



The buyer's guide to CAD for facilities layout

Choosing software to plan, design,
and validate your factory



Ready to start your factory transformation journey?

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Agility and flexibility are the hallmarks of a successful factory today

Agility (n): the ability to move quickly and easily

Flexibility (n): the ability to be easily modified

Agile, flexible factories arrive at optimized processes earlier. They accelerate review cycles. They eliminate repetitive, time-consuming design tasks. They have fewer errors and less rework. They start from a foundation of accurate real-world conditions. They don't compromise on quality.

The promise of agility and flexibility is highly resilient factories that can rise to whatever comes next. But how can this promise be delivered?

“It is absolutely necessary for us to have highly efficient and flexible factories regarding all aspects: sustainability, productivity, and global infrastructure. This efficiency and flexibility is the basis of our resilience.”

Maximilian Viessmann, CEO, Viessmann Group
Breaking Down the Barriers to More Collaborative Factory Projects, Harvard Business Review Analytic Services, 2022



Why facilities layout software matters

Check all that apply:

- ✓ We often have to deliver new, different, or customized products that require reconfiguration of processes.
- ✓ Smaller batch sizes are more common today than they used to be.
- ✓ We have similar facilities around the world but we lack productive interaction.
- ✓ We are constantly looking for ways to optimize our processes.
- ✓ More of our facilities are moving onshore or consolidating.
- ✓ We are facing challenging sustainability requirements.
- ✓ We don't have enough skilled workers.
- ✓ Our supply chain is overwhelmed or has become unreliable.

These are some of the most common circumstances impacting factories today. The problem is that current ways of working are too siloed and too two-dimensional to address them fast enough.

That's where the right technology makes a difference—by bridging gaps and unlocking digital, automated ways of working.

“Digital platforms are key to enable seamless coordination between the different subject matter experts involved by offering access to the latest information. Combined with the advancements in digital twin technology and simulation, we have enablers at our fingertips that offer the potential to front-load projects at a reasonable cost and thereby reduce implementation risk.”

Rupert Hoecherl,
Managing Director & Partner, io-consultants

Breaking Down the Barriers to More Collaborative Factory Projects, Harvard Business Review Analytic Services, 2022

Productization of factories

Let's take a look toward product design and engineering.

All industries have been subject to quickly changing customer demands for increasingly complex products. In response, companies adapted the ways they design and engineer their products, thinking of them in lifecycles and often adopting agile development methods, concurrent engineering, and systems engineering.

Now imagine: what would it mean to your business if your factory design team could replace traditional, siloed processes with the agile, flexible approach that has revolutionized product design? What if the integration and collaboration principles we see in product design and engineering can be applied to factory planning, design and validation as well?

3 things make this possible:

- 01 Digitalization
- 02 Data integration
- 03 Convergence of manufacturing with architecture, engineering, and construction (AEC)

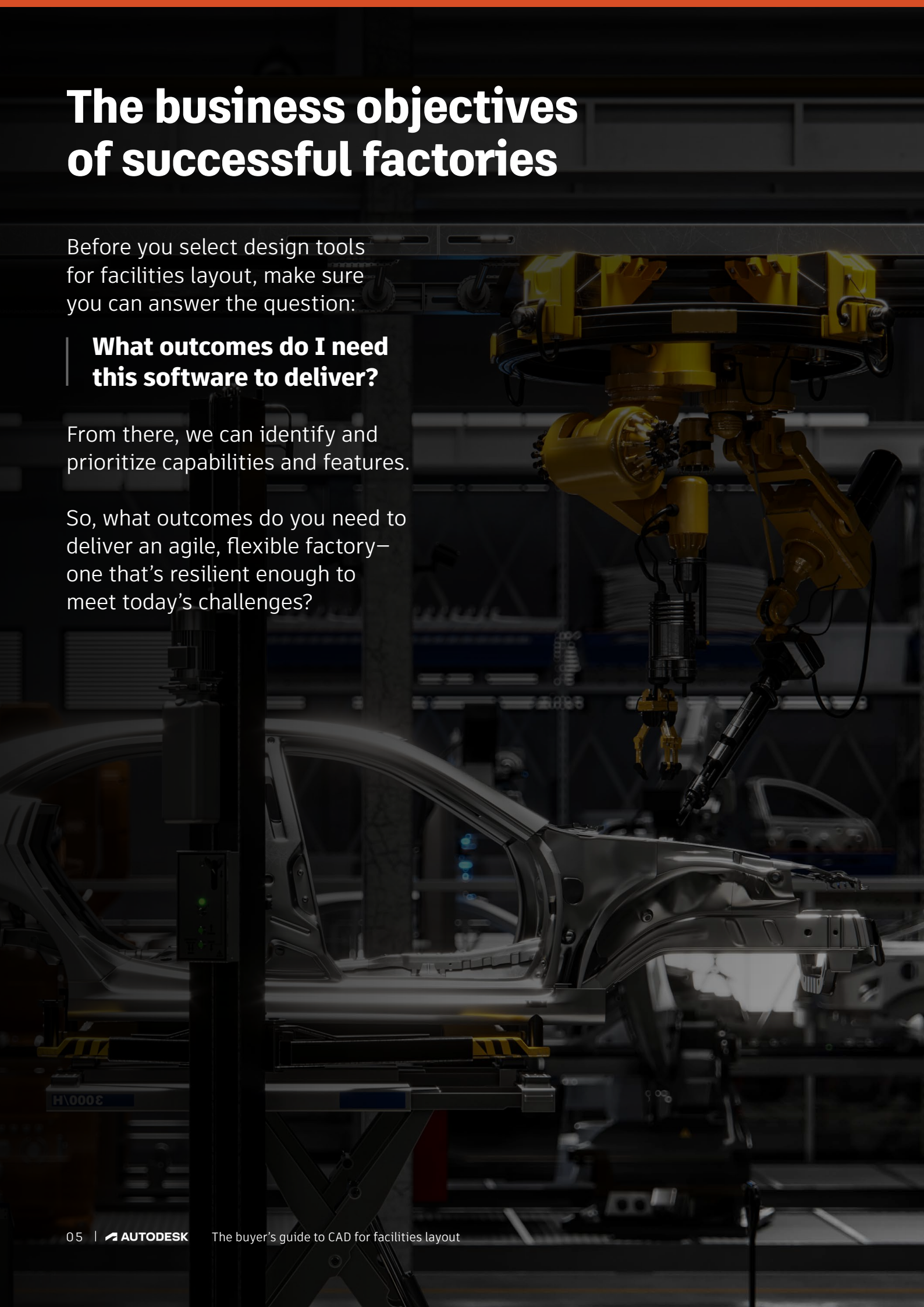
These movements together are breaking down silos so you can optimize production quality and efficiency. And the impact doesn't stop there. Every phase of the factory lifecycle—from planning, to design, to validation, to build, to operation—has something to gain.

“We believe that the steps already being taken in product design and engineering in terms of integration and collaboration are also leading the way for manufacturing operations.”

Srinath Jonnalagadda, Vice President,
Industry Strategy, Design & Manufacturing, Autodesk

Breaking Down the Barriers to More Collaborative Factory
Projects, Harvard Business Review Analytic Services, 2022

The business objectives of successful factories

A yellow industrial robotic arm is positioned above a car chassis on an assembly line. The background shows a factory environment with various mechanical parts and structures. The lighting is dim, highlighting the robot and the car body.

Before you select design tools for facilities layout, make sure you can answer the question:

What outcomes do I need this software to deliver?

From there, we can identify and prioritize capabilities and features.

So, what outcomes do you need to deliver an agile, flexible factory—one that's resilient enough to meet today's challenges?

I need to...

Optimize the factory design

Optimizing the factory design helps you:

- **Cut down excessive changeover time and costs**
- **Meet customer and market demands**
- **Address lack of floorspace**
- **Improve cross-functional collaboration**
- **Deliver on time more consistently**

Support any product lifecycle—no matter how short—and respond to external factors that necessitate quick reconfiguration.

To optimize a factory design for quality and efficiency, you must achieve a high degree of coordination between manufacturing processes, the production line, and the building facility during the factory design process. Manufacturing strategy, equipment planning, space planning, material flow analysis, and facility planning have to be aligned. Designing concurrently with engineering also accelerates efficiency.

Suggested success metrics:

- Plant capacity
- Production losses
- Project spend vs. budget
- Number of days to design the factory
- Number of design issues resolved
- Actual vs. planned target to plan
- Space occupied
- Resource requirements

Tip: Provide a baseline measurement and monitor the health of one or more criteria. Consider which metrics are most important to your company. What measure would indicate success? What measure would indicate failure?

I need to...

Increase manufacturing throughput

Manufacturing throughput can be increased by:

- **Cutting down excessive production downtime or overprocessing**
- **Reducing lead time**
- **Meeting customer and market demands**
- **Improving production capacity**
- **Improving resource utilization**
- **Increasing production yield**
- **Eliminating unplanned line stoppages**

Deliver more products sooner, potentially accelerating or increasing profits.

To increase manufacturing throughput, you must have visibility into where value is lost and gained during the manufacturing process. Then, you can look for opportunities to cut losses and improve availability, performance, and quality yield. Simulating material flow, designing products for manufacturing, and reducing product complexity are a few ways value can be regained in the manufacturing process. Opportunities to improve yield can be found in process design, operator or machine reliability, process adherence, product design, tooling, fault detection, and sign-off between processes.

Suggested success metrics:

- FTT/Yield = percentage good parts
- Production output vs. schedule
- Machine capacity utilization
- Production capacity utilization
- Unplanned downtime or stoppages
- Time to produce product

I need to...

Improve time to market

Improving time to market helps you:

- **Decrease design cycle time**
- **Decrease time to decision**
- **Rapidly explore design options**
- **Quickly get a product to manufacture**
- **Increase cross-functional collaboration**
- **Increase design efficiency**

Gain competitive advantage by reacting to market changes faster—one step ahead of your competitors.

Every discipline in an organization influences the journey of bringing a quality product to market. For production engineering, maintaining rigor and standards while reducing time frames can be achieved through efficient design workflows for factory layouts, productive design reviews where clashes and other issues are detected earlier, and front-loaded material flow analysis.

Suggested success metrics:

- Revenue margin
- Market share
- Time to market
- Part release status
- Number of product issues at launch
- Actual vs. planned target to plan

I need to...

Reduce non-value-add processes

Reducing non-value-add processes helps you:

- **Improve resource utilization**
- **Establish standard processes**
- **Get to market faster**
- **Improve cross-functional collaboration**
- **Open more time for innovation**
- **Simplify IT infrastructure**

Reduce dependency on finite resources in the face of external pressures such as a shortage of skilled workers, supply chain volatility, and energy regulations.

Most companies aren't getting maximum value from their current resources. Repetitive and mundane tasks take time away from innovation that can differentiate a business. Breaking down data silos is the key to freeing teams from redoing the same work again and again, while digitizing processes enables automation—which can significantly reduce the number of clicks it takes to get a job done so teams can focus on their most impactful work.

Suggested success metrics:

- Project resources
- Planned vs. actual cost and time
- Target productivity vs. actual per employee
- Direct resource costs
- Number of new products introduced

I need to...

Reduce errors and rework

Reducing errors and rework helps you address pressure from clients regarding margins, production speed, and quality of work so you can curb total project cost.

It's one thing to see a factory layout. It's another thing to see a factory layout in the context of a building. A combination of reality capture data, building information modeling (BIM), and digital factory planning provide a comprehensive and realistic view of a facility—where interferences, clashes, and material routing issues can be readily detected and quickly fixed well before construction begins.

Suggested success metrics:

- Decrease in errors
- Decrease in warnings
- Decrease in RFIs

Key capabilities for production engineering

Now that you have defined your target outcomes, you can determine the key capabilities you need your software to support.

They are:

Factory layouts and planning, or the ability to geometrically lay out and plan factory floor space.

Factory simulation, or the ability to simulate and assess the factory production environment through geometry and event simulation.

Mechanical design, or the ability to design mechanical products using CAD.

Existing conditions modeling, or the ability to produce an accurate representation of existing site conditions.

Design collaboration, or the ability for multiple departments, external stakeholders, and clients to collaborate on a design.

Coordination, or the ability to coordinate design and trade inputs to ensure the project can be executed as intended.

Let's take a closer look at each one.

Factory layouts and planning

Your software should enable you to geometrically lay out and plan factory floor space. Look for features that allow you to:

- Visualize digital models that include all machines, components, and scans aggregated from many original sources—regardless of file type or size.
- Combine the capabilities of 2D and 3D CAD to design layouts using your preferred workflows.
- Navigate, explore, and review even the largest and most complex models on a standard computer with smooth walk-through animations.
- Check for clashes and manage interferences well before construction is underway.
- Create standard libraries of assets and automate tedious, repetitive tasks so you can design more efficiently.

Path to maturity

- L1** Develop introductory 2D models to support factory planning.

- L2** Standardize on 3D models to help the organization and third-party contractors with planning.

- L3** Integrate processes and associated BIM data into a 3D model to further mature factory planning.

- L4** Inform factory layouts with performance data from digital twins.

- L5** Integrate industry-leading digital twins with enterprise systems. Update with real-time parameters and make available to all invited and relevant parties.

Technica International automated their workflows to reduce design time by half.

[→ Read their story](#)

Solution:

 AutoCAD

 Factory Design Utilities

 Inventor

Factory simulation

Your software should enable you to simulate and assess the factory production environment through geometry and event simulation. Look for features that allow you to:

- Analyze material flow for resource utilization, system capacity, process improvement, throughput, and bottlenecks.
- Test new process and system design or improvement ideas before committing time and resources necessary to making changes.

Path to maturity

- L1 Simulate in 1D and map manufacturing processes digitally.

- L2 Simulate in 2D and define manufacturing processes.

- L3 Conduct 3D static visualization and discrete event simulation.

- L4 Use augmented or virtual reality to assess the factory layout and manufacturing processes using real-time data.


- L5 Use IoT and production systems to drive production simulations. Generatively design processes to product, factory, and supplier constraints.

Porsche uses virtual reality to test production flow at their new electric car facility.

[➔ Read their story](#)

Solution:

 AutoCAD

 Factory Design Utilities

 ProModel

Mechanical design

Your software should enable you to design mechanical products using CAD. Look for features that allow you to:

- Use a mix of parametric, direct, and freeform modeling capabilities.
- Create digital assets of equipment that can be plugged into factory layouts.
- Create standard libraries of assets and automate tedious, repetitive tasks so you can design more efficiently.
- Capture all data needed for event simulation in standard models, preventing the need to re-input data.
- Use existing 2D data to build 3D models and create manufacturing documentation using the familiar DWG format.
- Open non-native CAD models without translation while maintaining associativity.

Path to maturity

- L1 Standardize on mechanical drafting templates.

- L2 Create drawings quicker and more efficiently for dimensioning and visual hidden lines.

- L3 Enrich drawings with more functionality for downstream usage based on application area, like electrical or building design.

GEA reduced engineering time from three weeks to two hours.

[→ Read their story](#)

Solution:



Existing conditions modeling

Your software should enable you to produce an accurate representation of existing site conditions. Look for features that allow you to:

- Understand and verify existing conditions and as-built assets to gain insights and make better decisions.
- Use a point cloud model in support of BIM processes and collaborate across teams referencing real-world conditions.
- Register point cloud data without targets or markers.

Path to maturity

- L1 Develop an existing conditions model from imported CAD image files and existing survey data. Export for detail design.
- L2 Standardize processes for wider use, adding the ability to import and export GIS. Use ARC GIS connectors.
- L3 Extract features from reality capture data and automate management and manipulation of survey data. Processes are solid and repeatable.
- L4 Practices, outcomes, and insights allow for targeted process refinement and the ability to work through complex design issues with high level of interdependency of capabilities.
- L5 Existing conditions modeling is targeted for defining state-of-the-art practices and maximizing impact of business outcomes and values.

Brioche-Pasquier combines scans with design data to create digital models of their factories.

[→ Read their story](#)

Solution:

 Revit

 ReCap Pro

Design collaboration

Your software should enable multiple departments, external stakeholders, and clients to collaborate on a design. Look for features that allow you to:

- Easily collect work-in-progress feedback from anyone, anywhere, on any device.
- Seamlessly integrate data management with your CAD tools.
- Ensure everyone is working from up-to-date information in a system that automatically tracks changes, maintains past file versions, and captures the entire history of your designs.
- Provide a central source of data in a system that allows users to check in and check out files ensuring they are not overwritten.

Path to maturity


- L1 Files can be shared within internal departments.
- L2 Files can be viewed by non-authoring departments.
- L3 Stakeholders across the organization can collaborate on files.
- L4 Internal and external stakeholders can collaborate on files.
- L5 Processes are automated between internal and external systems.

“When it comes to our project details, the digital solutions we choose play an important role in ensuring communication and collaboration is seamless and smooth. This is very important, given we are often working to meet very tight timescales.”

Michal Zajac,
Senior Architect and BIM Manager, Blue Projects

[→ Read their story](#)

Solution:

 Fusion 360 Manage with Upchain

 Vault

Coordination

Your software should enable you to coordinate the design and trade inputs to ensure the project can be executed as intended. Look for features that allow you to:

- Visualize and unify design and construction data within a single federated model.
- Identify and resolve clash and interference problems before construction begins.
- Conduct large-scale design reviews with virtual flythroughs of data aggregated from many original sources, including building models, equipment and layout designs, and scans.

Path to maturity


- L1 Digital 2D or 3D spatial coordination with project-by-project standards and methods, in which issue management is project and coordination specific.
- L2 Standardized model-based spatial coordination, BIM standards, and integrated issue management with meeting minutes and authoring software. Company-wide reporting.
- L3 Analyze and promote coordination compliance using company-wide data, including assurance of early and frequent spatial, quality, and safety coordination.
- L4 Correlate quality data to other data sources—like safety and schedule—to inform decision making. Design for quality and use visualization for training.
- L5 Automated and real-time quality management, including predictive analytics, based on account and industry data collection.


“The factory isn’t made up only of a building. There are a lot of conveyor systems, a lot of steel structures, machinery equipment, and so on [...] to coordinate or maintain this entire digital spectrum is not a common process yet.”

Robert Ostermann,
Factory Designer, Magna Steyr

Breaking Down the Barriers to More Collaborative Factory Projects, Harvard Business Review Analytic Services, 2022

Solution:

 BIM Collaborate Pro

 Navisworks

3 key qualities of factory solutions

That's a lot of capabilities and features to consider, but they all share a few common denominators that can serve as top-level filters as you choose a solution:

They integrate data from all disciplines and stages of the factory lifecycle.

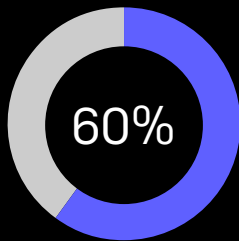
Ideal factory solutions don't exist in silos. They enable collaboration between everyone involved in planning, designing, validating, building, and operating the factory by unifying them around a single data source—closing the factory lifecycle loop and allowing you to tap into the full value of your data every step of the way.

They digitalize the factory.

Mature factory layout workflows rely on digital representations of equipment, layouts, and buildings that aggregate always-up-to-date data. They are holistic, highly visual, and current—so you can not only make more informed decisions, but make sure you're working from the correct information.

They represent convergence of industries.

Digital factory planning is only half the story. The other half is BIM. Strong factory solutions recognize that first and foremost, a factory is a building. Whether it's a greenfield project or a retrofit, your technology should enable you to design within the full context of the building from day one.



Of worldwide organizations identify industry ecosystems as a key priority for technology investment in the next two years to ensure long term resilience and success.

Building Resilient Manufacturing and AEC Companies, IDC, 2021

Why Autodesk?

For production engineers who plan factory layouts, Autodesk provides purpose-built design tools to optimize production quality and efficiency. Unlike other point solutions, Autodesk design tools flex to your preferences, integrate data across the factory lifecycle, and connect project stakeholders in one digital ecosystem.

Autodesk design tools are:

Efficient. Design workflows minimize repetitive tasks and disconnected processes that slow you down so you can get to work on the things that matter most.

Integrated. Collaborate seamlessly with the entire project team, no matter what tools and file types they're using.

Mature. Get industry-leading factory layout and planning software, trusted by designers and engineers and enhanced based on user feedback.

Plan factory layouts your way—but never in a silo—with efficient, accessible CAD built for convergence.

Facilities layout software

F Factory Design Utilities

I Inventor

V Vault

A AutoCAD

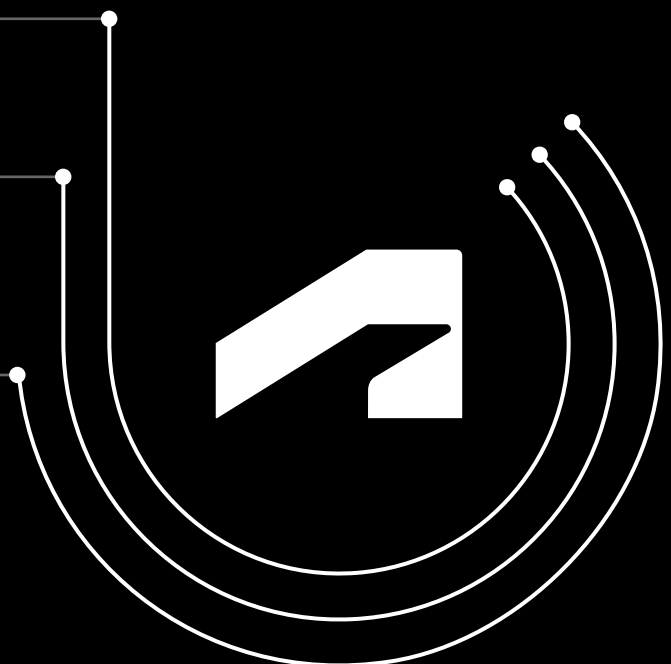
R ReCap Pro

R Revit

N Navisworks

C BIM Collaborate Pro

 ProModel



Leading companies choose Autodesk

“Our old tools didn’t have 3D, so we always had to go on site to take measurements. That’s an obstacle we’ve overcome thanks to BIM, which allows us to work in 3D. And because we have a digital model of our facilities, we can access the data remotely.”

Robin Riou, BIM Project Manager, Safran

“Now our work is much easier because we’re building a library of factories. We just take the 2D mechanical representation from the library, place them in the layout drawing, complete the configuration, and synchronize it all to 3D. None of our work is lost in the transition, so we can meet our deadlines faster.”

Assaad Hani, Business Analyst, Technica International

“Traditionally, our industry has worked on 2D, flat pieces of paper. Factory Design [Utilities] has allowed us to transition to 3D and I don’t see us going back. I think from here on out we’re going to be in a 3D world, along with all of our suppliers and all of the companies that interface with us. It’s going to make it a lot easier for us to work in the 3D world.”

Chris Hahn, Project Engineering Manager, Dearborn Mid-West

Next steps

Ready to take your design tools to the next level? We’re here to help you develop the capabilities you need to reach your goals.

➔ [Schedule a consultation](#)

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