

From Static to Smart: AI as a Co-Pilot in Production Planning

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A practical guide for small and mid-sized manufacturers looking at modernizing production planning. Step by step, without massive big-data projects or disruptive system overhauls.

Discover why planning is more of a strategic success factor than ever, where traditional methods reach their limits, what modern planning actually looks like and how it gives you the day-to-day confidence to act decisively and operate efficiently.

AI as a Co-Pilot in Production Planning

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About This Whitepaper

Manufacturers in 2025 are under pressure like never before. Geopolitical tensions, volatile energy costs, shipping delays, and renewed trade barriers – these are all constant stressors that affect every part of the production process. With new U.S. tariffs on European industrial goods, unstable global freight routes, and the continuing war in Ukraine, even well-structured operations are being pushed to their limits.

For small and mid-sized manufacturers, this creates an urgent need to rethink how planning works. If schedules can't adjust to fast-moving disruptions, companies risk falling behind.

This whitepaper explains how production planning can become a core stabilizing force. It outlines how flexible tools and well-structured planning processes help manufacturers adapt more quickly, avoid bottlenecks, and stay competitive. It also shows how AI, used in a practical and focused way, can support planners with faster decisions and better insights – without requiring major IT investments.



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As Founder's Associate at Phantasma Labs, a VC-backed deep tech startup, Louisa supports manufacturers with adopting AI as a co-pilot for dynamic and KPI-optimized production scheduling. Phantasma's unique AI approach designed for SME manufacturers mitigates typical barriers of AI adoption at factories such as data availability and technical infrastructure.

1 Introduction

Production Planning: From Operational Task to Success Factor

Planning as a Strategic Advantage

In 2025, manufacturers operate in an environment shaped by uncertainty and constant change. Cross-border logistics have become slower and less predictable. And with the return of U.S. tariffs on European goods, many industrial in- and exporters are facing rising costs and new regulatory complexity.

Planning used to be about keeping production running. Today, it's a core capability for staying competitive. When teams can't react fast to new constraints or opportunities, on-time delivery performance suffers – and margins often follow.

Recent Disruptions are not just 'Rare Exceptions'

Over the past year, manufacturers across the world have had to adapt to:

- Recent shifting U.S. tariffs on machinery, electronics, and industrial components
- Port rerouting and shipment delays caused by ongoing Red Sea tensions
- Rapid shifts in demand, particularly in the automotive and aerospace sectors
- Persistent labor shortages, especially in skilled roles, make it harder to maintain stable schedules and scale production efficiently

Each of these factors has a direct impact on production: from raw material availability to shift planning and delivery timing. Some companies face all of them at once.

Traditional planning systems, especially those based on static spreadsheets or rigid ERP logic, were not built for this level of complexity and volatility. They are difficult to update, slow to simulate new scenarios, and often depend on a few individuals with years of hands-on experience.

1.9 mio

missing skilled workers

1.9 million manufacturing jobs in the U.S. could go unfilled by 2033 if current labor gaps remain unsolved.

38%

more supply chain disruptions

In 2024, there was a 38% increase of supply chain disruptions compared to the previous year.

77%

of manufacturers have implemented AI

77% of manufacturers have implemented some form of AI with production being the top application area.

Planning must now absorb risk and create flexibility

This is why planning is becoming a strategic function. In unpredictable environments, it's no longer just about assigning orders to machines or filling out shift calendars. It's about creating visibility across teams, evaluating options quickly when something changes, and adjusting plans in a way that keeps production flowing without relying on constant firefighting. Good planning helps protect delivery reliability without needing excessive buffers, last-minute overtime, or unnecessary stress on the team.

Companies that treat planning as a tool for better decisions, not just for managing tasks, are in a stronger position to handle pressure. They can react faster, see risks earlier, and maintain focus when others are struggling to respond.

The shift in mindset: From stability to adaptability

In the past, planning was often based on stable routines. Production teams could rely on known lead times, predictable customer behavior, and relatively few disruptions. But that's no longer the world manufacturers operate in. Routines are now interrupted more often, and delays or shortages in one area can affect the entire flow.

What matters today is the ability to understand what's happening as early as possible, consider different scenarios before making changes, and respond confidently based on real priorities. With the right structure and tools in place, planning turns from a static task into a dynamic strength. It helps manufacturers use resources more effectively, avoid unnecessary costs, and stay reliable – even when the conditions are far from ideal.

What AI-Supported Planning Can Deliver

Even in factories with limited digitization, AI-supported planning can drive measurable results, without replacing existing systems:

- ✓ **Up to 70% less manual planning time**
→ More time for analysis, less spreadsheet maintenance
- ✓ **Up to 30% shorter production cycles**
→ Reduce delays caused by firefighting and manual rescheduling
- ✓ **Up to 20% improvement in on-time delivery rates**
→ Improve reliability even when constraints shift
- ✓ **Instantly adaptable schedules**
→ Update plans in seconds when machines fail or tariffs change

2 Status Quo

How planning is done today and where traditional methods reach their limits

Common Practices for Production Planning

In many small and mid-sized production companies, planning is still based on pragmatic, but often outdated methods:

- **Excel spreadsheets** maintained manually and updated only locally
- **Planning by gut feel** or verbal updates during daily operations
- **Mental planning** by experienced staff without system support

These approaches may have worked for years, but their limitations are becoming more apparent. In quiet times, the gaps may go unnoticed. But when things shift quickly, whether due to a missing shipment, a new trade policy, or a sudden change in customer demand, traditional planning methods struggle to keep up.

The result is more than just inefficiency. Teams operate under time pressure with incomplete information. Processes slow down, errors creep in, and planning becomes a source of stress instead of stability.

Where Traditional Methods Fall Short

Especially with volatile order volumes, unstable capacities, and last-minute disruptions, the limits of traditional planning become painfully clear. What used to be enough for basic coordination now often slows teams down, introduces risk, and leaves planners without the visibility or flexibility they need.

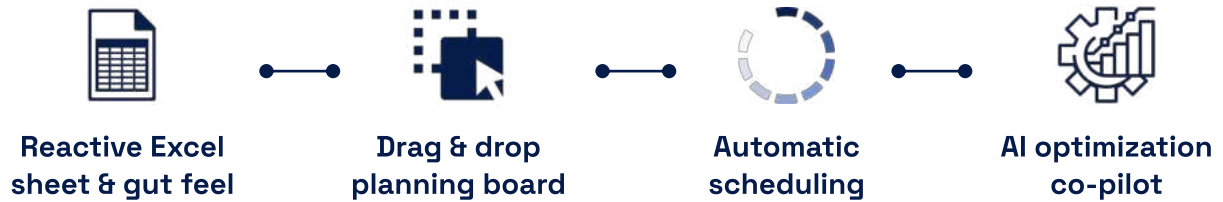
Typical weaknesses of outdated planning approaches include:

- **Lack of transparency:** Information is scattered across spreadsheets, outdated systems, and emails. Teams work with different information bases.
- **No way to test scenarios:** “What if” questions like a supplier delay or a priority change are difficult to answer without starting from scratch.
- **High manual workload:** Planners spend hours updating different tools, double-checking data, and coordinating with production and logistics by phone or message.
- **Dependency on individuals:** Key planning knowledge often lives in someone’s head and is lost when that person is on leave or leaves the company.

The more unstable the environment, the more damaging these weaknesses become.

3 Modern Production Planning

More than manual control: What today's planning needs to deliver



Production conditions can shift overnight. A supplier might delay shipment due to port congestion. A key machine might go offline during a high-priority run. Or a customer might bring forward a delivery window after holding back for weeks. In this kind of environment, static planning no longer works.

Modern planning systems must do more than structure production. They need to support planners actively with the transparency, flexibility, and foresight required to adapt quickly and stay in control when the unexpected hits.

Thinking in Real Time

Instead of updating plans once a week or even just once a day, companies today need systems that allow them to react quickly to change, whether it's a machine breakdown, a rush order, or a material shortage.

- **Replan quickly instead of rebuilding from scratch:** To stay flexible, production schedules must be easily adjustable at any time – without lengthy coordination or full reprocessing.
- **Shared data foundation:** Everyone involved in planning should work from the same up-to-date information, whether they are in production, logistics, or procurement.

Faster Reactions, With Clear Options

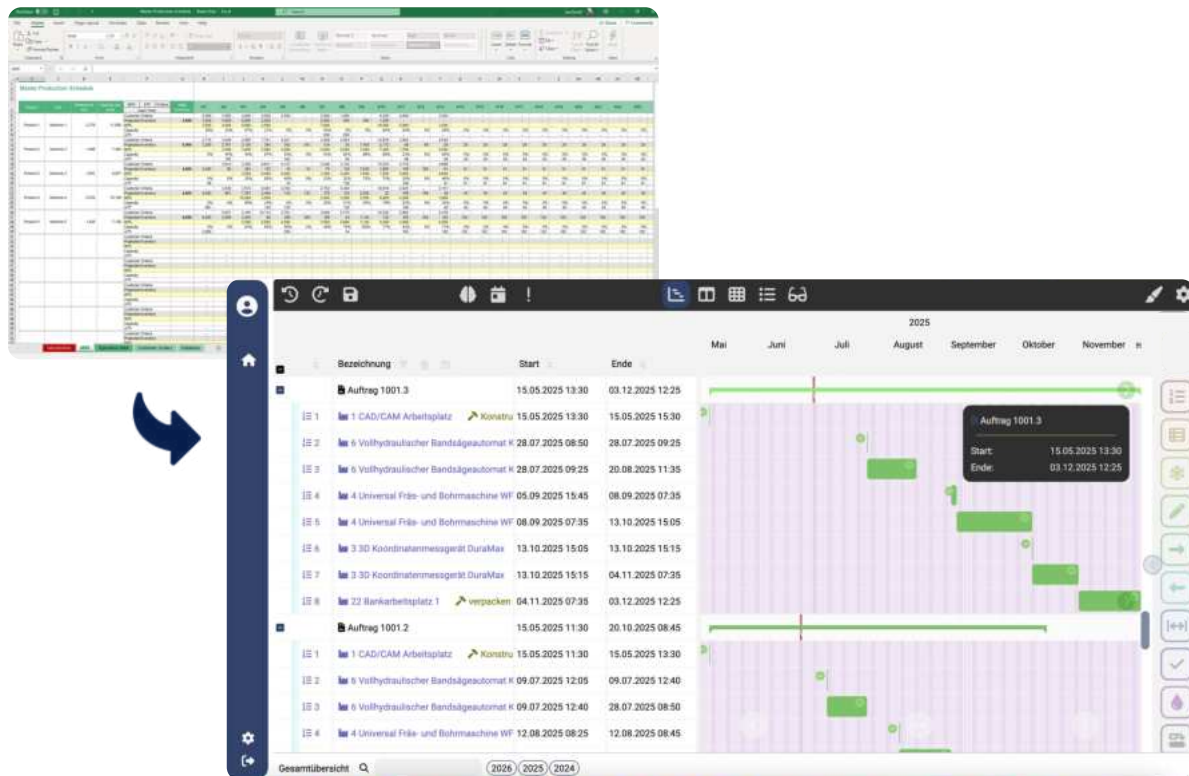
Planning is no longer just about assigning tasks. It's about responding quickly when things go off track, without making rushed decisions or relying on guesswork.

- **Scenario-ready:** Systems should make it easy to explore what-if scenarios when something changes. For example:
 "What happens if we prioritize Order X?"
 "What's the impact if Machine Y is unavailable tomorrow?"
- **Goal-driven:** Every decision in the plan should reflect clear business priorities. These could include meeting delivery deadlines, reducing changeover time, or protecting high-margin orders.

User-friendly, not overwhelming

Modern planning systems aren't just for specialists. They need to be easy to understand and simple to adjust especially for teams under pressure or during shift handovers. That means intuitive tools that show where bottlenecks are, where buffers are shrinking, and what can be done next.

- **Clear visualizations:** Key information about capacity, delays, or overloads should be visible at a glance
- **Flexible in use:** Whether the team prefers drag-and-drop adjustments, automatic scheduling, or AI-based planning support –the system should adapt to how they work, not the other way around.



4 Leveraging AI for Production Scheduling

What AI Can and Can't Do in Production Planning

What it's Really About: Supporting Better Decisions

Artificial Intelligence has the potential to make production planning more responsive and resilient. But many manufacturers are still unsure what AI can actually do in practice – and whether it's realistic for a small or mid-sized operations.

In reality, AI doesn't replace planners or automate away experience. It supports better decisions in situations that are too complex or time-sensitive for manual planning alone. AI can evaluate options, simulate trade-offs, and help teams stay in control when multiple constraints need to be balanced at once.

Examples of how AI supports real planning needs are:

- **Dynamic rescheduling:** When a machine breaks down, a shift is missed, or a supplier delays delivery, plans can be adapted fast
- **Goal-based prioritization:** Balancing delivery dates, setup times, and throughput when they can't all be met at once
- **Scenario comparison:** Testing alternatives such as "What happens if Order X is moved up?" or "What's the impact if Machine Y is unavailable tomorrow?"
- **Throughput adjustment:** Suggesting updated job sequences based on current shop floor conditions
- **Optimization:** Finding the best production sequence when multiple orders compete for limited capacity
- **Time savings:** Reducing the manual effort required to adjust plans, often by 50 to 70 percent in daily planning workflows

A Common Misconception: "We Need Loads of Data Before We Can Use AI"

Many manufacturers believe that AI only works if you already have large, well-structured historical datasets. That belief is understandable. Traditional machine learning models rely on past performance to make predictions. But this approach doesn't fit most small or mid-sized factories – especially when the past is no longer a reliable guide due to changing supply conditions, shifting demand, or updated processes.

That's where Reinforcement Learning (RL) offers a different, more practical path. Instead of learning from past data, RL trains itself using a digital model of your factory. This model includes your machines, production logic, rules, and business goals. The system then simulates thousands of possible planning decisions in seconds. It tries different strategies, evaluates the outcomes, and refines its recommendations based on what works best, according to the targets you set.

This simulation-based approach is especially useful when conditions are unpredictable or constantly changing. For example, RL can test:

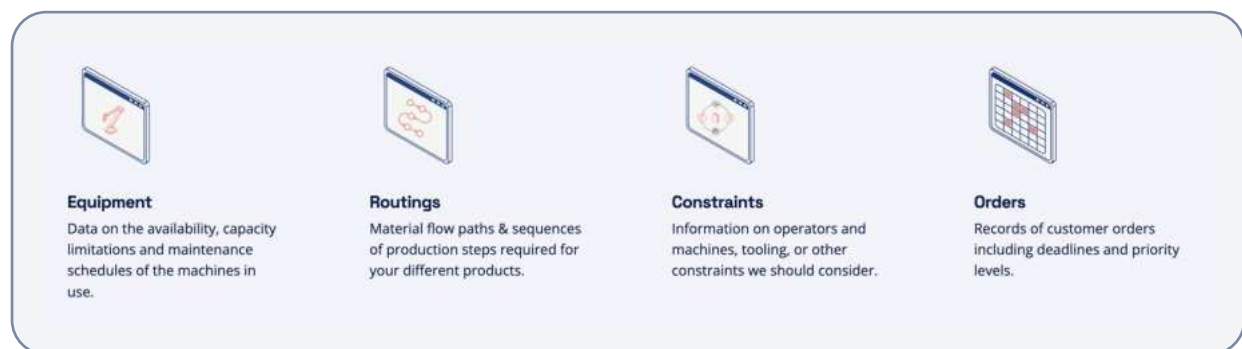
- What happens if a supplier is delayed by three days?
- How does the plan perform if machine X is taken offline for maintenance?
- What sequence delivers the best throughput with fewer changeovers?

Because the AI is trained in a virtual environment that reflects your real operations, it doesn't need long histories or perfect data. It just needs a structured overview of your constraints and clear optimization goals.

In practice, this means:

- **No big data requirements:** A clean digital representation of your current planning setup is enough, built from ERP data, rules, and constraints
- **Valid solutions, not guesses:** RL can propose new, effective plans for situations that haven't happened before
- **Clear, goal-driven logic:** The AI's output is based on what matters to you, like delivery performance, setup time, or cost, not on statistical guesswork

This makes RL not only realistic for SMEs, but especially valuable in today's volatile environment. It gives planners a way to test responses before reacting and to adapt faster when disruptions hit.



What AI Can't Do

Despite its benefits, AI is not a silver bullet. It can't compensate for missing planning logic, unstructured processes, or lack of team buy-in. And it's not a one-click solution for complexity.

Here's where its limits show:

- Planning logic or master data is missing or inconsistent
- Expectations are unrealistic ("The AI will figure it out")
- The teams affected aren't involved in the process

AI works best when it's used for what it does well: simulating possibilities, surfacing trade-offs, and giving planners a better basis for decisions. It is a co-pilot, not an autopilot.

5 Perceived Risks of AI Adoption

and why they're manageable.

Despite the rising interest in AI for manufacturing, many companies hesitate to move forward. Not because they doubt the potential, but because they see a gap between the promise of AI and what feels feasible in their own environment.

The perceived risks are real and understandable:

- “Do we have enough data?”
- “Will this work in our factory setup?”
- “Do we need a full digital transformation first?”
- “Is this a black box our team won't understand?”
- “Can we even afford this — in time, money, or resources?”

For small and mid-sized manufacturers in particular, these concerns can quickly add up to inaction. But not all AI is the same. Modern, simulation-trained approaches like Reinforcement Learning address many of the traditional barriers that have made AI feel out of reach. Instead of relying on massive datasets or fully automated factories, RL learns in a virtual replica of your factory setup and adapts to the constraints you already work with. This makes AI not only more accessible, but also more aligned with how production planning actually happens on the ground.

Let's take a closer look at the five most common concerns about adopting AI and see if and how modern approaches help mitigate or avoid them.

1. “We Don't Have Enough Data for AI to Work”

The concern

Many believe that AI only works if you already have years of clean, structured historical data.

The reality

That's true for traditional machine learning. But not for simulation-trained RL. Phantasma's AI learns in a digital twin, a virtual model of your factory's planning environment. It uses your current setup (e.g. machines, shifts, rules) to simulate thousands of planning decisions and learn the best strategies from scratch. No large datasets required.

How this helps you

Even if your data isn't perfect or complete, you can get started by simply exporting current ERP parameters.

2. “AI Projects Are Too Complex and Resource-Intensive”

The concern

AI adoption sounds like a multi-year IT overhaul that disrupts operations and drains budgets.

The reality

With a modular, integration-first approach, you can keep your existing planning setup and add AI as a lightweight add-on. Phantasma’s RL engine runs inside your ERP or planning board, requiring no separate interface or platform. You can test it in a single pilot, for example, one product group or plant, before scaling.

How this helps you

You avoid long change cycles and gain value quickly by starting small.

3. “We’re Not Digitized Enough for AI”

The concern

Manufacturers with limited automation or Industry 4.0 infrastructure often assume AI is out of reach.

The reality

Simulation-trained RL is especially suited to SME environments, because the AI learns from your rules and logic, not from sensors or IoT devices. All it needs is structured input data: orders, routings, shift schedules, machine constraints — typically available from your ERP system or Excel exports.

How this helps you

You can skip the automation race and still make smarter, faster planning decisions.

How Reinforcement Learning AI Lowers Adoption Barriers	
Concern	How Phantasma’s AI Approach Mitigates it
No big data	AI Agents can be trained in simulated environments instead of historical factory data
Complex projects	Runs inside existing tools, no rebuild needed
Low digitization	Integrates seamlessly with all common ERP and MES tools
Trust Issues	Offers scenario comparisons, not black-box results
No internal AI team	Delivered as a service, with full support

4. “It’s Too Hard to Trust AI With Something This Critical”

The concern

Planners and managers may worry that AI will override their experience or make ‘black-box’ decisions they don’t understand.

The reality

AI in planning should support, not replace your team. Phantasma’s RL-based AI provides clear, explainable alternatives, including scenario comparisons and KPI trade-offs. Your team stays in control: reviewing, approving, or modifying the AI’s suggestions as needed.

How this helps you

You gain speed and insight without giving up oversight.

5. “We Don’t Have the In-House Expertise to Run This”

The concern

Companies may feel unequipped to manage an AI project internally.

The reality

You don’t need an internal data science team. Phantasma delivers a ready-to-use AI module tailored to your planning environment. Our onboarding process includes use case definition, digital twin modeling, and hands-on testing – all in under six weeks.

How this helps you

You get expert-level AI capabilities with minimal internal lift.

**Still unsure if AI-supported planning is right for your factory?
Let’s find out together – Book your **AI Readiness Check** now.**

Maybe you’re wondering if your data is structured enough, if AI can really support planning for your kind of production, or if the effort is worth it at all. Or maybe you have concerns we didn’t address here.

We’re happy to evaluate together whether AI-driven planning makes sense for your operations, what a realistic path could look like, and what would be needed from your side to get started – based on your individual challenges and goals.



**Book your AI
Readiness Check
with our Team!**

6 Implementing AI: Build or Buy?

Three Practical Paths to AI-Driven Planning

Not every company wants or needs to switch immediately to a fully AI-driven planning system. And with today's business uncertainty, most can't afford to bet on a long, expensive transformation project.

What's needed are realistic steps that help teams work more flexibly, plan with fewer blind spots, and reduce firefighting. The good news is that AI-supported planning can be introduced in stages – based on your existing setup, available resources, and how much control you want to keep.

From conversations with manufacturers and recent project experience, three practical paths have emerged:

1 Develop AI In-House

Some companies explore building their own AI solutions, for example, using internal data science teams or by hiring external consultants. While technically possible, this option is often tied to high costs, long development cycles, and unclear expectations around return on investment.

For most small and mid-sized manufacturers, it's not realistic. This is especially true if historical data is limited, internal IT resources are already stretched, or there's no clear business case for building a custom tool.

2 Integrate External AI Into Existing Planning

Many companies want to modernize their planning without tearing everything down. They're looking for a solution that fits into current processes, reduces risk, and allows them to grow into more advanced capabilities when the time is right.

A practical starting point is to integrate a specialized AI module into your existing planning system, for example, into an ERP-based planning board. This lets you keep the current workflow while layering on powerful features like scenario simulation, KPI-based prioritization, or disruption handling.

This path works well for manufacturers who are already using digital planning boards and want to strengthen decision-making without rebuilding the entire process.

3 New Tools With Built-In AI Options

If your company is already adopting a new ERP system or switching to a more modern planning tool, it's worth choosing one that offers multiple planning modes: from manual to automatic to AI-supported. That way, you can scale up gradually, test the new logic in practice, and avoid overloading your team.

Solutions like **PlanningNow** or **BusinessNow** (developed by Vectotax, with optional AI integration from Phantasma Labs) are built specifically for this approach. They're user-friendly, scalable, and designed to support the needs of mid-sized manufacturing teams.

Each tool includes three planning modes you can activate based on your current needs:

1. Manual Planning (Drag & Drop)

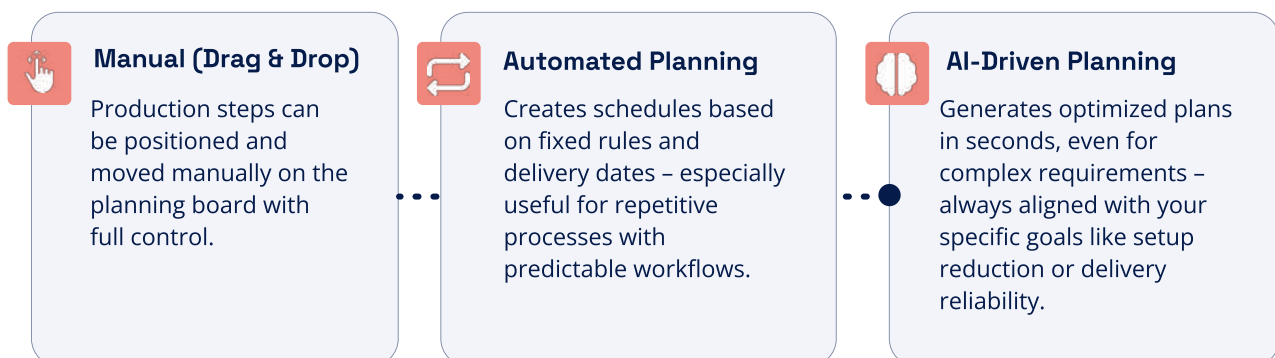
- Assignment of production tasks via drag-and-drop
- Clear visual overview with Gantt charts, multiple views, and timeline displays
- Group tasks by order or cost center to maintain full transparency
- Ideal for teams transitioning from Excel or paper-based workflows

2. Automated Planning

- Plan forward or backward based on delivery deadlines
- Automatically detect capacity bottlenecks or resource conflicts
- Rule-based prioritization and workload balancing based on predefined planning logic

3. AI-Supported (with Phantasma Labs)

- Seamless integration of advanced AI into the planning board
- Generate optimized, constraint-aware production schedules within seconds
- Forward and backward planning based on delivery dates or earliest possible start times
- Optimization of plans according to selectable goals, such as minimizing setup time, maximizing throughput, or improving delivery reliability
- Fast plan generation within seconds allows for testing and comparing different planning scenarios before executing



7 Taking the First Step

How AI fits into planning and what's needed to get started

No Big Data Project – But a Solid Foundation

Getting started with AI-driven planning doesn't require massive IT infrastructure or years of clean historical data. Modern approaches, especially those using simulation-based reinforcement learning, work with what's already available in your systems: your process logic, resource limits, and business goals.

For small and mid-sized manufacturers, this means: you might already be closer to AI-readiness than you think. The key is not how much data you've collected, but whether your planning structure is solid enough to use it well.

What helps most at the start:

- A well-defined planning logic (e.g. setup rules, shift allocation)
- A reliable technical infrastructure (such as an ERP system)
- A clear understanding of what you want to improve with AI, whether it's boosting delivery reliability, reducing setup times, or gaining more flexibility

Five Questions for Self-Assessment

These questions can help assess whether your company is ready to explore AI-supported planning:

- ☒ Do you have planning-relevant data available and accessible?
(e.g. orders, BOMs, machines, shifts, availability)
- ☒ Are your planning processes clearly defined and documented?
(e.g. setup rules, shift allocation, priorities, handoffs)
- ☒ Is there a basic technical infrastructure in place?
(e.g. ERP system, planning board, reliable interfaces or export options)
- ☒ How do you currently adjust plans?
(manually, with Excel, by phone, or supported by digital tools)
- ☒ How open is your team to using digital tools or automation?
(expectations, concerns, willingness to participate)

If you can answer "yes" to most of these, you're in a good position to start, without needing to launch a full-scale transformation.

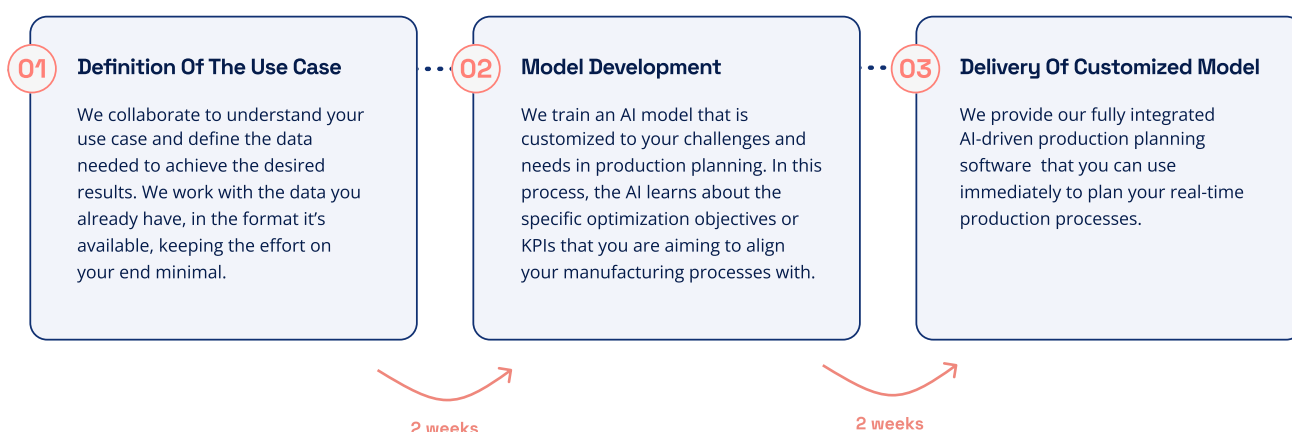
When Should You Consider AI-Driven Planning?

AI-supported planning isn't about replacing what works, it's about upgrading your response when things shift faster than your tools can keep up. You don't need a full overhaul to benefit. If any of these sound familiar, it might be time to explore AI as a co-pilot:

- ✓ Your team spends more time updating schedules than improving processes
- ✓ You regularly scramble when machines fail or urgent orders arrive
- ✓ You'd like to compare multiple production scenarios, but lack the time
- ✓ Bottlenecks, resource shortages and delivery deadlines are hard to handle in parallel
- ✓ Your current tools don't give you an overview across your ability to fulfill orders on time, the utilization of your machines, and other important KPIs

What a Typical Pilot Looks Like

Many manufacturers choose to start with a focused pilot. It's a simple, low-risk way to test how AI can support your planning, using your real data and systems. A typical pilot takes only four to six and follows three simple steps: define your use case, train the model using your data, and receive a ready-to-use planning tool tailored to your factory.



Step by Step – At Your Own Pace

Implementing AI-supported planning doesn't require a complete system overhaul. In most cases, it's about building on what's already in place and making the planning process more flexible, one step at a time.

Whether it's extending an existing tool, adding new functions, or exploring modern planning solutions, success doesn't depend on taking a giant leap. It's about finding the right entry point that builds on what works and addresses what doesn't. In 2025, flexibility matters more than perfection. And a practical starting point that fits your team and your tools will get you much further than waiting for the "perfect" moment.

Curious to Learn More?

If you're having challenges with planning, you're not alone. Many manufacturing teams are in the same position: trying to ease the pressure, improve visibility, and regain control of day-to-day planning.

Some are already using a digital planning board and want to explore what's next. Others are at the beginning of a system rethink and want to know what a realistic upgrade might look like.

Wherever you're starting from, we'd be happy to support. On our website, you'll find more on how AI-supported planning works, real-life examples, and a way to get in touch. We're happy to hear from you!

[Check out
website](#)



[See How AI-Driven
Planning Works](#)



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