

THE CASE FOR CLOUD

Charting the Future of Custom Manufacturing

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INTRODUCTION

Pain points with custom manufacturing go beyond broken supply chains

In an increasingly on-demand world, companies face enormous pressure to deliver high-quality products quickly and at scale around the globe. Custom manufacturers, which create tailor-made parts for specific customers, are vital to meeting this effort. But all too often, they're not up to the challenge, leading to delays, budget overages, and lost revenue.

While manufacturers may blame supply chain disruptions caused by the ongoing pandemic, the underlying problem runs deeper than materials shortages and shipping delays. With limited visibility into custom manufacturing partners' processes, companies struggle to know which partners they can trust to deliver high-quality parts on time. This struggle has been particularly painful for companies that follow just-in-time (JIT) manufacturing principles, holding minimal inventory while relying on partners to deliver parts as needed. For companies following JIT principles, any unexpected order delay has serious consequences.

To better understand these issues and how they impact companies' bottom lines and ability to innovate, Fast Radius surveyed 250 engineers, industrial and product designers, and procurement professionals about their pain points with custom manufacturing. Our results show that long lead times, inefficient communication, lack of transparency, and unreliable product quality are holding back innovation and negatively impacting companies' bottom lines.

The survey also revealed a widespread backlash against JIT. Almost half of respondents (48%) said they'd previously employed JIT, but moved away from the model. Of those who moved away from JIT, 55% had done so due to supply chain disruptions during COVID-19.

In this report, we'll dive deep into the pain points engineers, industrial and product designers, and procurement professionals experience with custom manufacturing and JIT. We'll also explore how many of these pain points could be solved with technology — specifically, the innovative principles of cloud manufacturing.

Key findings

58%

of engineers, industrial and product designers, and procurement professionals said product and development cycles keep getting shorter and shorter

52%

said reducing the costs of new product development would help them innovate more frequently

51%

said inconsistent product quality impacted their bottom line in the past 12 months

52%

have found out about delays or errors in production after it was too late to hit their shipping deadlines

What is cloud manufacturing?

Cloud manufacturing leverages multiple technologies to unite all stages of the manufacturing lifecycle within a common digital infrastructure, creating a flexible platform with the potential for global scale. Cloud manufacturing enables a number of powerful technologies and second-order effects and ultimately offers the efficiency and speed of JIT with improved reliability, resiliency, and flexibility.

Cloud manufacturing enables ...

ON-DEMAND MANUFACTURING

A manufacturing model in which customers order parts whenever they want, in the quantities they want without long lead times or high order minimums

MICROFACTORIES

“Factories in a box” with standardized physical and digital infrastructure that can be copied and pasted anywhere in the world — each focused on a specific production method, such as industrial-grade additive manufacturing or CNC machining

VIRTUAL WAREHOUSING

Instead of storing parts in a physical warehouse, store part designs in the cloud and produce them only as needed

MORE SUSTAINABLE AND FLEXIBLE SUPPLY CHAINS

Parts can be produced in microfactories close to where they're needed, cutting down shipping time and costs, and reducing carbon footprints

INSIGHT 1

Companies are moving away from just-in-time manufacturing due to concerns about flexibility and resiliency

- 1.1 Companies want fast, flexible, and cost-efficient supply chains
- 1.2 The JIT model is no longer delivering for many
- 1.3 Some companies are still making JIT work

INSIGHT 1.1

Companies want fast, flexible, and cost-efficient supply chains

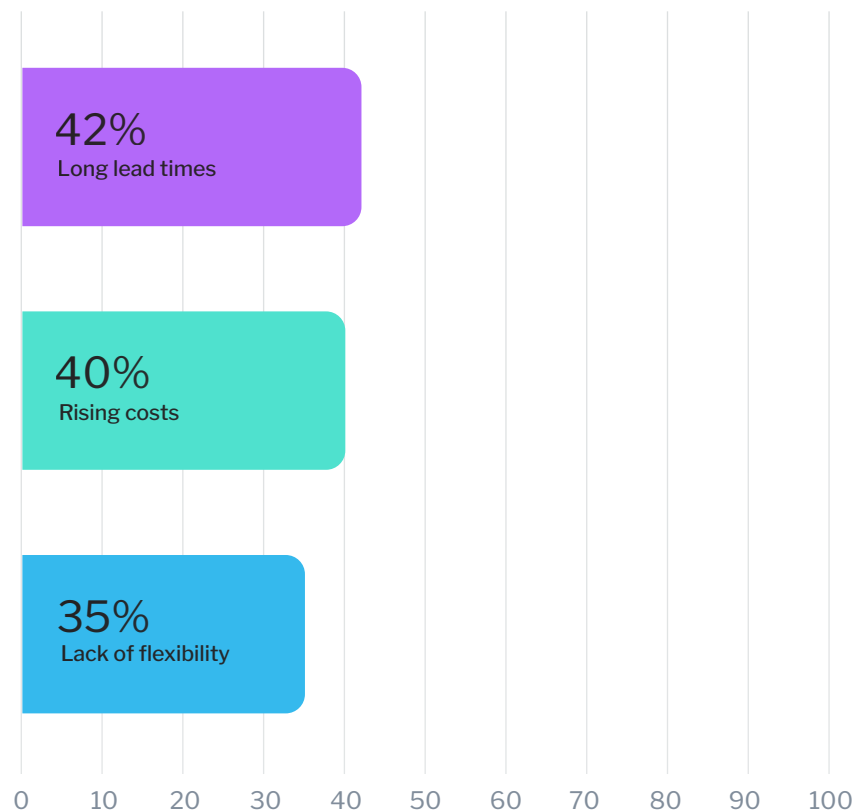
Speed is at a premium in today's on-demand economy, and companies expect custom manufacturers to accommodate tight turnarounds. Long lead times topped the list of respondents' supply chain pain points, followed by rising costs and lack of flexibility.

The bottom line: engineers, product and industrial designers, and procurement professionals want to get parts faster, without breaking the bank — and they want supply chains resilient enough to adapt quickly in the face of disruption. Companies need assurance that factory shutdowns or supply shortages won't lead to expensive delays.

TAKEAWAY

Long lead times and high costs are top supply chain pain points

Figure 1 - Top 3 supply chain pain points



INSIGHT 1.2

The JIT model is no longer delivering for many

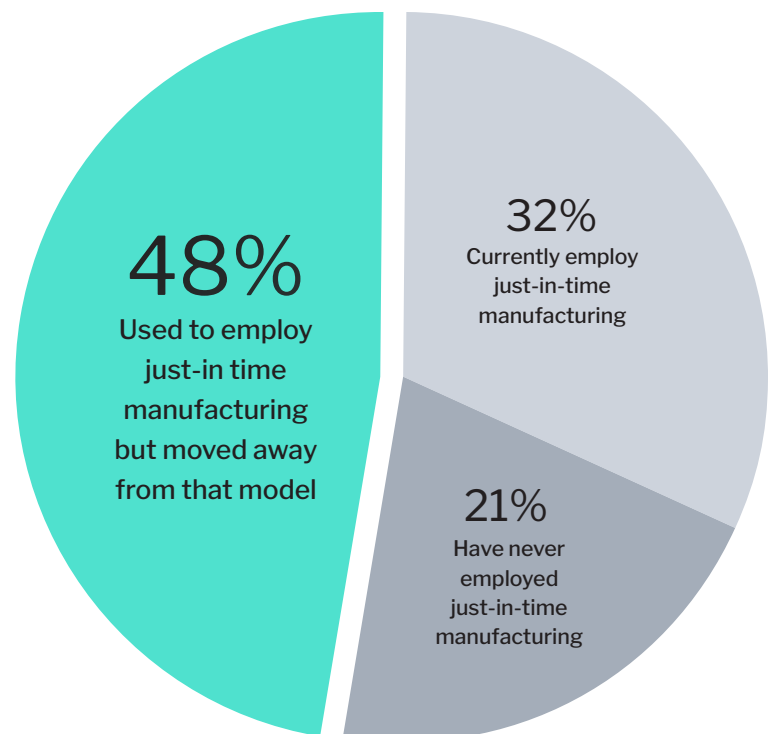
Based on these pain points, it's understandable why nearly half of respondents (48%) have moved away from JIT — and of those, more than half (55%) made the change during the pandemic. Since companies employing JIT carry little to no inventory, it's vital they receive parts immediately when needed. The kinds of shipping delays and supply chain disruptions that became common during the pandemic can quickly make the JIT model unworkable.

In addition, companies using JIT optimize their supply chains to work with just a handful of suppliers. This lowers costs but also reduces flexibility. For example, if a supplier's facility encounters a delay, it may not be possible to shift production elsewhere. Companies facing longer lead times — e.g., due to factory shutdowns during COVID-19 — and craving increased flexibility have motivation to move away from JIT.

TAKEAWAY

Nearly half of respondents have moved away from the JIT model

Figure 2 - Level of JIT adoption



INSIGHT 1.3

Some companies are still making JIT work

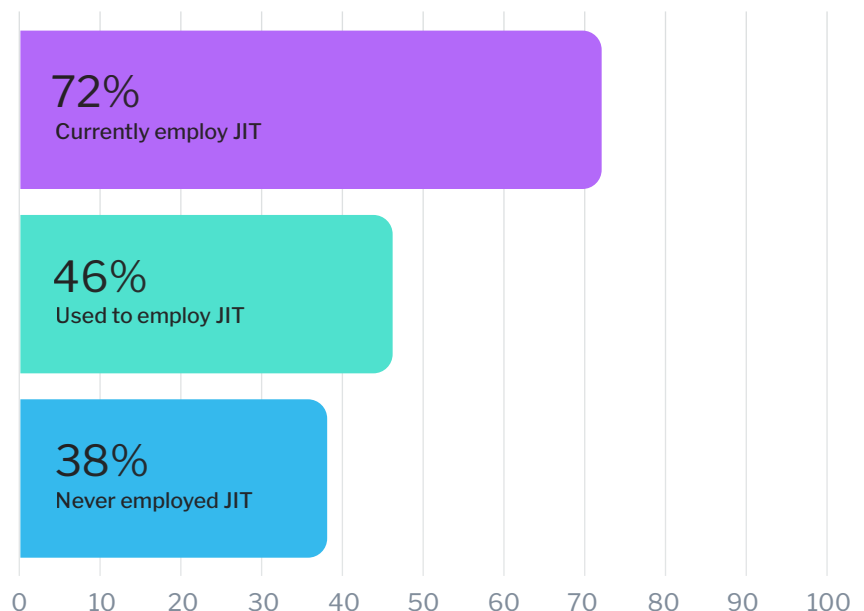
While supply chain shocks have highlighted the model's vulnerabilities, abandoning JIT completely and stocking up on inventory isn't the only alternative. Those respondents who still employ JIT — around one-third (32%) — appear to have found ways to mitigate the challenges inherent to the model. For example, they're much less likely to say it's hard to trust a manufacturer to deliver quality parts compared to other respondents.

Respondents who currently use JIT are also more likely to say their inventory management practices won't change in the next five years, demonstrating a higher level of commitment to their current practices compared to respondents who moved away from JIT or never employed it at all. These data points suggest that, despite pain points with JIT, a strategy of manufacturing parts only as needed can work in the right situation — and with the right partners.

TAKEAWAY

Current JIT users are the least likely to change inventory management practices

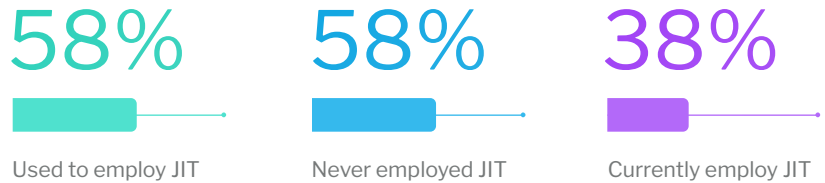
Figure 3 - Percentage of respondents who say their inventory management practices won't change in the next five years



TAKEAWAY

Success with JIT depends on trustworthy manufacturing partners

Figure 4 - Percentage of respondents who say it's hard to trust a manufacturer to deliver quality parts



How cloud manufacturing improves on JIT

MORE RELIABLE

Like JIT, cloud manufacturing creates parts when they're needed — but it does so with greater reliability, since all data related to a part's design and manufacture is stored digitally, so the product can be made to spec anywhere.

MORE RESILIENT

Through distributed production, cloud manufacturing technology can improve supply chain resiliency without the need to stock additional inventory. In fact, virtual warehousing can free companies from the need for inventory at all.

MORE FLEXIBLE

In addition, with microfactories deployed around the world, all capable of delivering the same production-ready parts, a cloud manufacturer can easily shift production from one facility to another as needed, providing more flexibility than is possible in a JIT model.

INSIGHT 2

Communication difficulties with custom manufacturers delay design and development cycles and hold back product innovation

2.1 Shorter product development cycles raise the pressure

2.2 A lack of centralized communication creates inefficiency

2.3 Inaccurate quotes slow innovation

INSIGHT 2.1

Shorter product development cycles raise the pressure

When it comes to new product development, engineering, industrial and product design, and procurement professionals are under pressure to deliver more in less time. A majority of respondents (58%) agree that product and development cycles keep getting shorter. For product and industrial designers, who are most affected by this issue, this number rises to 66%.

When the pressure is on, efficient communication with manufacturers is a must. Too much back-and-forth with suppliers can drag out timelines and delay projects. Unsurprisingly, inefficient communication was respondents' number one pain point in the design and development process.

TAKEAWAY

Inefficient communication is the number one design and development pain point

Figure 5 - Top pain points during design and development

| | | |
|-------|--|-----|
| ONE | Communicating with manufacturers takes up too much of my time | 28% |
| TWO | The quotes I receive from manufacturers are inaccurate | 20% |
| TWO | Manufacturers' minimum order quantities (MoQs) are too high for my needs | 20% |
| THREE | It takes too long to get a quote from a manufacturer | 17% |
| FOUR | Manufacturers have trouble understanding my project requirements | 15% |

INSIGHT 2.2

A lack of centralized communication creates inefficiency

One reason for this communication inefficiency: Most respondents still correspond with custom manufacturing partners by phone (58%) and text (56%), making it easy for messages and information to get lost in transit.

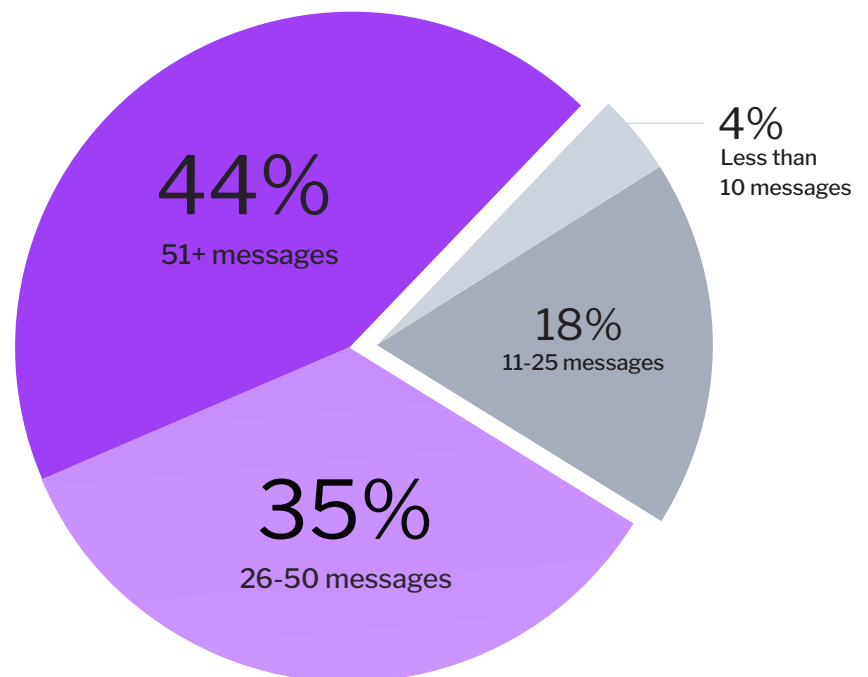
Less centralized information leads to confusion — and a lot of back-and-forth with the custom manufacturer. Almost half (44%) exchange more than 50 messages with a custom manufacturer during the manufacturing process for a single order, and another 35% exchange 26-50 messages.

Communication through online portals or apps isn't uncommon, with half of respondents saying they communicate in this way. However, the ongoing communication pain points reported by respondents suggest that manufacturers aren't taking advantage of portals' and apps' potential to organize information in one centralized place.

TAKEAWAY

There's too much back-and-forth with custom manufacturers

Figure 6 - Number of messages exchanged over the course of the manufacturing process



INSIGHT 2.3

Inaccurate quotes slow innovation

40%

said less than a quarter of the rapid quotes they received accurately reflected their project requirements

66%

said less than half of the rapid quotes they received were accurate

Tied for the No. 2 design and development pain point, inaccurate quotes are another issue slowing down the design and development process. Forty percent of respondents said less than a quarter of the rapid quotes they received accurately reflected their project requirements, while two-thirds (66%) said less than half of the rapid quotes they received were accurate.

These inefficiencies force engineers, industrial and product designers, and procurement professionals to waste valuable time on communication difficulties. In doing so, they raise the upfront, fixed costs of new product development, which ultimately creates roadblocks to innovation. Over half of respondents (52%) agree that if these upfront costs were reduced, their companies could innovate more frequently.

How cloud manufacturing enables faster product development cycles

STREAMLINED

By containing the entire manufacturing process in the same digital infrastructure, cloud manufacturing streamlines the scoping and quoting process.

CENTRALIZED

Communication takes place in the same interface where the part will be ordered.

EFFICIENT

It's less likely that messages will be lost or key specifications will be misunderstood, enabling an efficient process that supports rapid innovation.

INSIGHT 3

Inconsistent product quality is a major pain point that affects companies' bottom lines

3.1 Quality issues test companies' trust in their manufacturing partners

3.2 More stable partnerships might support improved quality

INSIGHT 3.1

Quality issues test companies' trust in their manufacturing partners

Quality issues with custom manufacturers are relatively common and affect many companies financially. About half of respondents (51%) say inconsistent product quality has impacted their bottom line in the past 12 months.

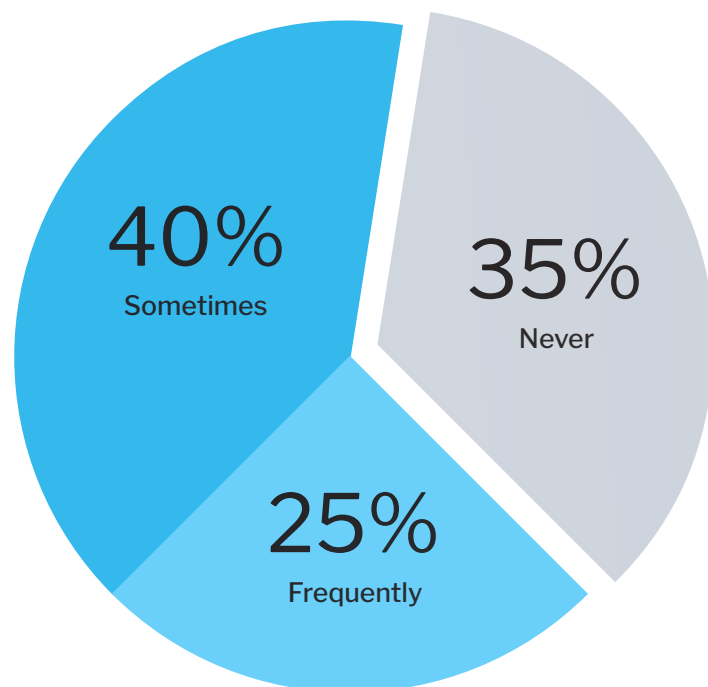
Nearly half of respondents (47%) say that custom manufacturing partners rarely or never offer feedback on part designs. And the high frequency of quality issues suggests the feedback partners do give isn't clear or thorough enough to make an impact. Poor quality control processes and unreliable operations also likely add to the problem, passing on costs to the customer who may be forced to pay for additional production runs.

These ongoing quality issues — and the unexpected costs that can result — have eroded respondents' trust in custom manufacturers as a whole. Over half of respondents (52%) said it was hard to trust a custom manufacturer to deliver the quality they needed, and that number rises to 60% for procurement and supply chain experts.

TAKEAWAY

Quality issues are common with custom manufacturers

Figure 7 - How often respondents say custom manufacturing partners deliver parts made inconsistently or not up to spec



INSIGHT 3.2

More stable partnerships might support improved quality

A lack of steady custom manufacturing partnerships might contribute to quality issues and their associated costs. Only about a quarter of respondents (27%) have one steady custom manufacturing partner. Most work with a few regular partners (38%) or find a new partner for each project (34%).

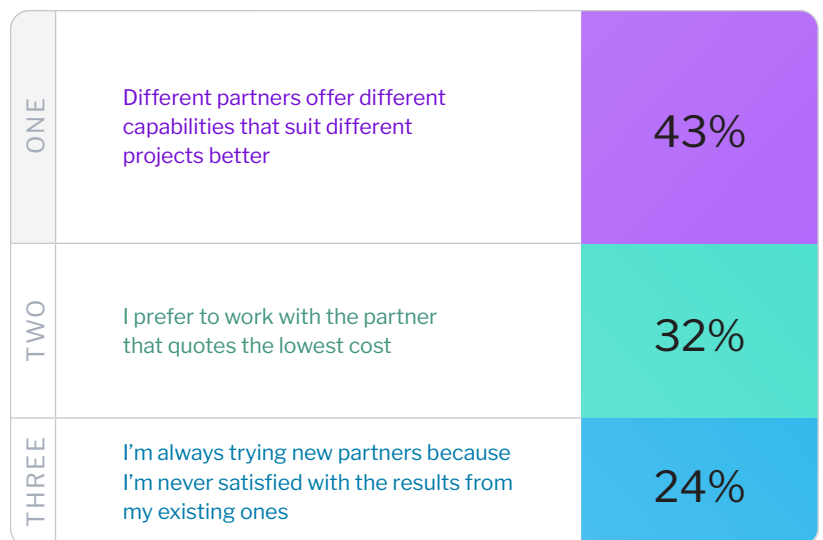
Companies that stick with the same partner get the benefit of institutional knowledge that builds up over time. They come to learn each others' processes and preferences, work out kinks in communication, and streamline workflows, avoiding expensive budget overruns.

By contrast, when a company onboards a new partner for every project, there's a steep learning curve each time, which can breed costly quality problems. Most respondents who switch between partners do so because they're searching for specific capabilities for a project. Finding a single partner with capabilities flexible enough to serve many projects could lead to quality improvements.

TAKEAWAY

Lack of capabilities is the top reason respondents switch partners

Figure 8 - Top 3 reasons for switching custom manufacturing partners



How cloud manufacturing ensures quality

IN-DEPTH FEEDBACK

Cloud manufacturing enables the manufacturer to provide in-depth feedback on parts designs, based on CAD files submitted by the customer. The customer submits their final, fully optimized CAD file through the same portal.

FULLY DIGITIZED

Since the entire process is digitized, with information centralized in a single platform, it's harder for details to slip through the cracks. The platform stores every piece of information needed to make parts to spec, so they're made reliably every time.

MORE TRANSPARENT

With transparent production and quality control processes supported by a dedicated team, there are no surprises with quality when parts arrive — and no unexpected costs.

INSIGHT 4

Companies are satisfied with their level of visibility into supplier processes — but still suffer from unexpected delays and errors

4.1 A lack of transparency around subcontracting erodes trust

4.2 Unexpected delays prove costly

INSIGHT 4.1

A lack of transparency around subcontracting erodes trust

Engineering, product and industrial design, and procurement professionals generally feel like their custom manufacturing partners are transparent, but some uncertainty remains. Almost two-thirds of respondents (63%) are satisfied with their level of visibility into their partners' processes. And most respondents receive some sort of real-time information from manufacturers, with shipping updates being the most common. However, more than half of respondents (58%) aren't confident their partners are transparent about subcontracting — meaning that they can't be sure who is actually manufacturing their parts.

INSIGHT 4.2

Unexpected delays prove costly

The real-time updates provided by custom manufacturers have not eliminated communication issues, which lead to unexpected — and often costly — delays. A majority of respondents (52%) have found out about delays or errors in production after it was too late to hit their shipping deadlines. Of those respondents who missed their shipping deadlines, nearly three-quarters (73%) said these delays and errors caused budget overages or otherwise had a monetary impact.

Some of the problem may lie in the information respondents aren't receiving in real time from manufacturers. Quality control results were the piece of information respondents most wished they could receive in real time, followed closely by overall order status.

52%

have found out about delays or errors in production after it was too late to hit their shipping deadlines.

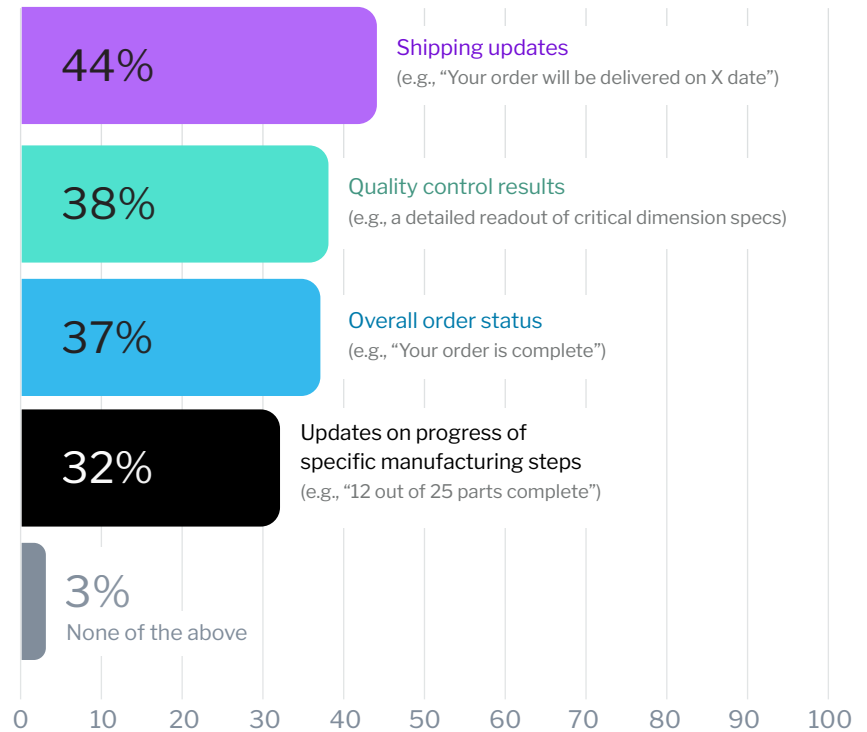
73%

said these delays and errors caused budget overages or otherwise had a monetary impact

TAKEAWAY

Shipping updates
are the type of real-
time information
respondents most
often receive...

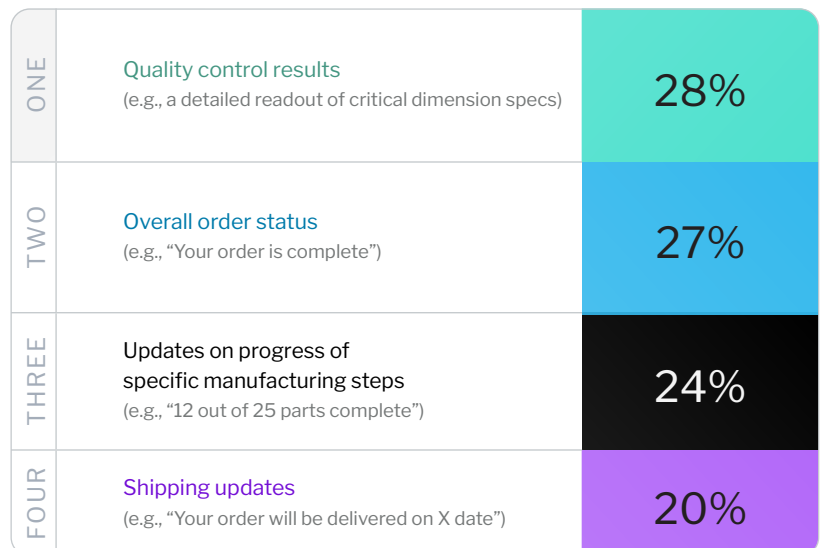
Figure 9 - Top 5 types of information received in real time



TAKEAWAY

... but they most want
to receive quality
control results

Figure 10 - Top 4 types of information respondents wish they could receive in real time



How cloud manufacturing increases visibility

TRULY REAL-TIME

By deploying Industrial Internet of Things (IIoT) technology throughout their production facilities, a cloud manufacturer with fully mature capabilities can collect real-time data at the individual part level for every step in the manufacturing lifecycle.

MORE TRANSPARENT

This increased data collection enables more frequent and specific updates for the customer throughout the process.

NO SURPRISES

Customers will know about any issues with production at the exact same time the manufacturer is alerted and can begin to plan accordingly, mitigating the impact of delays.

CONCLUSION

The cloud manufacturing revolution

Since March of 2020, supply chain disruptions have challenged the status quo in custom manufacturing. Faced with longer lead times and rising costs, companies have made big adjustments to their processes, whether by onboarding new suppliers or completely changing their inventory management practices.

But the problem with custom manufacturing runs deeper than temporary shortages or transportation delays. And that means change won't stop here. A revolution in manufacturing is coming.

As product development cycles continue to shrink and customer expectations rise, more forward-thinking companies are seeing the value in cloud manufacturing platforms. Cloud can deliver more flexible, resilient supply chains at a reasonable cost — and it's the future of custom manufacturing.

Learn more about cloud
manufacturing at fastradius.com