce an Implementation Plan
 - Create a step-by-step timeline for deploying automation.
 - Include key milestones, resource requirements, and responsible teams.

ROI example

| | Without automation | With automation |
|-------------------------------|--------------------|-----------------|
| Lines per annum | 1,500,000 | 1,500,000 |
| Accuracy | 98% | 99.50% |
| Errors per annum (%) | 2% | 0.50% |
| Errors per annum (no.) | 30000 | 7500 |
| Error reduction per annum | | 22500 |
| Cost per error | \$59.00 | \$59.00 |
| Cost of pick errors per annum | \$1,770,000.00 | \$442,500.00 |
| Overall cost saving | | \$1,327,500.00 |

- Cost per pick
- Reputational damage
- Increased returns
- Loss of repeat purchases/customers

Payback Period Example

During a recent voice picking trial a client calculated that their ROI, by replacing barcode scanning for picking was approximately 25.4% in the first year with a payback period of nine and a half months.

The cost of the system was £68,900 and the potential savings were £86,400 in terms of productivity and accuracy.

Therefore $(£86,400 - £68,900) / £68,900 = 25.4\%$

Payback period = $£68,900 / £86,400 \times 12 \text{ months} = 9.6 \text{ months}$

This isn't a totally accurate picture as no account was taken of the extra training costs, effect on the business during the early stages of implementation etc.

However, this does give the company a reasonably accurate picture of the potential ROI.

Case study examples



GWC became the first company in the Middle East to adopt Dexory's cutting-edge technology, showcasing their commitment to upscaling technological advancements in the logistics industry. The solution's scalability, reliability, and strong focus on safety align perfectly with GWC's strategic goals of enhancing operational efficiency and ensuring customer satisfaction.

Using advanced digital twin technology, Dexory captures real-time data through autonomous robots equipped with high-definition cameras and sensors. The robots navigate warehouses autonomously to generate detailed 3D scans of racks, pallets, and products. The captured data is fed into DexoryView platform to create real-time digital models, enabling warehouse managers to visualise inventory, detect discrepancies, and validate information seamlessly.

Dexory's platform enhances GWC's operations in several key ways:

1. Improved efficiency: Rapid inventory tracking and management reduce operational downtime.
2. Cost optimisation: Streamlined processes lead to significant cost savings.
3. Accuracy and visibility: GWC achieves an impressive 99% accuracy in tracking and identifying inventory.

Case study examples



DHL USA Collaborative Robots

“Before the introduction of the LocusBot it was cart picking and we were picking around 70-80 units per hour, now with Locus we are typically up to 150-180 UPH. The LocusBot gives the picker the location number, the SKU number, the lot number and the quantity required. That’s all displayed on the [touchscreen] so it’s very easy for them to find the product, verify, confirm the quantity and then it’s gone”.

We are seeing an 80% reduction in training times which is really good for an e-commerce and retail operation because when you have peak seasons you can train your associates faster and make sure they are productive faster.

We are seeing a reduction in cycle times of 50% for our e-commerce and retailers’ operations. We have seen a productivity improvement by up to 200% which allows us to keep the same headcount, but process double the volume.

Business Intelligence within the system can recognize when the robots need recharging or identify associate picking rates. It can also identify which goods are in high demand and ensure sufficient robots are in operation to safeguard cut-off times. Operators are also able to plan ahead with confidence by determining when peak periods are likely to occur and what goods are likely to be in high demand.

Case study examples

After only two years, Elektroimportøren, reached ROI on its AutoStore system from Element Logic.

Elektroimportøren is a supplier of all electrical equipment for B2B and B2C segments. The company has experienced large growth in recent years with the turnover increasing from 20 million to 100 million Euros in only six years.

With this impressive growth, it became evident that there was a need for a new warehouse and the streamlining of existing processes. They decided to build a new warehouse and to automate with an AutoStore system delivered by Element Logic.

Two years later the company had made a return on its investment. “We focused on our expenses and worked to not increase them parallel to our turnover,” André Swensen, Logistics Director at Elektroimportøren, said.

Session 3 Mastering Automation Implementation

Automation Implementation Steps

SOLUTION DESIGN

- Sophisticated 3D robot simulation software to help develop lower risk solutions
- 3D Visualisation of space and layout
- Cycle time/throughput analysis
- Choke point identification and resolution
- Reach Analysis
- Collision detection
- Access Checking

How to ensure Project Success

- Business Case, Governance and Planning
 - Solid business case presented to the Board mid 2021
 - Active sponsorship from the Chairman, CEO and board
 - Positive project ownership and support from the wider business.
 - Investment in project management with external expertise in warehouse automation.
 - A fully documented project plan with individual workstream deliverables.
- Project momentum, communication and adherence to legal requirements
 - A highly motivated project team.
 - Flexible and cooperative warehouse colleagues.
 - Realistic project planning timelines
 - Regular communications on progress to the wider business.
- Systems integration, testing, business process re-engineering, and transition management
 - Detailed product modelling focused on master data, seasonality and sales forecasts.
 - Alignment of business process re-engineering and IT development.
 - Rigorous testing prior to 'go live' followed by issue resolution support.

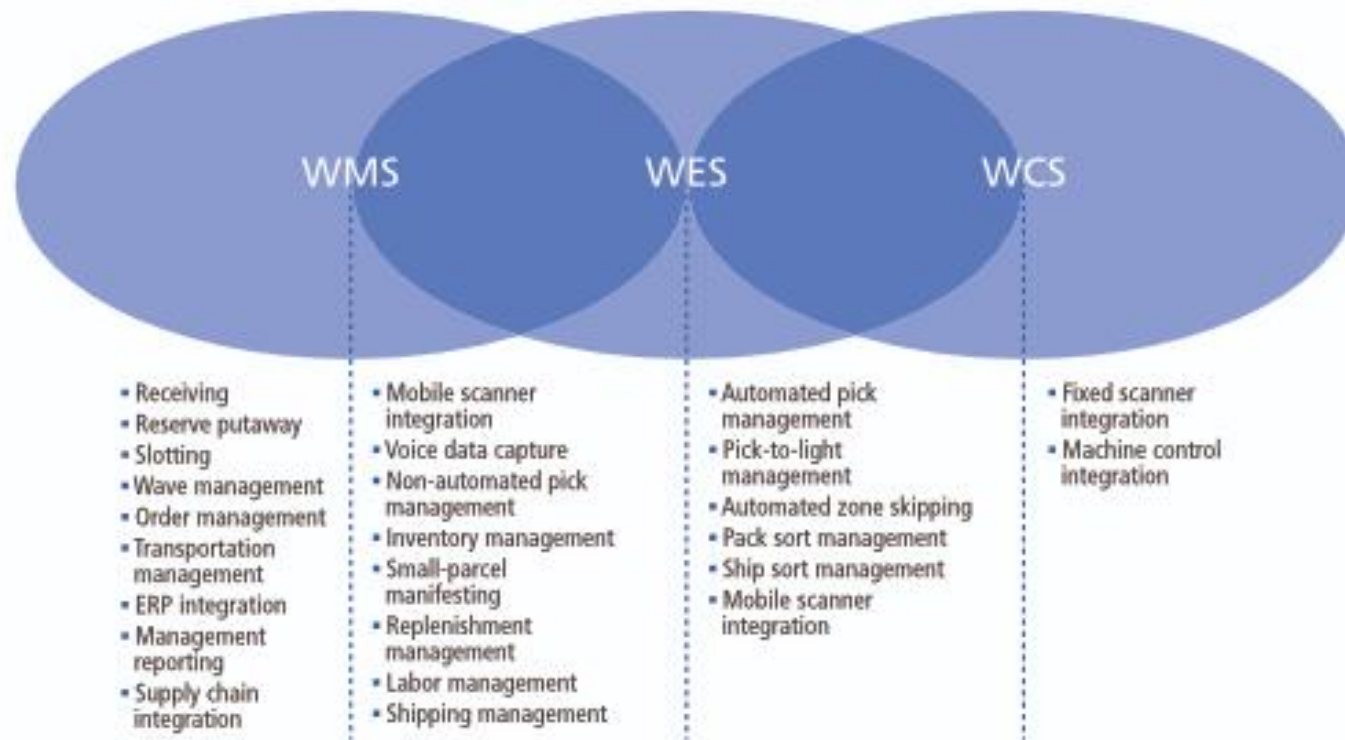
Session 4 Measuring success – KPIs and metrics



Typical KPI

- **Productivity & Efficiency**
 - OTIF – On Time In Full
 - Throughput per order (No. of units/lines/orders)
 - Order Cycle time
 - Dock to stock time
- **Accuracy & Quality**
 - Order accuracy
 - Inventory accuracy
- **Cost & ROI**
 - Labour cost savings
 - Cost per order despatched
 - ROI
- **System Reliability and Maintenance**
 - Downtime %
 - Mean time between failures (MTBF)
 - Mean time to repair
- **Health and Safety**
 - Lost time through injury
- **Customer satisfaction**
 - Returns rate
 - Customer satisfaction score

Comparison of Warehouse Management, Warehouse Execution and Warehouse Control Systems.



WHEN IT COMES TO FUNCTIONALITY AND CAPABILITIES, THERE'S SIGNIFICANT OVERLAP BETWEEN THE TASKS HANDLED BY WAREHOUSE MANAGEMENT SYSTEMS (WMS), WAREHOUSE EXECUTION SYSTEMS (WES), AND WAREHOUSE CONTROL SYSTEMS (WCS).

The role of System Integrators & Consultants

System Integrators

Unlike dealing with many automation suppliers system integrators such as L-A-C have a wide portfolio of technology solutions they can call upon. Some system integrators will have their own equipment and will also source and integrate additional 3rd party technology to provide the optimum solution for customer needs.

System Integrators continue to support customers by providing solutions which flex and adapt as their business grows or diversifies, in both the short and long term. Solutions are also designed to integrate seamlessly with legacy hardware and software systems, ensuring a smooth transition with minimal impact on existing operations. This also includes long-term support & aftercare.

With continuous advancements in automation technology, an effective system integrator needs to combine key design skills with the delivery of automation solutions that utilise the most appropriate hardware and software systems, to provide the best possible efficiencies, with favourable ROI.

If companies do not have the expertise in-house to gather all of the data required by automation suppliers, it can be prudent to use the services of a Consultancy company to assist in this process.

Closing remarks and Key Takeaways

Introducing automation and robotics into warehouse operations is no longer a futuristic vision but a practical solution for optimizing efficiency, productivity, and safety.

The integration of robotics can provide warehouse operators with a competitive edge in today's dynamic market.

While the implementation of these technologies presents challenges, the long-term benefits far outweigh the drawbacks.

As technology continues to advance, warehouses of the future will become even more automated, paving the way for faster, more reliable, and more sustainable supply chain operations.



Key Takeaways

- Ensure your processes are working efficiently before contemplating introducing automation.
- Seek advice
- Get buy in from the Board
- Gather and validate data
- Calculate ROI
- Choose equipment and vendors carefully
- Test, Test, Test
- Measure performance regularly

N.B. Automation isn't for everyone!!