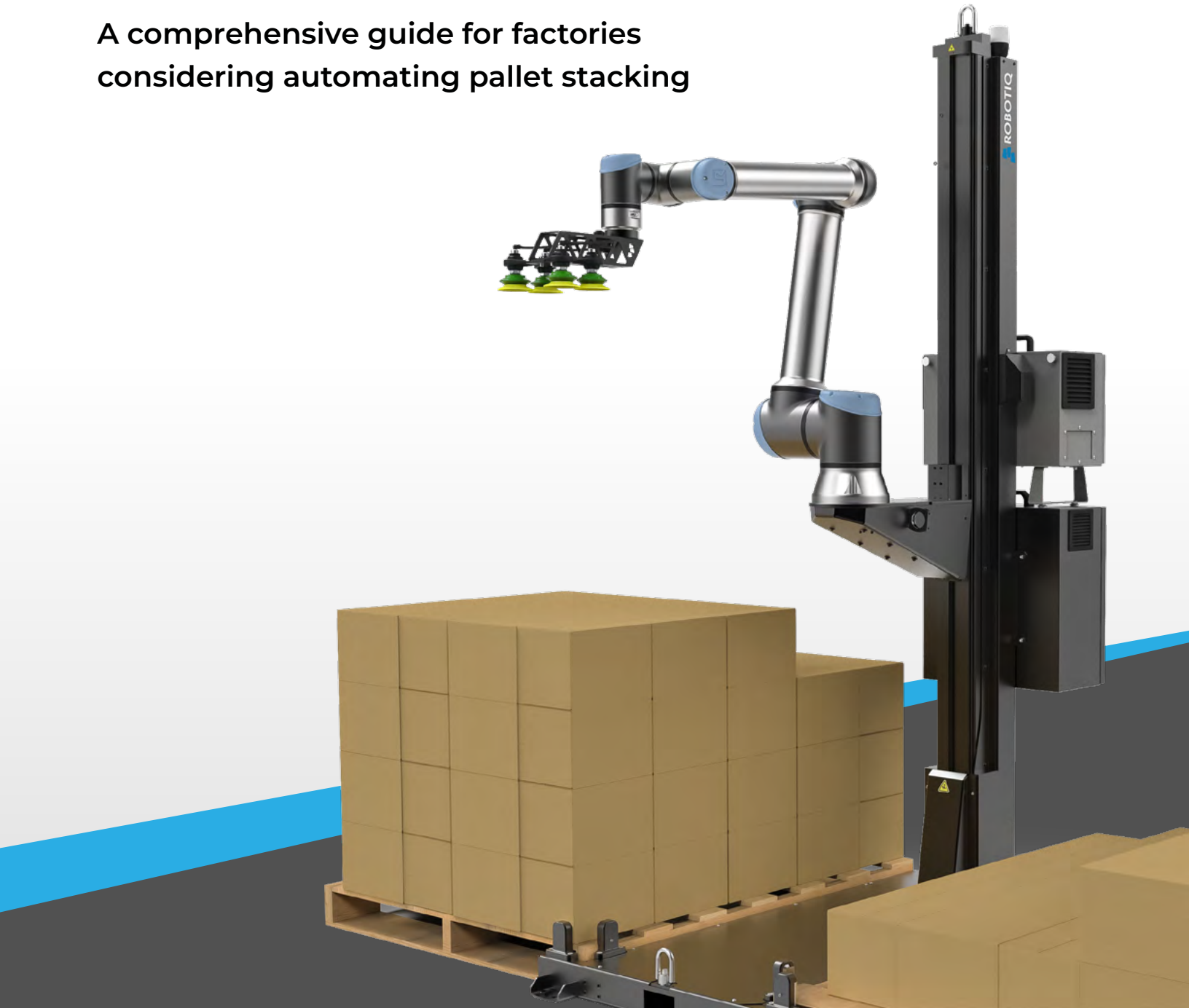
ROBOTIQ

The Automated Palletizing Buyer's Guide

A comprehensive guide for factories considering automating pallet stacking



Chances are that selecting an automated palletizing solution is not something you do regularly. Perhaps this level of investment is new for your business. Or maybe you are getting confused with the myriad of solutions and claims out there, and you need an organized way to make sense of it all.

Then this guide is for you!

We're pleased to offer you a structured decision-making process for selecting a palletizing solution. In this guide, we draw upon our years of experience to create a step-by-step process and the tools necessary to enable your decision. This process covers specifications, options, and solutions that you should explore during your research to arrive at the right decision for you and your company.

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01 Words from our CEO you can't afford to skip

Over 90% of the world's goods rely on pallet transportation, making your palletizing process more crucial than ever. Your palletizing stations are the lifeline connecting your goods to your customers. However, our industry faces challenges, including high job turnover rates of up to 50% and a projected labor deficit of over 10% by 2030.

The scarcity of available labor, especially affecting palletizing stations, is such a tough challenge businesses are grappling with today and won't resolve itself anytime soon. Wasting monotonous, laborious, and hazardous non-value-added work on scarce labor is not an effective strategy; it's a counterproductive management approach.

In this new reality, investing in an automated palletizing solution is a ***strategic imperative***. By integrating automated palletizing solutions into your end-of-line processes, you unlock a future where empowered individuals work alongside advanced automation, enhancing productivity and fostering adaptability. Moreover, studies reveal that 74% of warehouse workers prefer employers providing modern devices like robots to enhance their tasks.

At Robotiq, a pioneering force in collaborative robotics, we've empowered robotic arms with purpose and efficiency. Our LEAN ROBOTICS methodology, recognized worldwide, is instrumental in seamlessly transforming how work is done, from machine feeding to assembly, and from picking to packing.

By having assisted tens of thousands of manufacturers in their automation journey, we stand as your experienced partner in addressing your toughest production and logistics challenges.

"I wish I'd read Lean Robotics earlier. We've learned to start simple, get small wins, and stop over-complicating things. This book is our bible now."

- Craig Zoberis, CEO, Fusion OEM

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This buyer guide isn't a mere product pitch; it's a knowledge-sharing resource. We're dedicated to helping you find the best automated palletizing solution for your operations, even if it's not with us. Our goal is to provide insights for you and your team to assess various options and pinpoint what's essential for your success.

If our solution aligns with your needs, our team is ready to make your project a success. If not, we're happy to have assisted you in making the right choice, avoiding wasted time on an ill-fitting solution.

Now is the opportune moment to transform and modernize this vital business function, given the challenges we face.

Time to embrace a future defined by operational excellence & agility, focusing on People, Productivity, and Adaptability.

Join us in adopting the LEAN ROBOTICS methodology, guiding us through the Design, Integration, and Operation steps, toward practical yet groundbreaking factory and warehouse solutions.

Warm regards,

Sam Bouchard CEO, Robotiq
Author, LEAN ROBOTICS

PEOPLE
PRODUCTIVITY
ADAPTABILITY

LEAN **ROBOTICS**

DESIGN
INTEGRATE
OPERATE

02 Automating palletizing is a strategic imperative

Today companies face many challenges, including persistent job vacancies, supply chain instability, and evolving consumer behaviors. The aftermath of the pandemic changed commercial behaviors and affected labor availability. This left the manufacturing sector struggling with low job retention and fill rates. It is no surprise that people are not interested in repetitive, low-skill jobs. Automation, particularly in injury-prone tasks like palletizing, is an indispensable solution for any business.

The consumer expects a customized product experience. This requires businesses to shift away from high-volume, low-mix (HVLM) manufacturing. In addition to product demand changes, consumers are more conscious of their environmental impact and expect packaging to change to eco-friendly options. These changes in consumer demand are happening more frequently. Businesses are now looking for flexible automation options to meet those changes.

However, the market for automated palletizing solutions is fragmented, and navigating the myriad of information available can be confusing. This guide and comprehensive tools were developed to help anyone considering palletizing automation.

This Buyers Guide is a top-down approach to selecting the right palletizing solution for a business. Before jumping into a technical review of specific products or solutions, it is essential to document the strategic needs of the business. The process starts with the **Strategic Imperative Framework**, a high-level outline of the business challenges and opportunities.

The Strategic Imperative Framework

The **Strategic Imperative Framework** stems from the Lean Robotics methodology whose purpose is to:

LEAN ROBOTICS

*EMPOWER **PEOPLE**, BOOST **PRODUCTIVITY**, AND FOSTER **ADAPTABILITY** ON THE FACTORY FLOOR*

*MAXIMIZE AUTOMATION IMPACT THROUGH EFFICIENT DEPLOYMENT PHASED IN **DESIGN**, **INTEGRATE**, & **OPERATE**.*

WHY

PEOPLE

Having a focus on **People** creates a work environment that values safety, job satisfaction, and growth opportunities. This approach not only improves your operational efficiency and product quality but also builds a more resilient and satisfied workforce, ready to meet the challenges of today and tomorrow.

PRODUCTIVITY

Enhancing **Productivity** is fundamental to bridging the gap between production efficiency and customer satisfaction, directly impacting profitability and brand image. Streamlining operations eliminates manual bottlenecks, significantly boosting throughput while maintaining product consistency.

ADAPTABILITY

Adaptability is key to meeting customer needs and grabbing new opportunities. This means being ready to handle different product sizes or orders without big delays or needing outside help. It also means being able to grow your operations when demand spikes, making sure your investments pay off quickly. By focusing on being adaptable, businesses can stay competitive and see real benefits to their bottom line, ready for whatever comes next.

LEAN **ROBOTICS**

HOW

DESIGN

When considering a solution **Design**, focus on modular and configurable elements that cater to common operational needs, avoiding the complexities and costs of custom engineering. This approach not only facilitates a smoother transition to automation but also future-proofs your operations, allowing for easy adjustments as your business grows and market demands evolve. Emphasizing adaptability, efficiency, and ease of use in design will position your business for sustainable success and agility in a rapidly changing landscape.

INTEGRATE

Integrate solutions by focusing on quick deployment, leveraging standardized, modular designs that can be installed and operational within days, not weeks. Choose systems that complement your current processes and layout, avoiding solutions that necessitate extensive modifications or could introduce bottlenecks.

OPERATE

Choosing to **Operate** a reliable and adaptable solution with a proven global track record is key. This approach maintains operational control, ensuring your team can manage and adapt the system without becoming overly reliant on external support, thus avoiding replacing one form of dependency with another.

The goal of the **Strategic Imperative Framework** is to provide an understanding of those key strategic factors that decision-makers need to consider in the selection process.

This Framework is designed to be a thought-provoking process. It should be completed by a group of stakeholders as opposed to a single person. A group of 3-5 people covering the different aspects of automating that task (process, engineering, maintenance, people, finance) will ensure that all elements are considered during the evaluation and that a decision gets made.

To simplify the Framework, the table on the next page summarizes the subsection within each category.

How important are these?

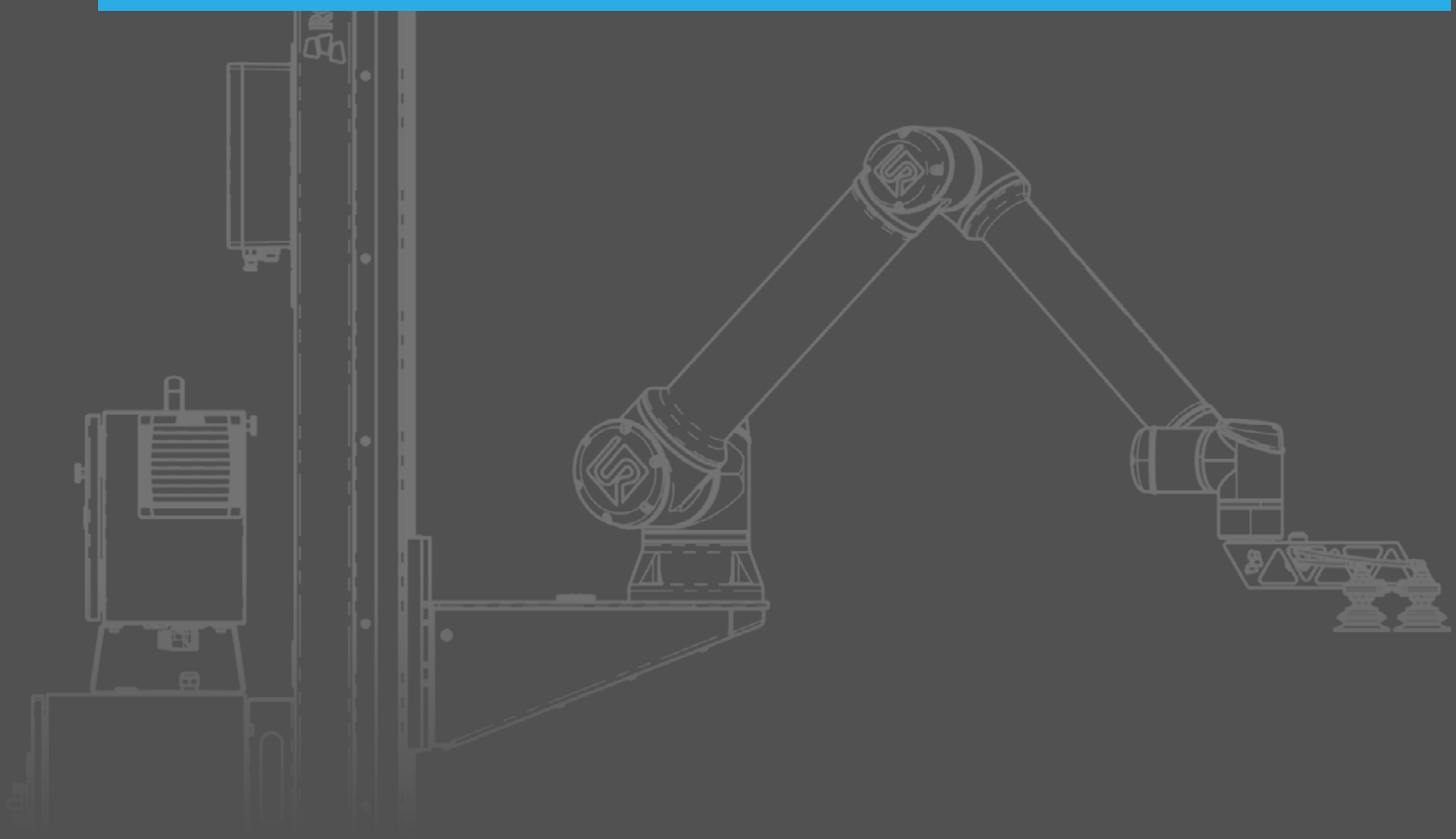
PEOPLE	**Health & safety**	Increase palletizing safety and reduce health risks.
	Labor availability	Reduce dependency on manual labor for hard-to-fill roles.
	Employee engagement	Increase employee growth and retention.
PRODUCTIVITY	**Efficiency & throughput**	Increase throughput and prevent bottlenecks.
	Consistency	Increase pallet integrity and consistency.
ADAPTABILITY	**Continuity**	Reduce downtime and reduce dependency on a few operators.
	Flexibility	Meet cycle-time needs of the value stream in real time; reduce changeover time and complexity.
	Scalability	Manage fluctuating demands, react to growth, and meet ROI.
DESIGN	**Pre-engineered precision**	Reduce design costs, prevent scope creep, and reduce risks associated with custom-engineered designs.
	Maximized performance	Maximize payload and pick rate. Decrease footprint.
	Turnkey solution	Reduce selection and installation complexity.
INTEGRATE	**Fast installation**	Reduce system install and training time.
	Factory fit	Minimize impact to factory layout; minimize rearranging upstream and downstream operations.
OPERATE	**Reliability**	Increase production uptime and reduce unplanned downtime.
	Control	Maintain control of product handling, increase software useability, and modify programs autonomously.

Considering the business challenges to solve with automated palletizing, this chart can be used to score the importance of each element from 1 (Highest Priority) to 5 (Lowest Priority). It will be used as a reference throughout the selection process.

Spending time at this step is encouraged to align the decision process in the right strategic direction. Once completed and memorized, the Strategic Imperative Framework will be put aside (temporarily). The next chapter presents the different solution categories available on the market that factories may encounter in their search for solutions. The business priority and solution landscape will then come together in later chapters.

NOTE :

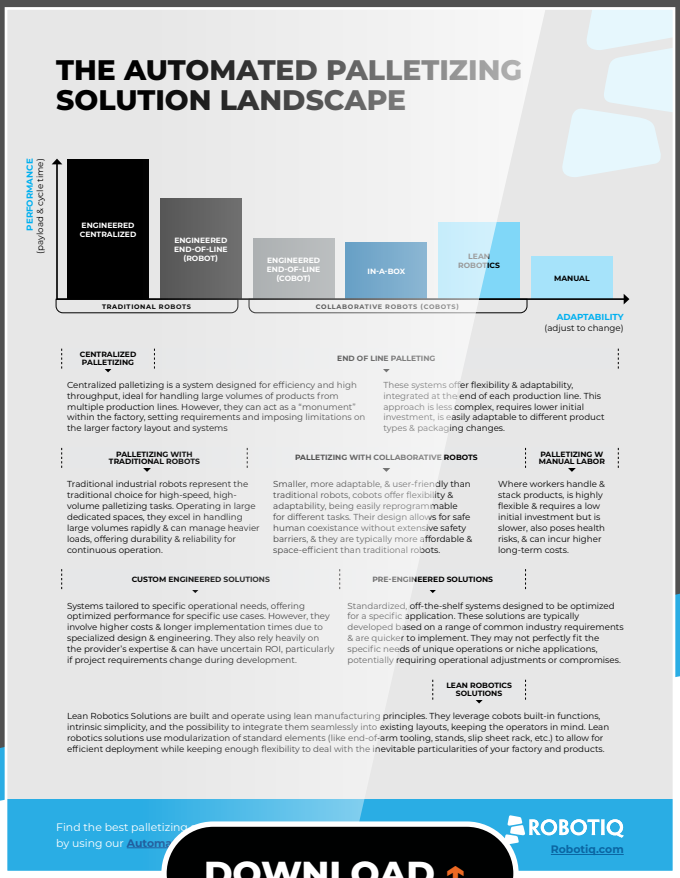
A low ranking does not indicate an indifference to a particular element. While all elements are important, some businesses may need the palletizer to provide solutions in a particular category. For example, if a business has a robust Environment, Health, and Safety (EHS) program and ranks Health & Safety a 5 (least important), they have confidence in their EHS infrastructure and do not need the palletizing option to solve a Health & Safety risk. Alternatively, if a business ranks this as a 1 (most important), this business is indicating a current risk that the palletizing solution needs to mitigate.

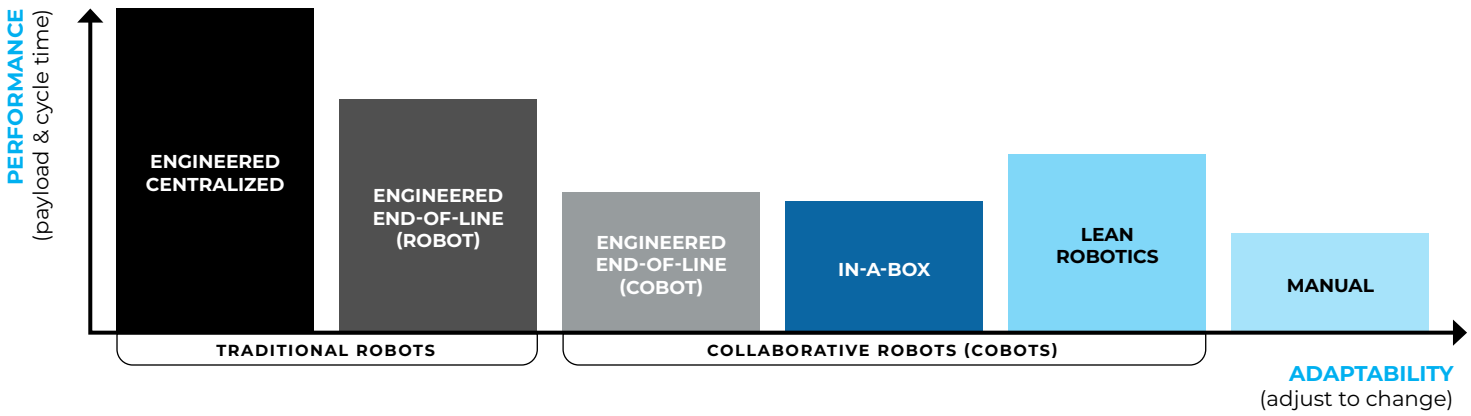


03 Discovering the palletizing solution landscape

A critical step is understanding what is available in the market today. Selecting an option without considering the landscape of available solutions may eliminate viable options. It is important to undertake this step before delving into any one solution. This chapter will provide an organized overview of solution categories to jumpstart the research process.

Solution categories start at “Engineered Centralized" (a fenced-off, large-scale traditional robot) to “Manual Palletizing”. As one would expect, the categories in the middle are more nuanced. This chapter will touch on those differences.





Zero-sum automation: Is there a clear win with automation?

The vast majority of investments in palletizing are aimed at eliminating the reliance on manual labor for this repetitive, strained, and ergonomically unfriendly work. As seen in the graph below, manual palletizing provides the highest level of adaptability (assuming that labor scarcity is not a constraint).

However, the tradeoff is that the fully-automation choice, while eliminating the reliance on unskilled manual labor, will create a new reliance on highly-skilled labor. Instead of solving the labor shortage problem, it exchanges one shortage for another.

This is the zero-sum automation trade-off: eliminating the reliance on manual labor results in reliance on highly-skilled labor.

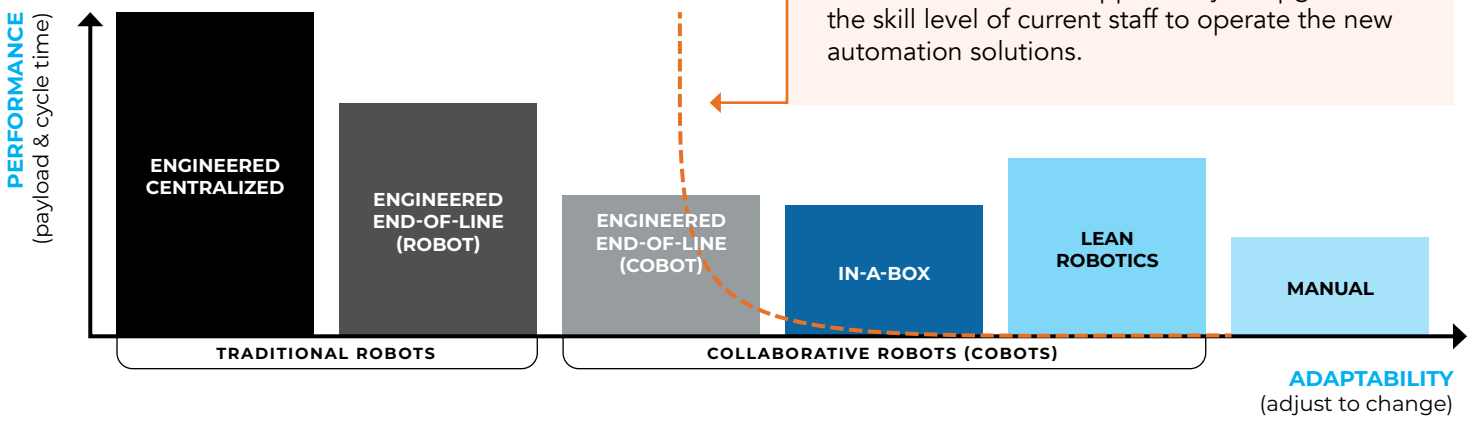
However, a palletizing automation decision does not have to be subject to the zero-sum automation trade-off, nor does it have to be a choice between productivity and adaptability.

The graphic also includes a zero-sum automation curve, represented by the dotted line.

The two categories on the left side are the most likely to experience the zero-sum automation tradeoff, meaning that they require specialized skilled automation labor either in-house or sourced externally. People with these skills are in high demand and may draw companies into a challenge of scarcity and high turnover, within the staff and with external service providers.

Categories on the right side of the curve offer the opportunity to upgrade the skill level of current staff to operate the new automation solutions.

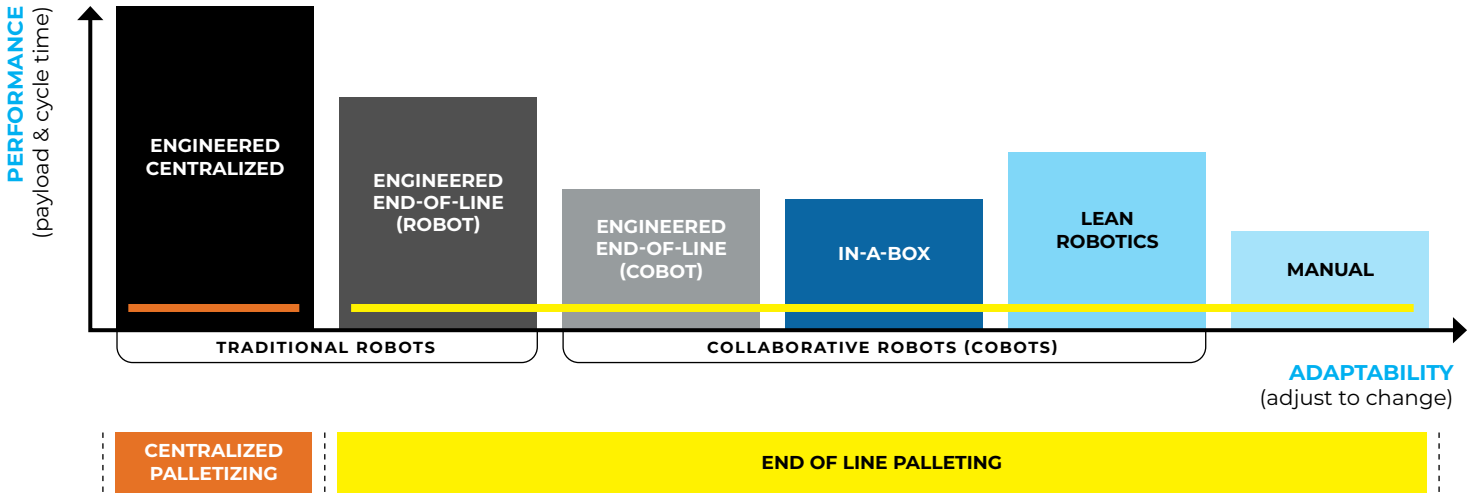
Zero-Sum Automation Curve: The chosen solution may eliminate the reliance on manual labor but can create a new reliance on automation labor, which presents a challenge of a whole different category. This is referred to as zero-sum automation, where you win on one side to lose on the other. Categories on the right side of the curve offer the opportunity to upgrade the skill level of current staff to operate the new automation solutions.



The palletizing landscape can be explained by defining and comparing the following characteristics:

1. **Centralized vs End-Of-Line palletizing**
2. **Palletizing with traditional robots, collaborative robots, or manual labor**
3. **Custom Engineered vs Pre-Engineered palletizing solutions**
4. **Lean Robotics solutions**

Centralized vs End-Of-Line palletizing



CENTRALIZED PALLETIZING

Centralized Palletizing systems stand out for their ability to handle large volumes and high payload at high speeds from multiple production lines. Various lines of conveyors are routed to a central location where the palletizer works. These systems are strategically placed to manage large volumes of standard products (i.e. soft drink bottling), with high speed and precision. However, they come with significant initial investment costs. Centralized palletizers can act as a "monument" within the factory, setting requirements and imposing limitations on the larger factory layout and systems. This can dictate the flow of production and restrict future modifications or expansions of the facility. Their complexity necessitates highly skilled staff for operation and maintenance. Being a single system, they risk entire production line disruptions due to malfunctions.

END-OF-LINE PALLETIZING

End-Of-Line Palletizing systems offer flexibility, adaptability, and scalability. These systems are integrated at the end of each production line. This approach is less complex, requires lower initial investment, and is adaptable. While offering direct control and easier adjustments, these systems have lower throughput efficiency compared to centralized systems. These systems can lead to equipment redundancy in facilities with multiple similar lines and require additional space, impacting overall floor space efficiency.

When choosing between systems, manufacturers must consider their needs and constraints.

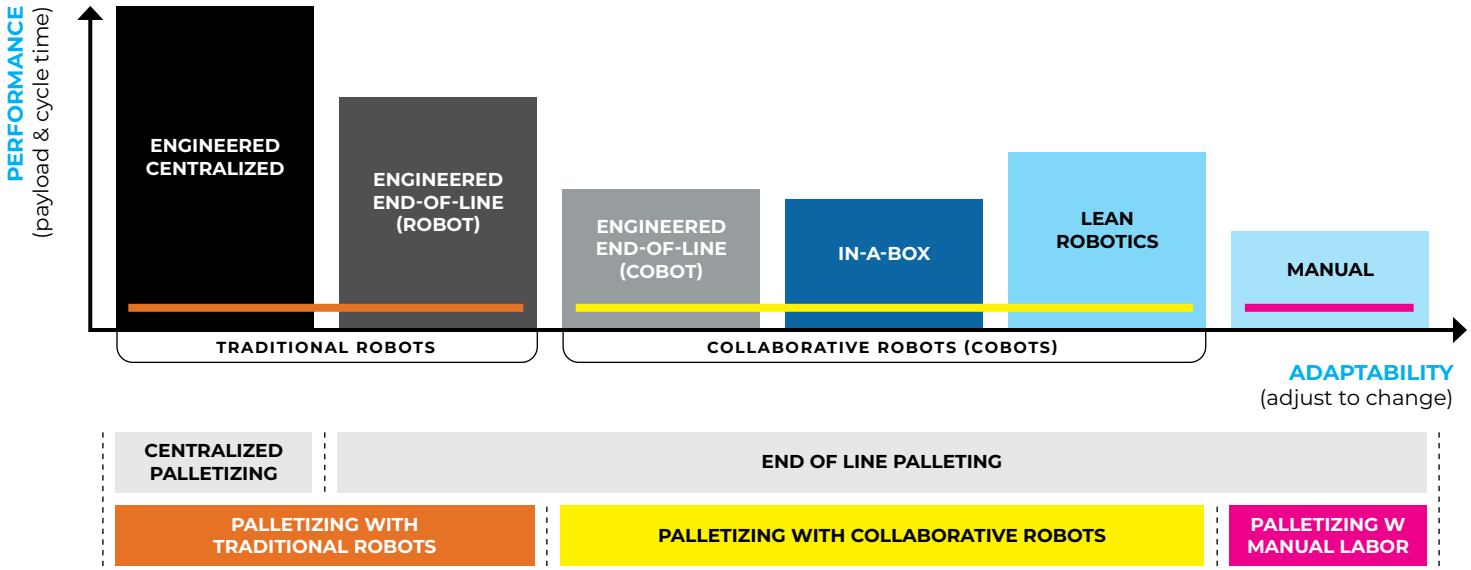
CENTRALIZED
PALLETIZING SYSTEMS

- \+ Suitable for operations with high-volume, standard product flows.
- − Require a higher initial investment and offer less flexibility.
- − Can become a single point of failure

END-OF-LINE
PALLETIZING SYSTEMS

- \+ More adaptable and resilient
- \+ Cost effective
- − Less scalable if wrong platform is chosen initially

Palletizing with traditional robots, collaborative robots, or manual labor



PALLETIZING WITH TRADITIONAL ROBOTS

Traditional industrial robots represent the traditional choice for high-speed, high-volume palletizing tasks. These large, stationary systems operate in dedicated spaces away from human workers for safety. They excel in handling large volumes and can manage heavier loads, offering durability and reliability for continuous operation.

However, these robots require significant initial investment. Their limited flexibility, extensive space requirements, and complex maintenance requirements are notable drawbacks. These systems necessitate specialized staff for operation and maintenance, and their immobility and impact on your existing floor layout within the factory can be a constraint.

PALLETIZING WITH COLLABORATIVE ROBOTS (COBOTS)

Collaborative robots, or cobots, are designed to coexist with human workers. Smaller, more adaptable, and user-friendly than traditional robots, cobots are suitable for a wide range of applications. They offer flexibility and adaptability, being easily reprogrammable for different tasks. Their design allows for safe human coexistence without extensive safety barriers. Cobot systems are typically more affordable and space-efficient than traditional robots. Cobots can be quickly deployed and integrated

into existing workflows, with intuitive interfaces that are easy to use. However, they generally have lower payload capacities and speed.

PALLETIZING WITH MANUAL LABOR

Manual labor in palletizing involves human workers handling and stacking products. This method offers high flexibility, allowing quick adaptation to different product types and sizes. It also requires minimal initial investment. Manual labor is easy to integrate into existing processes and does not require specialized maintenance.

However, it is generally slower and less consistent than automated methods. Manual palletizing poses health and safety risks from the repetitive movement and lifting. This yields much higher long-term labor costs. The reliance on the labor market and the volatility in labor costs are additional challenges, along with limited capacity to handle heavy or oversized products.

Solving labor shortage is an important problem that becomes urgent at some point for all businesses. The post-pandemic era showed us a glimpse of the future. What are the root causes of your labor challenge? How will they evolve in the future? In most cases, the answer is that it should get worse. It's up to you to decide when to proactively act on this important issue before you reactively need to address this urgent need.

When choosing a palletizing solution, manufacturers must consider factors like payload, size, speed, flexibility, initial investment, and long-term operational costs.

TRADITIONAL ROBOTS

- \+ Suitable for operations with high-volume, and repetitive tasks.
- − Comes with a higher initial cost, more rigidity and a larger footprint..
- − Necessitate specialized staff for operation and maintenance.

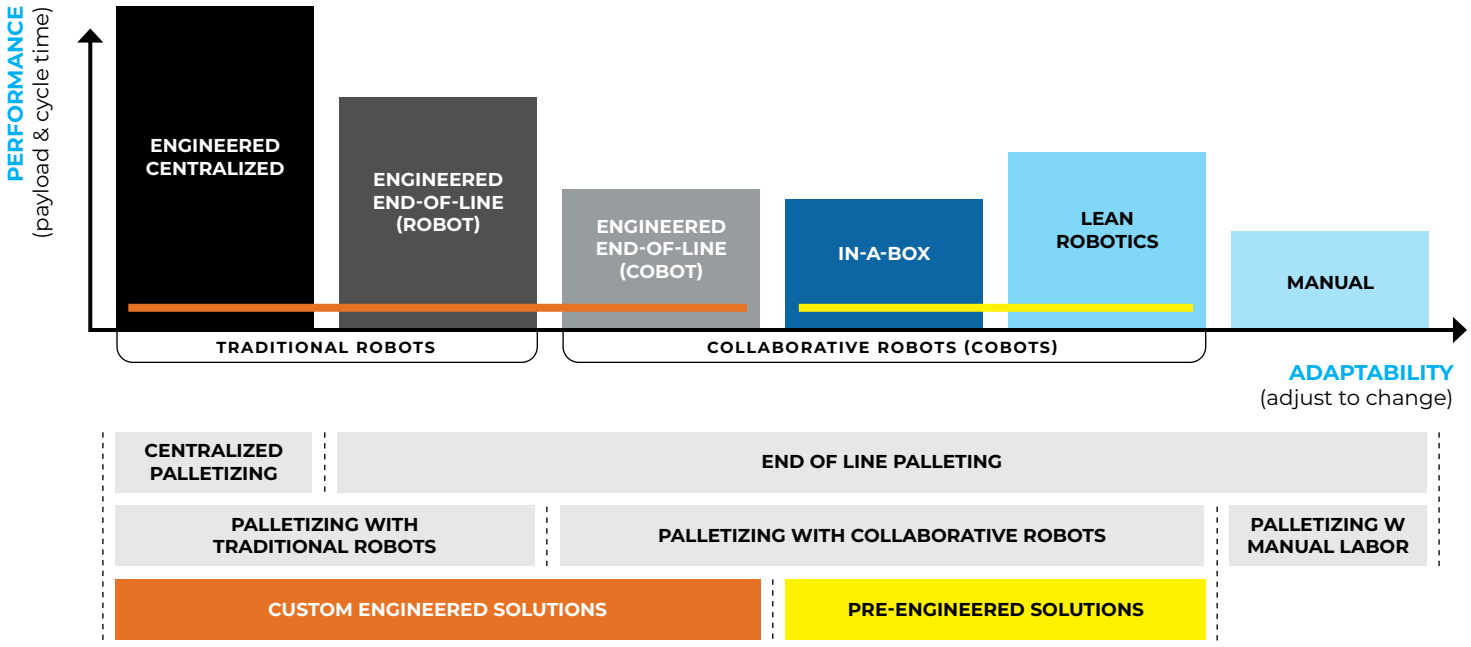
COLLABORATIVE ROBOTS

- \+ Offer flexibility and adaptability, being easily reprogrammable for different tasks.
- \+ Typically more affordable and space-efficient.
- − Generally have lower payload capacities and speed.

MANUAL LABOR

- \+ Offers high flexibility, allowing quick adaptation to different product types and sizes.
- \+ Easy to integrate into existing processes.
- − Slower and less consistent.
- − Reliance on the labor market and the volatility in labor costs.
- − Health hazards

Custom Engineered vs Pre-Engineered palletizing solutions



CUSTOM ENGINEERED SOLUTIONS

Custom Engineered Solutions are on the left side of the zero-sum curve and are designed to cater to the specific and fixed requirements of a task. These solutions are developed from scratch, allowing for a high degree of customization to address unique challenges and integrate seamlessly with existing processes. They can accommodate a particular operation's specific product type, size, and workflow. Custom Engineered Solutions seamlessly integrate with existing systems but are susceptible to locking the customer in with the vendor, making changes difficult, costly, and slow in the future.

These solutions come with higher costs due to the need for specialized design and engineering. They have longer implementation times and are prone to be over engineered, which can lead to increased maintenance and operational challenges. The open nature of the design process is vulnerable to scope creep, potentially inflating costs and complicating project management. These solutions heavily depend on the expertise of the solution provider and require specialized maintenance. The return on investment (ROI) can also be uncertain, especially if project scopes change during development.

PRE-ENGINEERED SOLUTIONS

Pre-Engineered Solutions refer to standardized, off-the-shelf systems designed to be versatile and optimized for a specific application. These solutions are typically developed based on a range of common industry requirements. As a result, they are quicker to implement compared to Custom Engineered systems. They may cover about 80% of the total set of requirements, with the remaining 20% solved by custom engineering. These solutions are a bit more cost-effective due to standardized production and economies of scale. They offer faster implementation, proven reliability, and ease of maintenance and operation thanks to standardized parts and processes.

However, Pre-Engineered Solutions may not fit all of the needs of an operation, requiring operational adjustments or compromises. They are less adaptable or scalable to future changes or expansions in operations. Their generic approach may not fully optimize efficiency or productivity for unique processes, and they are constrained by the standard features they offer.

IN-A-BOX SOLUTIONS

An In-A-Box Palletizing solution is a pre-engineered palletizing solution using a collaborative robot (cobot). It represents a standardized, "cookie-cutter" approach to automation in palletizing tasks. The cobot-based system typically includes pre-configured software and hardware components, making it relatively easy to implement in diverse settings. However, this one-size-fits-all approach can quickly reach its limits in more demanding, complex or specialized applications.

When deciding between custom engineered and pre-engineered solutions, manufacturers must weigh the uniqueness of their operational requirements against budget constraints, implementation timeframes, and long-term scalability needs.

CUSTOM ENGINEERED SOLUTIONS

- \+ Seamless Integration
- − Long lead times
- − Vendor Lock-In
- − Specialized maintenance
- − Scope Creep can impact ROI

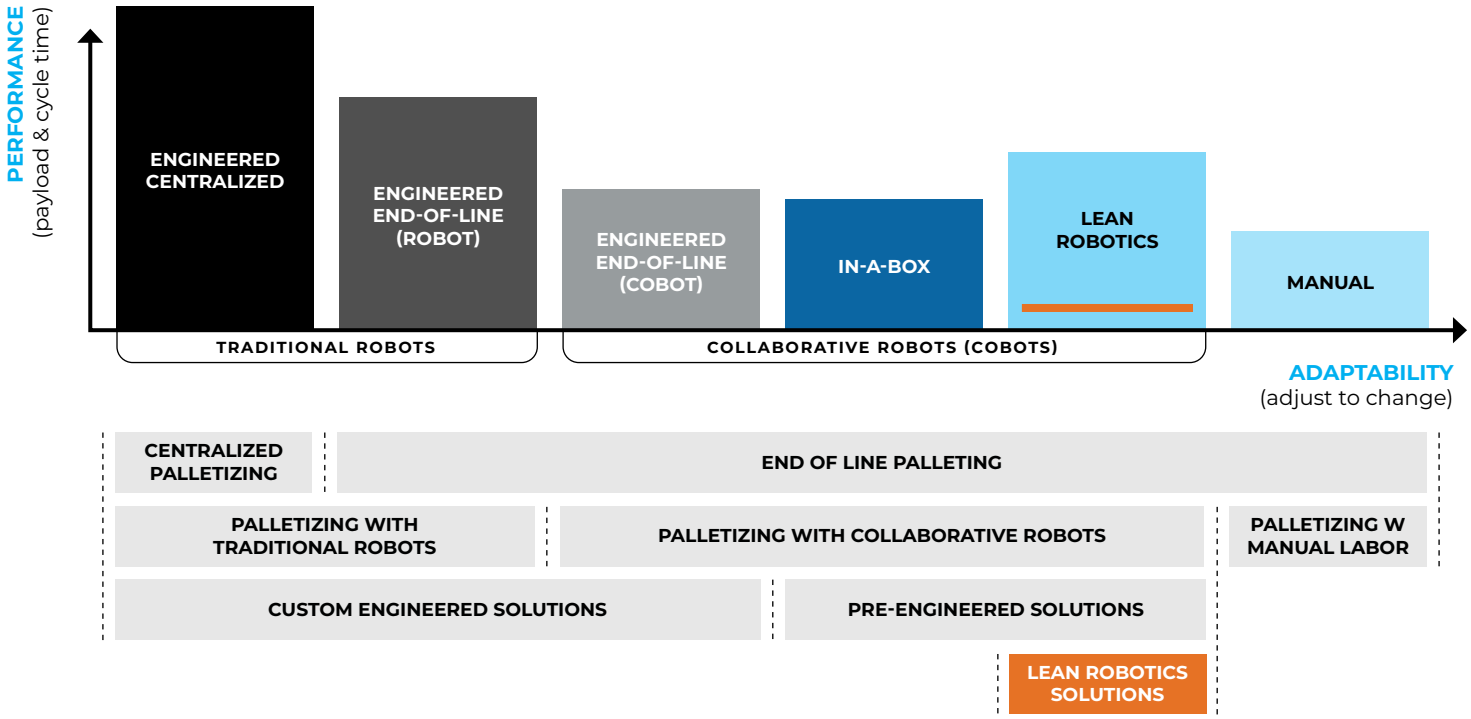
PRE-ENGINEERED SOLUTIONS

- \+ Quicker implementation
- \+ Reliable with easier maintenance
- − Most requirements are met with the standard product, the remainder with customized elements or compromises.
- − Less adaptable

IN-A-BOX SOLUTIONS

- \+ Quick and easy implementation with pre-configured software and hardware
- \+ Cobots are easy to learn & operate
- − One-size-fits-all approach limits performance
- − Not adaptable

Lean Robotics solutions



LEAN ROBOTICS SOLUTIONS

A Lean Robotics Palletizer is built and operates using lean manufacturing principles. Contrary to the other methods for which the supplier or technology dictates how you need to adapt your layout or material flow, this approach supports your factory floor's continuous improvement efforts.

Lean Robotics Palletizers are built on collaborative robots. It leverages their built-in functions, intrinsic simplicity, and the possibility to integrate them seamlessly into existing layouts, keeping the operators in mind.

Contrary to the In-A-Box Solutions that sacrifice performance, this solution category offers reliability, and interoperability for quick deployment, advanced control software, flexible tooling, and a user-friendly setup interface.

Moreover, the Lean Robotics Palletizer:

- Optimizes the material flow at the cell.
- Ensures pallet integrity.
- Allows you to keep improving it and adding new products over time.

It uses modularization of standard elements (like end-of-arm tooling, stands, slip sheet rack, etc.) to allow for efficient deployment, while keeping enough flexibility to deal with the inevitable particularities of your factory and product.

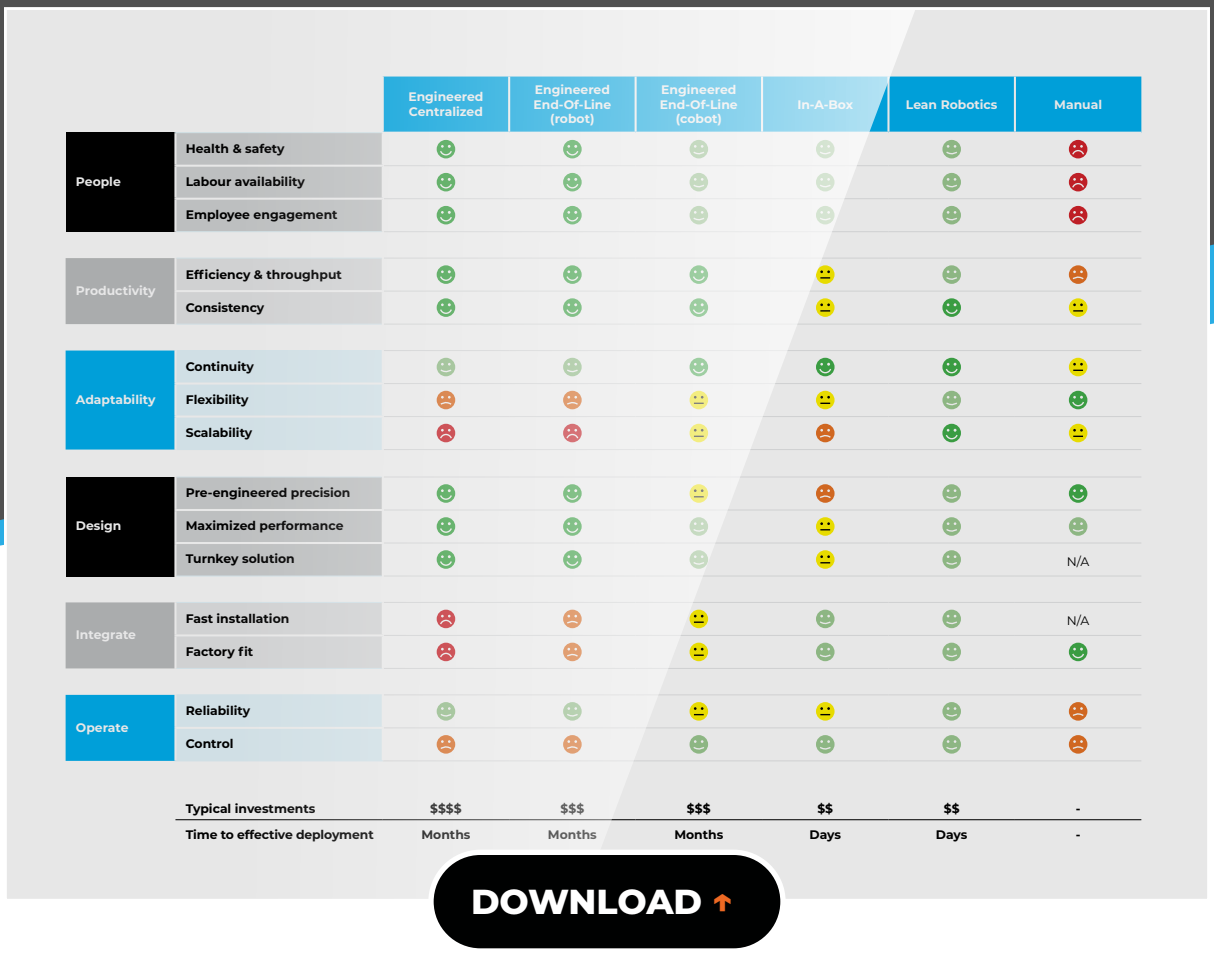
04 The Business Alignment Matrix

With a complete understanding of the different solution categories and their characteristics, the next recommended step is to use the **Business Alignment Matrix**.

This matrix evaluates the Strategic Imperative Framework to the solution categories and weighs how well the solutions help solve the business challenges.

By focusing on the most important strategic considerations rated previously, 2 or 3 solution categories should emerge as leading candidates. If the results are a surprise, it is ok to go back and rework the Strategic Imperative Framework.

The following step is to analyze these down-selected options with the detailed specifications of the application.



		Engineered Centralized	Engineered End-Of-Line (robot)	Engineered End-Of-Line (cobot)	In-A-Box	Lean Robotics	Manual
People	Health & safety	☺	☺	☺	☺	☺	☹
	Labour availability	☺	☺	☺	☺	☺	☹
	Employee engagement	☺	☺	☺	☺	☺	☹
Productivity	Efficiency & throughput	☺	☺	☺	😐	☺	☹
	Consistency	☺	☺	☺	😐	☺	😐
Adaptability	Continuity	☺	☺	☺	☺	☺	😐
	Flexibility	☹	☹	😐	😐	☺	☺
	Scalability	☹	☹	😐	☹	☺	😐
Design	Pre-engineered precision	☺	☺	😐	☹	☺	☺
	Maximized performance	☺	☺	☺	😐	☺	☺
	Turnkey solution	☺	☺	☺	😐	☺	N/A
Integrate	Fast installation	☹	☹	😐	☺	☺	N/A
	Factory fit	☹	☹	😐	☺	☺	☺
Operate	Reliability	☺	☺	😐	😐	☺	☹
	Control	☹	☹	☺	☺	☺	☹
	Typical investments	$$$$	$$$	$$$	$$	$$	-
	Time to effective deployment	Months	Months	Months	Days	Days	-

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05 Palletizing process detailed specifications

While, at this point, some preferences may appear for one (or more) categories based on business needs. The final determination is validated through the detailed specifications of the palletizing operations.

The following document helps to assess the requirements of the palletizing process to automate and rate the importance of each specification. According to the requirements needed, some solution categories will stand out as potential candidates.

		Your requirements	Importance (1=most, 5=least)	Engineered Centralized	Engineered End-Of-Line (robot)	Engineered End-Of-Line (cobot)	In-A-Box	Lean Robotics	Manual
Pick rate	Up to 6 picks/min			✓	✓	✓	✓	✓	✓
	6-9 picks/min			✓	✓	✓		✓	✓
	9-13 picks/min			✓	✓			✓	⚠
	> 13 picks/min			✓	✓				⚠
Pallet height	Up to 1.5m (59in)			✓	✓	✓	✓	✓	✓
	Up to 2.1m (81in)			✓	✓	✓	✓	✓	✓
	Up to 2.4m (96in)			✓	⚠	⚠		✓	⚠
	Up to 2.7m (108in)			✓				✓	⚠
Product types	Cardboard cases			✓	✓	✓	✓	✓	✓
	Buckets			✓	✓	✓	✓	✓	✓
	Shrinked wrap			✓	⚠	⚠		⚠	✓
	Open top products			✓	⚠	⚠		⚠	✓
	Bags			✓	⚠				✓
Product weight	Up to 11.5kg			✓	✓	✓	✓	✓	✓
	Up to 18.1kg			✓	✓	✓	✓	✓	⚠
	Up to 27kg			✓	✓	✓	✓	✓	⚠
	> 27kg			✓	✓				⚠
Processes	Washdown			⚠	⚠	⚠		⚠	✓
	Label orientation			✓	✓	✓	✓	✓	✓
	Mobility					⚠	✓	⚠	✓
	Slipsheets/tiersheets			✓	✓	✓		✓	✓
	Mixed pallets			✓	⚠				✓
Requirements	Standard power outlet					✓	✓	✓	
	Minimal footprint			⚠	6.4m x 4.2m (20'10"x 13'8")	3m x 1.5m (10' x 5')	3m x 1.5m (10' x 5')	3m x 1.5m (10' x 5')	

⚠ Depend on each vendor's solution ⚠ Depends on each vendor's solution and specific requirements ⚠ Subject to ergonomics constraints

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06 Avoiding common pitfalls

After reviewing the business priorities and detailed specifications, you should now have a better idea of the Palletizing Solution(s) you want to explore further.

But the selection process isn't completed yet. In the dense area of the competitive landscape where numerous suppliers and their specific technologies fight for attention, it's crucial to be aware of common pitfalls.

Some options or choices could potentially lead to overkill features, empty promises, or clever marketing gimmicks. For this reason, be aware of:

Feature overload: Certain solutions attempt to cater to everyone's needs with an abundance of features and functionalities. As a result, everyone is paying for features they do not need and investing in a platform with unnecessary complexity.

Empty commitments: Exercise caution with providers that make grand promises without substantial evidence or a proven track record of fulfilling those claims.

Cut the fluff: Scrutinize flashy marketing content that aims to impress. Beware of providers that prioritize style over substance, diverting attention from critical decision-making factors.

Excessive customization: Some providers entice clients with extensive customization capabilities. While some customization can be beneficial, excessive customization carries the risk of vendor lock-in, increased costs, product obsolescence, and complexities if not actively managed.

The In-A-Box offer that you'll never buy: To get a foot in your door, many engineered solution providers will promote In-A-Box solutions. You'll soon realize that the limitations of that entry-level solution will prevent you from using it, and you'll gradually migrate to their engineered solution. Be aware if this happens, you might want to take a step back and reconsider other vendors.

Overly complex solutions: Overly intricate solutions can result in challenges during implementation and maintenance. This complexity not only jeopardizes ROI but also affects system useability.

Hidden costs: Some solutions may appear cost-effective on the surface but have hidden fees, such as ongoing maintenance, support, or integration costs.

Vendor lock-in: Be cautious of solutions that require long-term contracts or proprietary systems, creating a high barrier to exit or change. This limits flexibility and future choices.

Ease-of-use over performance: It's advantageous to have an easy to deploy system, but does it perform the required tasks reliably? It may be easy to program a system, it's another level to have it perform reliably. Make sure that the performance of the easy-to-deploy systems will not create a bottleneck in your production flow.

07 Budget considerations

A crucial part of investing in an automated palletizing solution is the cost information. The following section provides insights into the factors that impact pricing. These are the types of questions that are asked before obtaining internal approval.

When evaluating the cost of a palletizing system, it's important to take a comprehensive approach. Compare the initial investment, ongoing operating expenses, and the costs associated with making adjustments or scaling the system.

It is also essential to consider how the initial choice may introduce dependencies that could affect cost flexibility.

Let's begin with the critical cost components of an automated palletizing solution:

- **Initial investment**
- **Operating**
- **Training**
- **Downtime**

Initial investment

There are many factors to consider with the initial automated palletizing solution investment.

BUDGET PRICING VS. QUOTED PRICING

Make a clear distinction between estimated (budgetary costs) and specific price quotes. This approach is crucial to ensure a fair and accurate comparison of each alternative. Take note of the vendor's recommended budget contingency or the extra room they recommend as a precautionary measure to accommodate additional costs.

ESSENTIAL VS. NICE-TO-HAVE FEATURES

Using the Detailed Specification as a reference, essential and "nice-to-have" features should be clear. Make your own list before receiving your quotes. When a quote is received, crucial features of the specific use case should be highlighted, while the superfluous ones should be struck out. If necessary, ask the vendor to provide a new quote to remove any unnecessary features.

INTEGRATION

Certain automated palletizing solutions may require more substantial (and perhaps intricate) integration efforts. The level to which a solution aligns with the existing factory processes, layout, and systems is important to understand. Here are questions to ask the vendor to help kick start that discussion:

- Will the chosen platform allow you to automate other stations in your factory or in sister companies?
- How well does the solution accommodate our current factory layout?
- What level of compatibility does the solution have with our existing systems?
- How extensive are the integration efforts?
- Are there any prerequisites or modifications needed in our current processes for successful integration?
- Can you provide examples of successful integrations with similar factory setups?

CUSTOMIZATION

If the solution does not cover the essential features required for the palletizing application, there might be additional customization costs. The initial customization costs should be considered, as well as the need for ongoing cost-of-ownership expenses to maintain the system's relevance and functionality. This includes additional customization expenses over time as the system evolves and remains in operation. Referring to the Detailed Specifications, expenses associated with each customization to incorporate the essential features should be considered.

VENDOR LOCK-IN

When assessing the initial investment, the potential long-term costs and consequences of selecting the vendor must be considered. Vendor lock-in may have an impact on changes, scalability, and other factors. Considering this in the review of the alternatives can affect the cost of ownership portion of the ROI calculation.

SCALABILITY

Finally, it is important to consider the scalability of a solution and how it might influence the cost of ownership. Here are some questions to consider:

- Does this solution require a larger upfront investment but then reduce the costs of subsequent upgrades?
- Does this solution enable a modest investment and offer the possibility to expand as needed?
- Will it be possible to scale the solution and expand its capacity as the requirements evolve?
- What would be the upgrade costs?

The following table outlines the **Initial Investment Considerations** for each solution type. These are relative representations between each category to help in your decision process.

Initial Investment Considerations	Engineered Centralized	Engineered End-Of-Line (robot)	Engineered End-Of-Line (cobot)	In-A-Box	Lean Robotics	Manual
Disparencies between estimated budget & quote	☹	☹	😐	☺	☺	N/A
Essential over nice-to-have features	☺	☺	☺	😐	☺	N/A
Customization possible	☺	☺	☺	☹	☺	N/A
Integration complexity	☹	☹	☹	☺	☺	N/A
Vendor lock-in	☹	☹	😐	☺	☺	N/A
Potential scalability	☹	☹	😐	☹	☺	N/A

Operating costs

The operating costs for a robot palletizer can vary significantly depending on several factors:

1. **Energy costs:** Energy costs depend on system efficiency, runtime, and the local electricity rates.

2. **Maintenance and repairs:** Regular maintenance and repairs contribute to operating costs. It is important to understand who is authorized to perform maintenance, proposed service contracts, and how spare parts are purchased. If possible, a current customer of the vendor can provide insights from the user's standpoint. The proposed maintenance and support packages offered by the supplier should meet the company's expectations.

3. **Training costs:** The cost of training existing and new employees on the system should be compared. Current customers can provide a clear view of the training experience their team received.

4. **Programming and software updates:** It is important to document software license costs and subscription costs. Equally as important is clarifying the responsibilities for program additions and changes. Can existing employees handle these tasks, or does it involve external individuals?

Unexpected costs are frustrating. Keeping track of all potential expenses increases the likelihood of obtaining a more accurate estimate of the initial investment and operating true costs.

08 ROI considerations

Now, understanding the initial and ownership costs from the previous chapter, the logical next step is to project the Return on Investment (ROI).

The previous financial information should be supplemented with productivity gains and labor impact information in order to compare with manual palletizing operations.

RETURN ON INVESTMENT

ROI formula:
(Net Gain from Investment / Initial Investment Cost) x 100

Net gain formula:
Savings in costs (labor, downtime, etc.) + Additional revenue from increased productivity.

PRODUCTIVITY GAINS

- **Cycle time:** Duration to complete a specific task or produce an item.
- **Output:** Number of units processed per unit of time.
- **Scalability:** Ability to increase volume with minimal additional cost.

LABOR IMPACT

- **Labor costs:** Current manual labor costs, including wages and benefits.
- **Labor efficiency:** Productivity and efficiency of manual labor.
- **Labor flexibility:** Ability to reassign labor for various tasks.

COST OF OWNERSHIP

To define the total cost of ownership, the operation costs should be added to the initial investment by considering a specific period (typically predefined by the business) for each solution in the comparison.

INVESTMENT RISK ASSESSMENT

Any investment can have risks. It is important to consider them and have a mitigation plan if they happen.

- **Identify risks:** Potential risks such as technological failures, market changes, or regulatory issues.
- **Risk mitigation:** Document strategies to mitigate each risk and calculate the potential cost associated with mitigation.
- **Include a risk factor in your ROI comparison:** Look at your factory's previous, large-scale, cross-functional investment projects. Were they on time and on budget? If not, add that risk factor to your ROI calculation for Centralized and Engineered solutions that are of a similar nature.

INTANGIBLE BENEFITS

These may not be clear numbers, but they are qualitative gains that need to be considered in your decision process.

- **Safety:** Decrease costs associated with workplace accidents, medical leave, injuries, and near-misses.
- **Employee engagement:** Evaluate the influence on workforce morale and the increase in employee retention.
- **Quality improvement:** Calculate the reduction of costs related to errors.
- **Market reputation:** Estimate the positive impact on the company's reputation (both with customers and job candidates) for innovation and efficiency.

09 Identifying drawbacks and risks

Every type of palletizing solution comes with its unique set of advantages and benefits, accompanied by its own set of drawbacks and risks. Culminating key insights from this guide, the following overview highlights where each solution excels and instances where exercising caution might be prudent.

In this stage, assess the chosen solution(s) to their respective sections below. As each option comes with its own set of drawbacks and risks, it is crucial to verify that all risks can be addressed and mitigated.

Source: FANUC on YouTube

Engineered Centralized palletizer

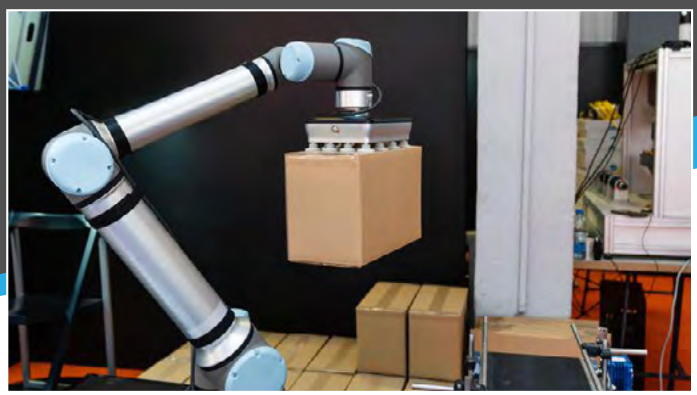
This solution type creates factory challenges such as layout limitations as it acts like a 'monument' within the facility. This establishes a single point of potential failure and restricts modifications. The installation of this customized system demands extensive project planning, coordination, and a significant initial investment. Additionally, the system requires highly skilled operators and specialized maintenance personnel.

Distinct benefits and advantages	• High efficiency for high production rate • All pallets end up at the same location
Challenges/problems it solves better than its alternatives in the market	• Higher efficiency
Drawbacks and risks	• Single point of failure • Very large footprint • Construction project scale • High initial investment • Upgrade ripple effect • Requires expertise to operate • Reduced flexibility • Can be dependant on vendor for adding new products
Risk mitigation option(s) / Plan B	• Only use highly reliable, proven technologies as the palletizer becomes a single point of failure • Only use this type of palletizer for steady and predictable production • Have a rigorous maintenance program

Engineered End-Of-Line palletizer (robot)

This custom palletizing system often requires a high initial investment and offers limited flexibility in adapting to different tasks. They demand considerable space, adding to the complexity of maintenance and operation. Expertise is essential for their operation, and their limited mobility can be a constraint. Additionally, there is often a dependency on the vendor for integrating new products into the system.

Distinct benefits and advantages	• High efficiency and speed • High payload capability • Durable and reliable
Challenges/problems it solves better than its alternatives in the market	• Higher payload and/or higher throughput
Drawbacks and risks	• High initial investment • Limited flexibility • Space requirements • Maintenance complexity • Requires expertise to operate • Limited mobility • Can be dependant on the vendor for adding new products
Risk mitigation option(s) / Plan B	• Only use highly reliable, proven technologies as the palletizer becomes a single point of failure • Only use this type of palletizer for steady and predictable production • Have a solid maintenance program



Engineered End-Of-Line palletizer (cobot)

Engineered End-Of-Line cobots offer a small footprint and flexibility include tailored gripper, infeed, and safety features that outperform many alternatives. However, they typically have limited throughput and can only handle limited payloads and pallet height. There is often a dependency on the vendor for extending capabilities and adding new products, which can be a significant limitation. Additionally, as cobots are a more recent and thus less-proven robotics technology, this introduces an element of uncertainty.

Distinct benefits and advantages	• Small footprint • Flexible
Challenges/problems it solves better than its alternatives in the market	• Small footprint with tailored gripper, infeed, and safety
Drawbacks and risks	• Limited throughput • Limited pallet height • Dependant on the vendor for extending capabilities • Can be dependant on the vendor for adding new products • Cobots are a more recent (less proven) robotics technology
Risk mitigation option(s) / Plan B	• Switch back to manual labor if an issue arises (not a single point of failure) • Have extra capacity in terms of pallet height, throughput and payload (e.g., 25% additional capacity) to accommodate lack of visibility for the non-standard or non-simulated project components

Source: Doosan

In-A-Box palletizer

This off-the-shelf palletizing solution provides high mobility, and simple software for adding new products or pallet patterns. However, they have very limited throughput and pallet height capabilities, and cannot perform tasks not pre-programmed in the software, such as handling slip sheets. Their capabilities cannot be extended using traditional automation techniques, and as a more recent and less proven technology, cobots carry inherent uncertainties.

Distinct benefits and advantages	• Small footprint • Highly mobile • Simple SW to add new products/pallet patterns • Small lead time and integration time
Challenges/problems it solves better than its alternatives in the market	• Intra-day mobility from one line to the other
Drawbacks and risks	• Very limited throughput and pallet height • Cannot perform tasks not considered in the software (e.g. slip sheets) • Capabilities cannot be extended using traditional automation techniques
Risk mitigation option(s) / Plan B	• Switch back to manual labor if an issue arises (not a single point of failure) • Limit to smaller throughput application (e.g. 6 picks/min) as there is very little levers to optimize performances

Source: Robotiq

Lean Robotics palletizer

A Lean Robotics Palletizer is built and operates using lean manufacturing principles. Contrary to the other methods for which the supplier or technology dictates how you need to adapt your layout or material flow, this approach supports your factory floor's continuous improvement efforts.

This palletizing solution addresses challenges that other market alternatives cannot, combining the advantages of a cobot solution with the ability to cover a wider range of applications in terms of throughput, pallet height, and more. It leverages the cobot's built-in functions, intrinsic simplicity, and the possibility to integrate them seamlessly into existing layouts, keeping the operators in mind. On the other side, they still have some limitations compared to full-scale industrial solutions, particularly in payload and throughput capacities.

Distinct benefits and advantages	• Optimized control algorithm and tooling enables higher capabilities than other cobot solutions (throughput, pallet height) • Possibility to extend capabilities using traditional automation technique • Simple software to add new products/pallet patterns • Short lead time and integration time
Challenges/problems it solves better than its alternatives in the market	• Advantages of a cobot solution (smaller footprint, etc.) while covering a wider range of applications (throughput, pallet height, etc.).
Drawbacks and risks	• Can be too limited compared to industrial solutions (payload, throughput) • Small lead time advantage disappears if the application is very complex
Risk mitigation option(s) / Plan B	• Switch back to manual labor if an issue arises (not a single point of failure)

Manual palletizing

This method is noticeably slower and less consistent than automated methods. Hazards include short-term and long-term health and safety risks. The higher long-term labor costs associated with ongoing manual work may exceed the one-time cost of automation. Moreover, this method is subject to fluctuations and shortages in the labor market. Additionally, manual palletizing may have limited capacity, particularly in handling extremely heavy or oversized products.

Distinct benefits and advantages	• Can adapt to all types of applications • Only solution for unpredictable or very variable production
Challenges/problems it solves better than its alternatives in the market	• Often the only possible solution
Drawbacks and risks	• Ergonomics issue • Health and safety risks - manual material handling in factories • Higher costs • Labor scarcity - Employee Engagement • Gradual lost of productivity relative to competitors investing in automation
Risk mitigation option(s) / Plan B	• N/A (status quo)

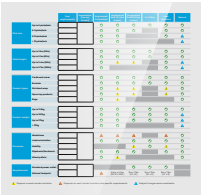
10 Bringing it all together

Throughout this journey, the essential elements contributing to a well-informed decision for a palletizing solution have been explored. Before seeking approval, it is recommended to review each section to ensure that the information is comprehensive and clear.

The final step is to consolidate the findings in a comprehensive overview, emphasizing the Strategic Imperatives, Detailed Specifications, Cost Analysis, and Risk Mitigation. This compilation will help validate and advocate the choice within the organization.

1. STRATEGIC IMPERATIVES

Start by revisiting the Strategic Imperatives Framework from the beginning of the process. These are the guiding principles for your decision-making process. Following this, the Business Alignment Matrix should help align those business principles to the different palletizing solution categories.



2. DETAIL SPECIFICATIONS

Summarize the technical specifications and highlight specific features (and functions) that are essential with the Palletizing Process Detailed Specifications table.

3. SOLUTION RATINGS

Review the previous tools to analyze the palletizing options. Categorize each based on how well they align with the strategic imperatives and specifications.

4. COST ANALYSIS

Provide an overview of the cost analysis, detailing initial investments, operating costs, and scalability implications for each solution.

5. DECISION-MAKING FRAMEWORK

Transfer required information to your business's decision-making framework.

6. CONCLUSION AND RECOMMENDATION

Based on the alignment with your strategic imperatives, specifications, and cost analysis, present the solution that emerged as the most suitable.

7. PITCH AND JUSTIFICATION

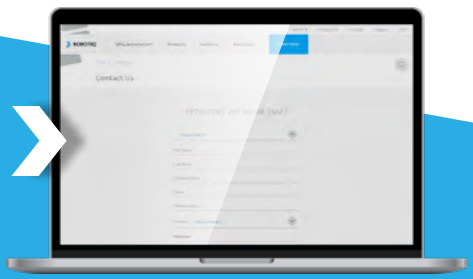
Using the information documented in the Automated Palletizing Buyer's Guide, develop a persuasive argument for your chosen solution. Highlight its benefits, unique value proposition, and how it aligns with your company's long-term goals.

8. INTERNAL COMMUNICATION

Prepare a clear and concise presentation (or document) to share with relevant stakeholders in your organization. Ensure that your justification is well-structured and data-driven.

Need help?

If you have any remaining questions or would like to discuss your Specification Report with one of our experts, **click here or visit our website**.



11 Your next steps

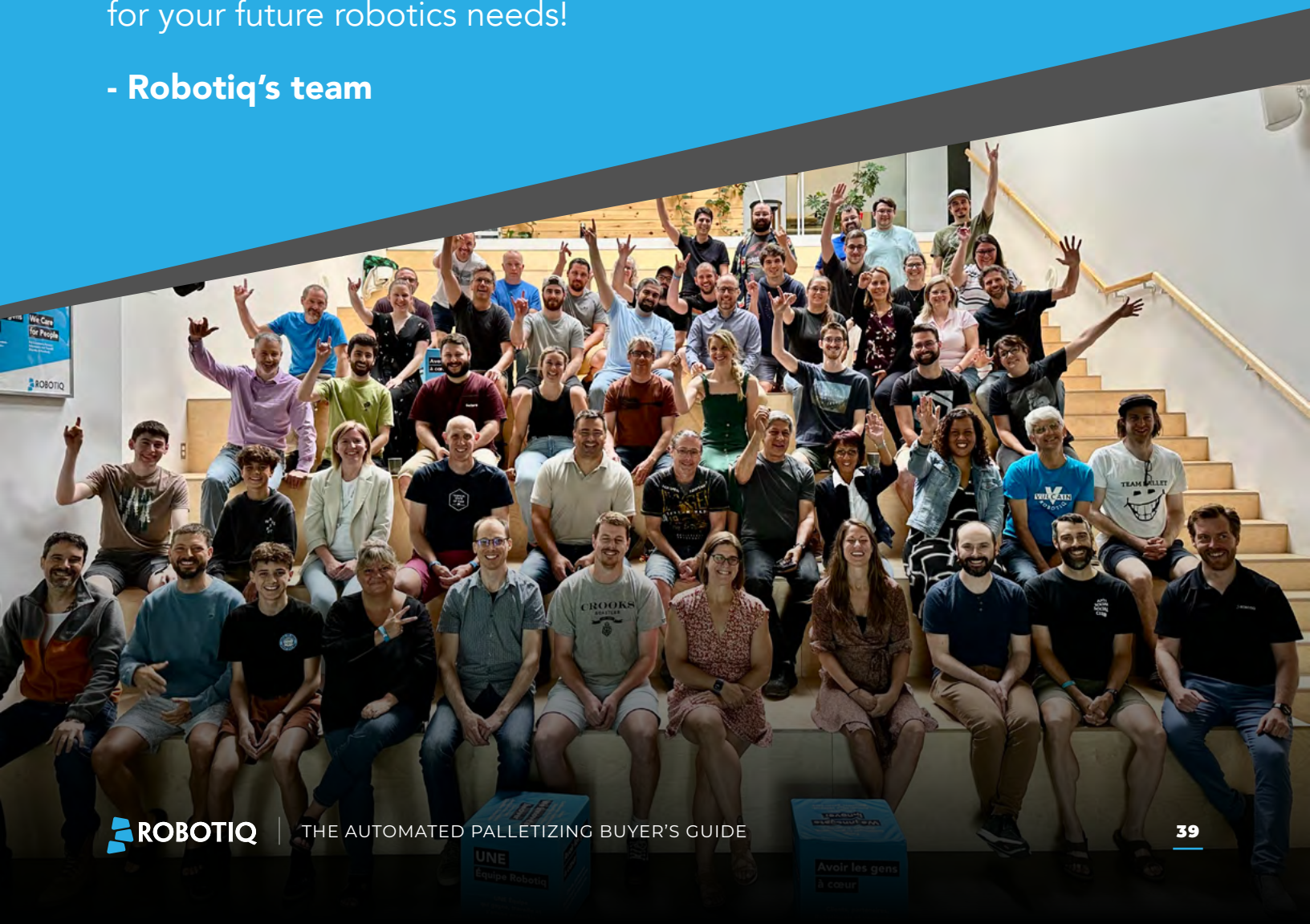
Congratulations! You've completed the Automated Palletizing Buyer's Guide. You now have everything in hand to make an informed decision on an automated palletizing solution.

With a focus on operational excellence and flexibility through the People, Productivity, and Adaptability frames, now is the time to take action and **start production faster**.

The Lean Robotics approach will lead you through the steps of Design, Integration, and Operation towards innovative yet practical solutions for factories and warehouses.

We look forward to potentially crossing paths
for your future robotics needs!

- Robotiq's team

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