2021 INDUSTRY CAPABILITIES BENCHMARK REPORT

Insights from over 1,000 business leaders, managers, and professionals on the most important capabilities they need to thrive over the next 5 years.
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Why capabilities matter

Autodesk is continuously working to help businesses as they adapt to an increasingly digital, data-driven, and automated world. A critical component of helping companies thrive, now and in the future, is understanding what capabilities they need to be successful. We collected feedback from over 1000 business leaders and professionals, from 617 companies, across the Building Design, Civil Engineering, Construction, and Manufacturing industries.

A capability is a combination of workflows, technology, data, and skills a team needs to perform a critical business process or function, such as co-authoring a model.

Autodesk is using this feedback to align our Success Planning practice with the areas where our customers are looking for the most expertise and guidance.

Intent to Invest

“How will your organization be investing in improving your capabilities over the next 12 months?”

45% investing more
47% investing the same
7% investing less
At Autodesk, we believe that our success is predicated on the success of our customers. For us to reach our goals, we must help organizations improve their capabilities and realize better outcomes across their projects and initiatives.

Recently, we collaborated with a broad spectrum of businesses to identify and document important outcomes and the associated success metrics.

This “Outcome Framework” provides us with a common language to better understand the unique needs of each business, recommend relevant capabilities to develop, and connect them with the resources they need to move the needle. By focusing on the right workflows, companies can maximize the ROI of their technology investments.

The framework also provides us with a standard approach to comparing maturity-level among companies in each industry, giving them guidance on where they may be leading the pack or at risk falling behind.

**Outcomes**
*Measurable goals your business wants to achieve*

**Capabilities**
*Your organization’s workflows, technology, data, and skills*

**Accelerators**
*Coaching & courses included in your Autodesk plan*
OVERVIEW

1,068 total participants

Number of Responses by Country

- No data
- ≤ 10
- 10 - 25
- 25 - 50
- 50 - 250
- ≥ 250
OVERVIEW

Industries Represented

- Building Design: 44%
- Manufacturing: 20%
- Civil Engineering: 11%
- Construction: 25%

Roles

- Technology Manager: 34%
- User: 20%
- Manager: 13%
- Senior Leadership: 33%

Company Size

- 1-19 employees: 50 employees
- 20-49 employees: 32 employees
- 50-99 employees: 13 employees
- 100-499 employees: 22 employees
- 500-4,999 employees: 16 employees
- 5,000 employees: 11 employees

Technology Usage

“Which of the following describes your engagement with Autodesk products?”
(Multiple selections permitted)

- I install, deploy, or manage licenses: 24%
- I use the software: 39%
- I install/update my own software: 28%
- I do something else: 9%
With limited time to train new employees and review drawings, it is essential that we get the entire firm using the established standards and workflows, both to work more efficiently and to reduce errors.

– Production Designer on BIM
Most Important Capability Areas

56% of respondents selected BIM, followed by 11% choosing Design for Constructability.

- Building Information Modeling (BIM): 56%
- Design for Constructability: 11%
- Computer Aided Design (CAD): 9%
- Project Delivery: 6%
- Design Analysis: 6%
- Visualization: 3%
- Computational Design: 3%
- Generative Design: 2%
- Process Automation: 2%
- Predictive Design: 1%
- Operational Strategy: 1%

By Emily Bisaga Dunne

Well over half of the participants in the architecture industry ranked Building Information Modeling (BIM) as the most important area for their teams to develop capabilities in. When we think about BIM, what we’re really talking about is generating and managing digital, data-driven representations of the physical and functional characteristics of a place.

Driven by global mandates around ISO 19650, we’re seeing a shift in the market for firms to fully transition to BIM processes. The need for this investment is continuous as clients have increasing expectations, from model delivery through operations.

"We aim to become BIM Level 2 accredited, transitioning from predominantly 2D CAD to Revit and BIM projects."

– Designer/Engineer on BIM

There is much to gain when adopting BIM into your design process, from winning more projects to producing higher quality designs. BIM is also foundational for harnessing more advanced capabilities, such as process automation or generative design.

Read more about BIM adoption around the world
This data shows the most important capabilities to participants in the area of BIM. Not all industry capabilities are shown.

73% of respondents selected BIM Standards as a top capability, but less than half consider themselves proficient.
Developing standard workflows and methods will greatly benefit cross-project sharing of design resources.

— Technology Manger on BIM

Within the area of BIM, BIM Standards was ranked the most critical capability to develop. The high ranking was consistent across roles, responsibilities, and company sizes. Companies seeking to create and scale consistency are organizing around BIM processes to drive efficiency across projects.

Having well-articulated BIM Standards helps the whole team build higher quality models. Typical standardized workflows include managing linked files, repeating elements, design options, data exchange, design collaboration parameters, phasing, shared coordinates, and level of detail for modeling (LOD).

As part of developing BIM Standards, many organizations have a BIM Execution Plan, which includes project strategy, goals and framework, and a project homepage.

Learn how a BIM Execution Plan can help you win customers
Most respondents felt that they had proficiency with Architectural Detailing, but saw a bigger gap in MEP Design for Fabrication, which was the 2nd highest ranked capability.
After BIM, Design for Constructability was selected as the next crucial area for building design firms. Architects and engineers looking to lead with highly functional and technically considered designs were eager to improve capabilities in Architectural Detailing, Cost Estimation, and Design for Pre-Fabrication. With the lines between design and construction blurring, each industry is demanding higher levels of collaboration and involvement both earlier and later in the project timeline.

Computer Aided Design (CAD) capabilities were also viewed as important, particularly among smaller companies seeking more developed skills for Digital Drafting and Drawing Management. Of the respondents who selected CAD capabilities as most critical, nearly 80% work for companies with less than 50 employees. These results highlight ongoing demand for a lightweight, horizontal solution to quickly develop two-dimensional drawings, often optimized for construction and detailing.

Emily Bisaga Dunne is the Industry Outcomes Lead for Building Design at Autodesk.
A big part of our design practice is in the 0-30% range of civil design development. Having more staff with advanced software capabilities will help us consider more design options in less time.

– Engineering Associate on Conceptual Design
By Lee Zebedee

Like Building Designers, the Civil Engineering industry continues to adopt and implement BIM processes, with over 50% of participants selecting BIM as the most important area to develop their capabilities.

Today, infrastructure projects are significantly more complex, and owners increasingly demand BIM deliverables as they seek continuous improvements throughout the asset’s lifecycle. In 2016, the UK became one of the first governing bodies to demand BIM as a deliverable on all public-sector projects. We now see BIM mandates or policies in 12 countries, with an additional 13 on the horizon, as more governments seek to harness the benefits of data-driven models.

Within the area of BIM, participants ranked BIM Standards, Model Authoring, and Data Enrichment, Management and Delivery as the most critical capabilities to develop over the next 3-5 years.

“\nIt goes without saying that a model for any type of design is going to provide many more downstream benefits that would not exist otherwise.\n”

– Technical Specialist on BIM

Learn our workflows for Advanced Bridge Design
BIM Standards, Civil Structure Model Authoring, and Data Enrichment, Management and Delivery were all called out as relatively important capabilities with lower proficiencies.
After BIM and CAD, **Project Delivery** was the priority focus area for civil engineers. Creating designs in isolation is demanding enough, but working together as a team to successfully deliver a project is a much greater challenge.

With projects becoming more complex, project teams need better ways of collaborating. The contracts that bind project stakeholders are evolving and the technology and processes that support these teams must also evolve.

*Lee Zebedee* is the Industry Outcomes Lead for Civil Engineering at Autodesk.

> Project delivery is the engine of our business. Focusing on excellence in project delivery, by using innovative approaches, is how we deliver value for our clients and lasting improvements for society and the natural environment.

– Head of Project Technology on Project Delivery

Read more about BIM collaboration for Project Delivery
Design Coordination and Review was the clear favorite among Project Delivery capabilities. Project Management, Model Co-authoring, and IT Infrastructure Readiness also stood out, perhaps highlighting the impact of increased remote work.
We feel that by getting better at estimating, we can hone in our bid number and win more projects. In addition, if we can increase our pre-fabrication opportunities once we get the work, then we will be able to make a better profit.

– Mechanical Designer
In the Construction industry, 40% of participants selected **Coordination** as one of their top 5 capabilities, with firms striving to synchronize design input across trades to ensure the project is built as intended.

Poorly coordinated designs can lead to constructability issues on site, often resulting in rework. These issues affect project costs, as time taken to redesign and rebuild eats into the schedule, labor costs, and material costs. Having structured model review and clash detection processes between trades can save time and money by identifying and resolving issues before they impact progress on site.

After Coordination, **Document Management** was the next highest ranked capability, highlighting the foundational need for all project parties to be working on the most up to date information. Keeping the site teams working on the same drawing set or project model as the office-based teams is critical to reducing unwanted rework on the jobsite.

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**Check out our guide to Coordination with BIM 360**

**Better document management workflows will drastically save time and energy spent currently.**

— Project Manager
CONSTRUCTION CAPABILITIES

**Top Ranked Capabilities to Develop** (% selected as top 2 capability)

<table>
<thead>
<tr>
<th>Capability</th>
<th>% Selected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordination</td>
<td>27%</td>
</tr>
<tr>
<td>Design Collaboration</td>
<td>23%</td>
</tr>
<tr>
<td>Design Detailing</td>
<td>22%</td>
</tr>
<tr>
<td>Document Management</td>
<td>20%</td>
</tr>
<tr>
<td>Bid Management</td>
<td>16%</td>
</tr>
<tr>
<td>Cost Management</td>
<td>11%</td>
</tr>
<tr>
<td>Estimating</td>
<td>10%</td>
</tr>
<tr>
<td>Commissioning</td>
<td>9%</td>
</tr>
<tr>
<td>Quality Management</td>
<td>8%</td>
</tr>
<tr>
<td>Safety Management</td>
<td>8%</td>
</tr>
<tr>
<td>Layout</td>
<td>8%</td>
</tr>
</tbody>
</table>

**Capability Proficiency** (% rating their teams as widely proficient)

<table>
<thead>
<tr>
<th>Capability</th>
<th>% Proficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordination</td>
<td>64%</td>
</tr>
<tr>
<td>Design Collaboration</td>
<td>56%</td>
</tr>
<tr>
<td>Design Detailing</td>
<td>52%</td>
</tr>
<tr>
<td>Document Management</td>
<td>50%</td>
</tr>
<tr>
<td>Bid Management</td>
<td>36%</td>
</tr>
<tr>
<td>Cost Management</td>
<td>32%</td>
</tr>
<tr>
<td>Estimating</td>
<td>39%</td>
</tr>
<tr>
<td>Commissioning</td>
<td>36%</td>
</tr>
<tr>
<td>Quality Management</td>
<td>40%</td>
</tr>
<tr>
<td>Safety Management</td>
<td>46%</td>
</tr>
<tr>
<td>Layout</td>
<td>52%</td>
</tr>
</tbody>
</table>

This data shows the most important capabilities to participants. Not all industry capabilities are shown.

Coordination and Collaboration were key for Construction firms. Bid Management and Cost Management were also notably ranked high for importance and low for proficiency.
Improved Document Management workflows, such as mobile or tablet-based access to drawings and models, can drastically reduce the risk of building based on out-of-date information.

Interestingly, despite many contractors not undertaking the main design work themselves, Design Collaboration was called out as the third most important capability. Design Management teams need to ensure that architects and engineers are collaborating effectively to prevent uncoordinated designs – alleviating some of the root cause for coordination issues. Once onsite, the ability for consultants to quickly and collaboratively iterate the design is essential to avoid schedule slips and the resulting cost overruns. Many contractors are finding that they need to provide the collaboration platform to ensure that this is happening, rather than leaving it to the designers.

Matt Keen is a Senior Industry Strategist for Construction at Autodesk.
MANUFACTURING

“
These capabilities will allow our engineering department have a better understanding of our products and be able to fully rely on our models and data to provide answers to customers, upper management, and the factory floor.

– Head of Engineering
**MANUFACTURING INSIGHTS**

**Most Important Capability Areas**

42% of respondents selected **Flexible Manufacturing**, followed closely by **Collaboration**.

<table>
<thead>
<tr>
<th>Capability</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexible Manufacturing</td>
<td>42%</td>
</tr>
<tr>
<td>Collaboration</td>
<td>41%</td>
</tr>
<tr>
<td>Mass Customization</td>
<td>8%</td>
</tr>
<tr>
<td>Design Analysis</td>
<td>7%</td>
</tr>
<tr>
<td>Product as a Service</td>
<td>3%</td>
</tr>
</tbody>
</table>

*By Rohit Auluck*

**Collaboration** and **Flexible Manufacturing** were ranked as the most important capability areas by Design and Manufacturing firms.

Market pressures are driving the industry to become more agile in their product development and operations. To stay competitive, product makers are getting to market faster by reimagining their factory floors and reducing non-value add tasks through automation.

Manufacturing participants emphasized the need to develop their **Design for Manufacture** capabilities, signaling a need to ensure a product design is actually feasible with the selected materials and available process manufacturing technologies. If overlooked, “manufacturability” issues may lead to late engineering changes, often the culprit in product launch delays. These changes are usually accompanied by expensive manufacturing and supply chain changes.

*Flexibility is decreasing time to market, cutting financial losses, and ensuring better quality control.*

– Engineering Manager

*Read about the top 5 Manufacturing trends in 2021*
Like product designers, flexible facility design teams can uncover potential issues ahead of layout implementation. With improved Design Coordination & Review capabilities for facilities, multiple stakeholders can effectively contribute to the development of a model and even step through it visually prior to execution.

Closely following Flexible Manufacturing, Collaboration was voted as the second most critical area for capability development. Collaboration includes working together within an organization as well as with external stakeholders, such as your supply chain and customers. Breaking down the barriers that lead to siloed work can improve outcomes throughout the product lifecycle and enable better use of design and manufacturing resources.

"It’s all about time and streamlining the flow of data between departments. We produce a lot of bespoke designs so getting info to production quickly and accurately is very important."

– Development Manager

As seen across every industry, the need for effective collaboration tools has only been accelerated by the global pandemic. The shift to remote work through connected technologies is creating new opportunities for organizations to maximize their global resource pool, leading to higher productivity and time savings.
FLEXIBLE MANUFACTURING CAPABILITIES

Top Ranked Capabilities to Develop (% selected as top 2 capability)

<table>
<thead>
<tr>
<th>Capability</th>
<th>% Selected as Top 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design for Manufacture</td>
<td>39%</td>
</tr>
<tr>
<td>Machine Design</td>
<td>24%</td>
</tr>
<tr>
<td>CAD to CAM</td>
<td>22%</td>
</tr>
<tr>
<td>Bill of Materials Management</td>
<td>22%</td>
</tr>
<tr>
<td>Mechanical Drafting</td>
<td>20%</td>
</tr>
<tr>
<td>Design Coordination and Review</td>
<td>12%</td>
</tr>
<tr>
<td>Prototyping</td>
<td>11%</td>
</tr>
<tr>
<td>Manufacturing Automation</td>
<td>8%</td>
</tr>
<tr>
<td>Factory Layouts and Planning</td>
<td>6%</td>
</tr>
</tbody>
</table>

Capability Proficiency (% rating their teams as widely proficient)

<table>
<thead>
<tr>
<th>Capability</th>
<th>% Widely Proficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design for Manufacture</td>
<td>49%</td>
</tr>
<tr>
<td>Machine Design</td>
<td>54%</td>
</tr>
<tr>
<td>CAD to CAM</td>
<td>43%</td>
</tr>
<tr>
<td>Bill of Materials Management</td>
<td>47%</td>
</tr>
<tr>
<td>Mechanical Drafting</td>
<td>63%</td>
</tr>
<tr>
<td>Design Coordination and Review</td>
<td>38%</td>
</tr>
<tr>
<td>Prototyping</td>
<td>40%</td>
</tr>
<tr>
<td>Manufacturing Automation</td>
<td>26%</td>
</tr>
<tr>
<td>Factory Layouts and Planning</td>
<td>29%</td>
</tr>
</tbody>
</table>

This data shows the most important capabilities to participants in the area of Flexible Manufacturing. Not all industry capabilities are shown.

Design for Manufacture stood out as an important capability to develop while few participants cited wide proficiency with Manufacturing Automation.
Data Management is at the heart of collaboration. Recognized as crucially important by respondents in leadership roles, effective Data Management practices on common data platforms can cut design times, improve overall time to market, and increase product development agility. Along with Data Management, Design Collaboration was called out as critical to success, with companies seeking efficient, standardized processes for tracking, reviewing, and approving designs – both internally and externally.

Notably, the survey results indicate a strong desire to develop CAD Interoperability capabilities. Interoperability is key when working with different ecosystems, vendors, and industry standards. Moreover, as we see continued industry convergence, the ability to use data to collaborate across different platforms and working groups has become more imperative than ever.

Rohit Auluck is the Industry Outcomes Lead for Manufacturing at Autodesk.

“We are trying to save the users time and work by more fully integrating our tools, so that the users no longer need to enter the same data into more that one location.”

– Global CAD Manager
MANUFACTURING INSIGHTS

COLLABORATION CAPABILITIES

Top Ranked Capabilities to Develop (% selected as top 2 capability)

- CAD Interoperability: 41%
- Conceptual Design: 35%
- Data Management: 26%
- Design Collaboration: 25%
- Change Management: 21%
- Project Management: 21%
- Model Maintenance: 18%

Capability Proficiency (% rating their teams as widely proficient)

- CAD Interoperability: 49%
- Conceptual Design: 51%
- Data Management: 50%
- Design Collaboration: 41%
- Change Management: 43%
- Project Management: 36%
- Model Maintenance: 47%

This data shows the most important capabilities to participants. Not all industry capabilities are shown.

CAD Interoperability was the highest ranked Collaboration capability in terms of importance, while self-rated their Project Management proficiency lower.
When it comes to thriving in disruption, Autodesk has found that teams who are continuously developing new capabilities to stay ahead of the curve are more adaptable, achieve better outcomes, and are ultimately more successful. In a year dominated by the global COVID-19 pandemic, Collaboration capabilities were thrust into the spotlight, highlighting leaders and laggards among departments and project teams seeking to maintain business continuity.

Across all industries and markets, the shift to remote work is also shedding light on opportunities for organizations to maximize their geographically distributed resources, leading to higher productivity and time savings that may last long beyond the pandemic.

At Autodesk, we are seeing accelerated integration of design and make processes in every industry we support. Some of our most innovative customers are rethinking their entire supply chain, connecting platforms, processes, and data across their ecosystem to solve some of their industry’s biggest challenges. We expect these trends to continue, making adaptability paramount to survival.

For this reason, we include Customer Success in every Autodesk plan. When you subscribe to Autodesk, you get access to resources and services designed to help your teams develop their capabilities and improve their outcomes.

Ready to take your team to the next level?

LOG INTO THE CUSTOMER SUCCES HUB
Find resources and get coaching to improve your teams capabilities

GIVE US YOUR FEEDBACK
Get a customized benchmark report for your business
Customer Success

Customer Success Hub

Autodesk Plans

Methodology

Participants were asked to provide demographic information and then select their primary industry. Within an industry, participants selected the area they believed was most important for them to develop their capabilities in. Then, they stack ranked relevant capabilities in order of importance to their business over the next 3-5 years.

Participants also self-assessed their team’s current capabilities and provided open-ended feedback what they needed to be successful.

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