IT & OT CONVERGENCE RESEARCH REPORT:

BRIDGING THE GAP BETWEEN THE ENTERPRISE AND THE SHOP FLOOR

Researched & produced by:
THE MANUFACTURER

Commissioned by: NetApp

FOREWORD

While there certainly haven't been many, one silver lining of the COVID-19 pandemic has been the acceleration of manufacturers' digital transformation efforts. In the face of the biggest health and economic crisis in recent history, organisations had to pivot, virtually overnight, to protect their people and continue their operations.

The concept of Information Technology (IT) and Operational Technology (OT) convergence is often at the heart of manufacturers' digital transformation aspirations. After all, smarter shop floor machines produce better data. And better data helps to make machines operate more efficiently. The mutual benefits for the shop floor and the enterprise of IT and OT convergence are substantial.

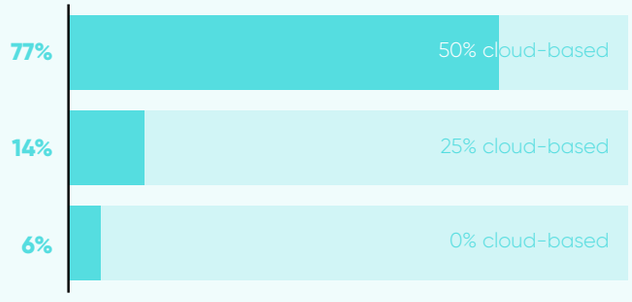
Industry 4.0 is fundamentally changing the ways in which manufacturers operate and IT and OT convergence represents a large piece of that overall puzzle.

However, while creating greater harmony between IT and OT has rapidly risen up the board's agenda, realising the real benefits of better integration requires both sides to work in unison for the benefit of the organisation's overall digitisation strategy.

At a time when manufacturers are, arguably, under more pressure than they have been in recent memory, forging a solid IT and OT convergence strategy has never been more pivotal.

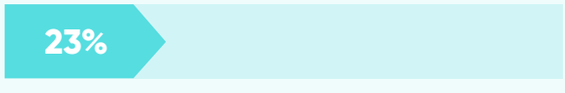
Henry Anson, Director of Hennik Group, publishers of *The Manufacturer*.

KEY FINDINGS:

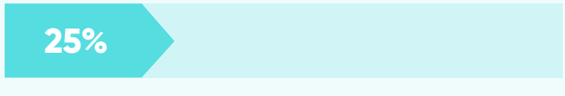


77% of manufacturers are at least 50% cloud-based in terms of infrastructure, while a further 14% are at least 25% cloud-based. Just 6% have no cloud-based infrastructure.

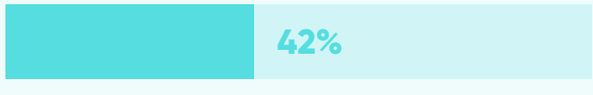
96% of companies are using at least one **next-generation technology** in their organisation



Yet just 23% of manufacturers have achieved more than a basic level of IT and OT convergence.



While a quarter still choose to air gap plant operations from enterprise IT.



And less than half (42%) of manufacturers agree that their IT and OT visions are aligned.

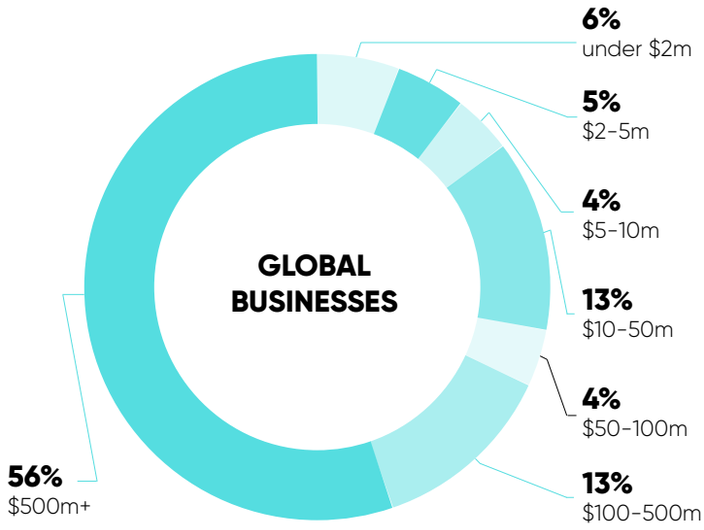
METHODOLOGY

This report is based on a survey of more than 100 senior manufacturing professionals, launched to coincide with the Industrial Data Summit (IDS) 2022.

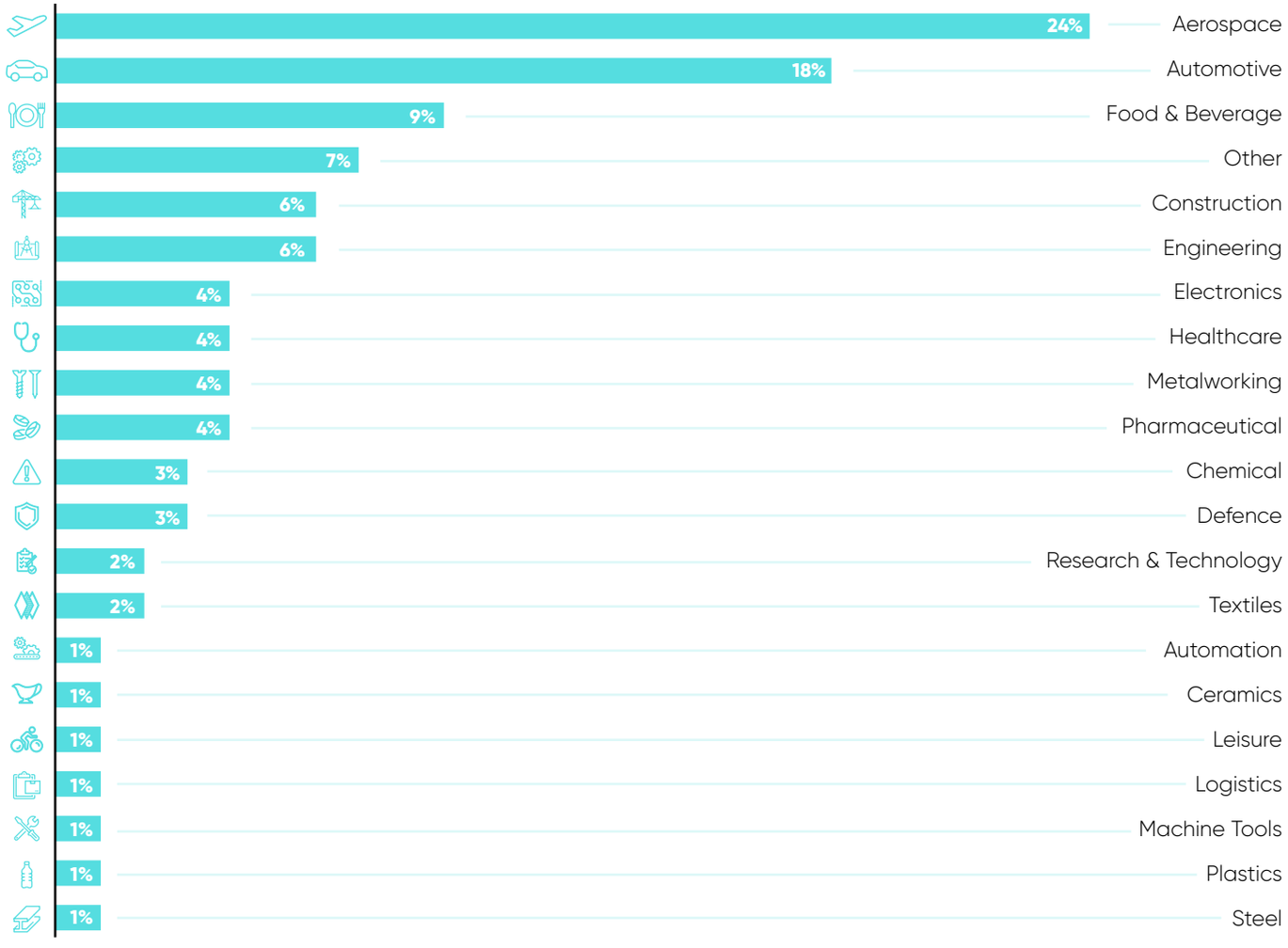
Conducted by *The Manufacturer,* the premier industry publication providing insights, events and research, and sponsored by hybrid cloud data services and data management specialist, NetApp, the survey sought to discover the current state of manufacturing IT and OT convergence. That is to say, what level of union is there between manufacturers' Information Technology systems and their Operational Technology systems.

The Manufacturer followed up with a number of respondents to add qualitative content to our quantitative research, further expanding the level of insights obtained. These interviews were equally split between companies with turnovers of $10-$50m, $100-$500m and $500m+.

Respondents by company turnover:



Respondents by industry:



CONTENTS

ACCELERATING DIGITAL TRANSFORMATION

How integrated are your IT & OT operations?

Despite the plethora of challenges faced by manufacturers in recent times, a significant proportion have made some decent headway on their IT/OT convergence journeys. In fact, as highlighted in our subsequent discussions with senior decision makers from these companies, the events of the past two years have actually served to accelerate their digital transformation efforts, of which IT and OT convergence represents a crucial component.

Indeed, our survey found that a full 72% of manufacturers have achieved at least some level of IT and OT convergence. While the majority of these companies (49%) said their IT and OT convergence was just at a basic level with supply vendors, 6% indicated that their IT and OT operations are "fully integrated with an understanding of financial impact". And it's this 'financial impact' part of the puzzle that, as we will highlight later in this report, is eluding manufacturers.

Meanwhile, a quarter (25%) of the manufacturing firms polled said they still "choose to air gap plant operations from enterprise IT". While this may seem like a significant proportion, the key word here is 'choose'. This is a reality that became evident in our follow-up discussions.

As one Digital and Analytics Programme Manager at a multinational chemical company told us, risk is still an enormous consideration and the biggest barrier to said manufacturer converging its IT and OT operations. "Cyber security is the number one driving force behind our continued decision to keep our plant and IT operations separate," he said.

Perhaps such a stance isn't really surprising given the nature of the chemicals industry and the large amounts of intellectual property related to new chemicals and processes created by companies. A 2021 UK government study estimated that cyber attacks cost the chemical industry £1.3bn.

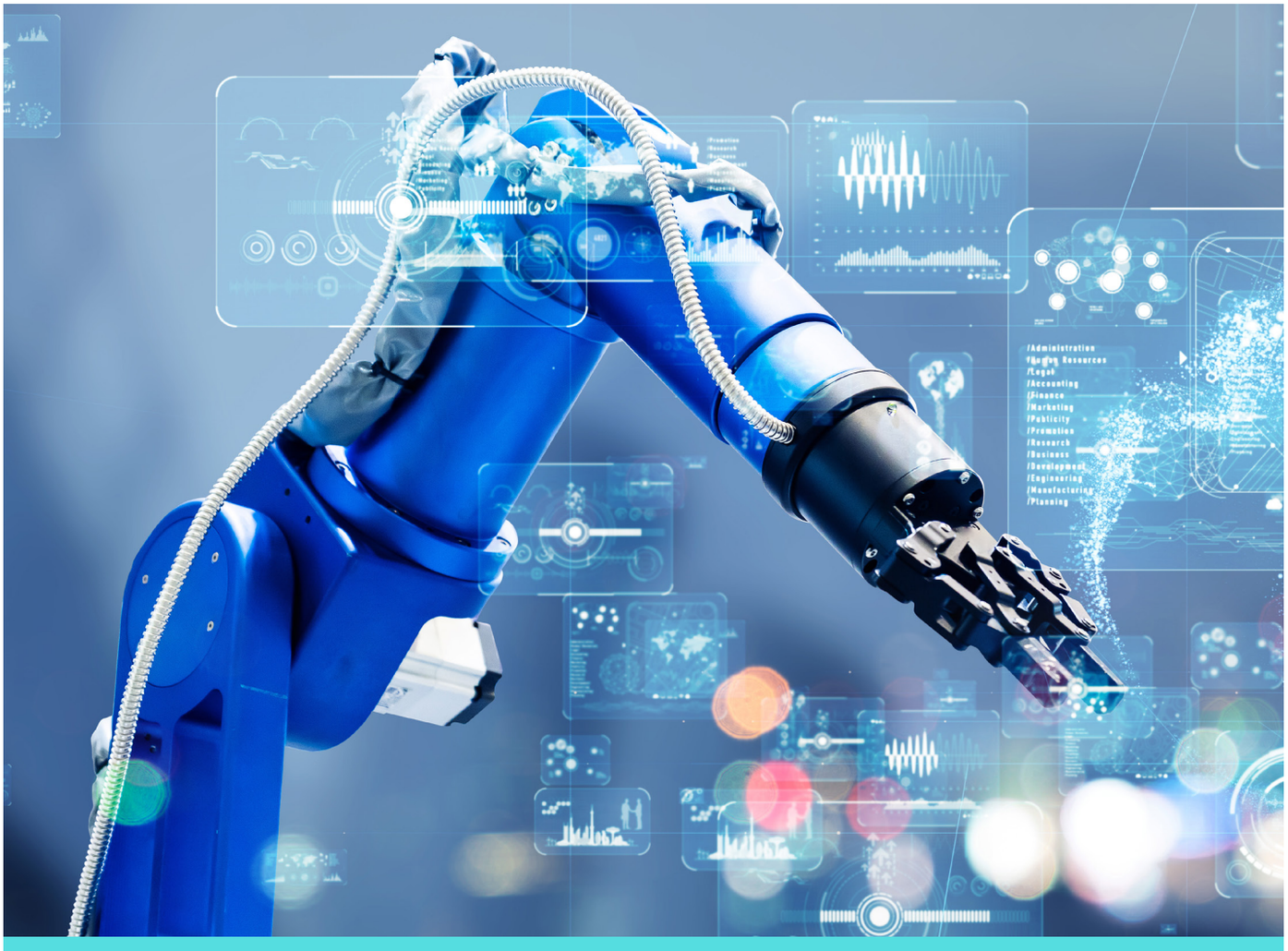
ACCELERATING DIGITAL TRANSFORMATION

However, there are also manufacturers whose plant and IT operations remain separate because they are still at the very beginning of their convergence journeys. We spoke to the Head of Data Insight at an iconic British automotive manufacturer who told us that the biggest barrier they are encountering is getting over the "we've always done it this way" attitude.

He elaborated by saying that the firm has traditionally always focused on the design and manufacturing side of things, which meant infrastructure and technology has taken something of a backseat over the past 25 years or so. But now he says business mentality is changing.

"We've started to recognise the need to embrace change and understand how technology can actually help the manufacturing side of our operations," he said.

As a result, the manufacturer has spent the last four or five years moving away from operating on a highly customised, legacy system for its ERP to a new, scalable solution. To achieve this, said manufacturer has brought in representatives from different areas of its business to be part of the project team, allowing more diverse insights and expertise to benefit the overall project, a reality that provides a nice segway into the next section of our report.



> **Cyber security is the number one driving force behind our continued decision to keep our plant and IT operations separate.**
>
> - Digital and Analytics Programme Manager at a multinational chemical company

CHAPTER 2

ALIGNMENT IS KEY

When it comes to IT and OT convergence, the teams behind both of these areas have traditionally functioned as very much separate entities, often only coming together as and when needed. Over the years, this reality has led to both adopting certain working practices and relevant technological solutions to complement them.

However, as manufacturers now strive to better integrate their IT and OT operations and achieve a certain level of convergence, the siloed way in which these different teams' function is making the journey more challenging.

This was highlighted in our survey results when we asked the manufacturers how aligned their IT and OT visions are, who is architecting their convergence strategy and who/what is funding their journey.

While 42% of manufacturing decision makers said their IT and OT visions are aligned (vs. just 22% that said theirs are unaligned), 36% indicated a neutral position. Of those companies whose visions are aligned, just 8% said they were 'highly aligned', suggesting there is room for improvement in this area.

Indeed, as one of the senior decision makers at a global food and beverage manufacturer we spoke to said: "Our IT and OT convergence journey is a lot like love. Right now, it's as though our internal teams are just getting to know each other."

He went on to explain how their organisation has multiple manufacturing locations across the world, each of which operates in its own individual way. Upon commencing its IT and OT convergence journey, the organisation soon realised that a large wall existed between its IT and OT teams. This presented a challenge right from the outset, especially in terms of vision alignment.

"The IT guys viewed the engineers as risky because they overlooked security updates and patches, while the engineers saw IT as blockers, tying their hands and restricting the technologies they could roll out," he explained.

In light of our survey's alignment findings, it was refreshing to learn that, nevertheless, many manufacturers' IT and OT teams are jointly planning their convergence strategies. Our survey revealed that nearly half (48%) of firms' IT and OT convergence strategies are a joint IT and operations effort when it comes to architecture.

Meanwhile, 10% of companies said their IT team was architecting their IT and OT convergence strategy and the same proportion (10%) indicated that it was operations leading the way. Just 7% of manufacturers said a third party adviser was architecting their strategies.

> **Our IT and OT convergence journey is a lot like love. Right now, it's as though our internal teams are just getting to know each other.**
>
> - Strategic IT Director at a global food and beverage manufacturer

CHAPTER 2

ALIGNMENT IS KEY

Interestingly, a quarter of organisations polled stated that they did not know who is architecting their convergence strategies, or that ownership isn't clear. This highlights the importance of solid communications for every project an organisation undertakes, an absolute must for securing stakeholder buy-in and ensuring everyone within the organisation is on the same page. This is the same for the 29% of manufacturers that said they did not know or it's not clear who is funding their IT and OT convergence strategies.

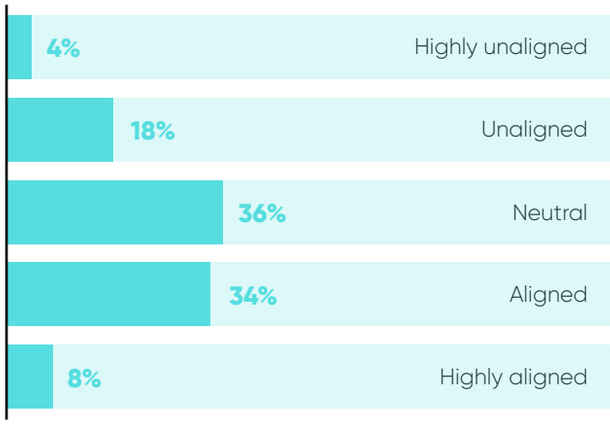
In terms of funding, almost a third (31%) of respondents said their IT and OT convergence journeys were being funded from a central budget. This is a promising revelation as it highlights the importance IT and OT convergence is being given by many companies, opting to fund it from a central budget and not pushing the responsibility on IT or operations.

> **Once operational teams see firsthand the benefits of IT and OT convergence, the rest of the journey is made easier.**

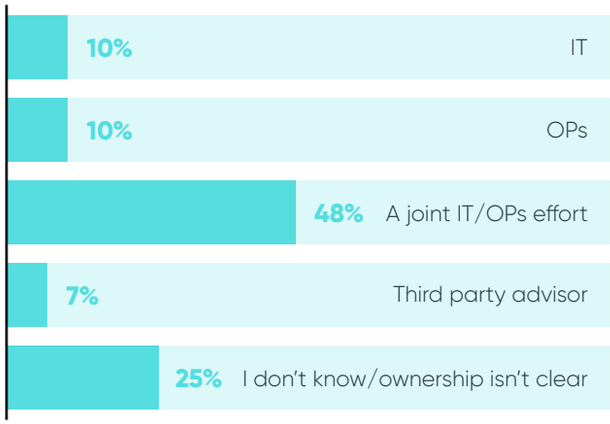
While 9% of respondents indicated that it is their IT department that is footing the bill for their IT and OT convergence and the same percentage again (9%) said it was being jointly funded by IT and operations, 21% cited ops as the main funder. This is interesting as we often hear how it is manufacturing operations teams, often with their legacy mindsets and business models, that are resistant to change.

Yet, from what we've seen, it is often the case that once operational teams see firsthand the benefits of IT and OT convergence, the rest of the journey is made easier. This can start with IT creating a simple digital handshake that enables data insights relating to equipment health and efficiency to be obtained from existing machinery. Once production staff realise how valuable this operational data can be in making their operations more intuitive and efficient, the barriers to IT and OT convergence acceptance have already begun to be broken down.

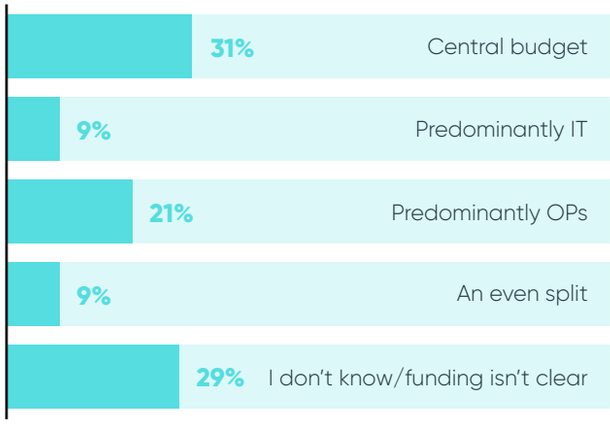
How aligned are your IT & OT visions?



Who is architecting your IT/OT convergence strategy?



Who or what is funding your IT/OT convergence strategy?



DIGITALISATION DRIVING OPERATIONAL EFFICIENCY

Manufacturing companies' top 5 highest priorities:

80%
Operational efficiency

64%
Cost savings

64%
Worker environmental H&S

62%
Environmental sustainability

62%
Customer retention

CHAPTER 3

DIGITALISATION DRIVING OPERATIONAL EFFICIENCY

As part of our survey, we also asked senior manufacturing decision makers to provide some insights into their organisation's current priorities. Given the events of the past two years, particularly the supply chain disruptions manufacturers have experienced, the insights we obtained are invaluable in helping us understand where focus is being placed.

The highest priority for manufacturers right now is operational efficiency, cited by 80% of survey respondents. In joint second are realising cost savings and ensuring the health and safety of workers (64%). Rounding out the top five are environmental sustainability (62%) and customer retention (62%).

As manufacturers look to further enhance productivity and output, which both contribute to overall operational efficiency and, in turn, lead to cost savings, the importance of IT and OT convergence really comes into play, as one of the manufacturers we spoke with outlined.

The IT Director of a large food and beverage producer explained how their organisation had switched from traditional planning and scheduling processes to more modern, digital alternatives. As a result, the manufacturer's operational efficiency has increased significantly.

"Previously, our production manager would schedule and plan production using spreadsheets. While this worked and it did so for years, we did not have the flexibility and agility to respond to any sudden changes. Moreover, we never had a true vision of our production capacity and so were not in a position to make last minute decisions on whether we could take on additional orders.

"Now, with our production planning and scheduling digitised, we can respond to last minute changes and ensure we still successfully fulfil orders. We also benefit from greater visibility into our operations, which allows us to make data-backed business decisions regarding orders we haven't planned for."

> **"With our production planning and scheduling digitised, we can respond to last minute changes and ensure we still successfully fulfil orders.**

A great insight we gleaned from a senior decision maker at a large automotive manufacturer is how their organisation is increasing operational efficiency through the implementation of automated tooling. So rather than a production worker having to use a hand pressure gauge to ensure the correct level of torque, now it is determined by automated tooling. And said tooling is pre-programmed to adjust its torque levels automatically depending on the next model coming down the production line. It not only gives the production worker one less factor to worry about, but also saves them time by eliminating the need to measure pressure manually.

CHAPTER 4

IT AND OT CONVERGENCE: A PIVOTAL PIECE OF THE PUZZLE

The biggest operations management challenges manufacturers are trying to overcome in the next two years

91%

Supply chain fragility/ disruption

86%

Production planning & scheduling

84%

Skills and competencies gap

The biggest operations management challenge manufacturers are trying to overcome in the next two years is supply chain fragility/disruption, with 91% of all the organisations we polled citing it as a "big" or "medium" challenge. This was followed by production planning and scheduling (86%) and skills and competency gaps (84%).

Given the COVID-19 pandemic, the subsequent global shipping crisis, semiconductor shortage and the ongoing conflict in Ukraine, supply chain fragility and disruption was always going to feature high in terms of operational challenges.

In fact, securing supplies of raw materials from trusted sources has proved to be a significant challenge for one of the manufacturers we spoke to. For one chemical manufacturer we followed up with, the slightest change in raw materials quality or source has an enormous impact.

"When quality is the fundamental foundation of everything you produce, a simple supply change can have a significant impact," he said.

"A deviation in raw materials quality from a supplier, or securing from a new source, can mean a chemical recipe that used to work well starts to cause problems. Obviously, we will never send out substandard products, but the added challenges can sometimes lead to delays," he added.

The decision maker also went on to say that one of the first questions they ask is how or whether technology can address such issues, be it in the short- or long-term. This is a perfect example of how manufacturers are actively looking to tech to solve their biggest challenges and IT and OT convergence represents a pivotal piece in this overall puzzle.

When it comes to overall IT/OT challenges, our survey revealed how capturing disconnected data and utilising it to its fullest appears to be a hurdle for many organisations. According to our survey, disconnected data or a lack of interconnectivity between siloed systems/technologies is the biggest IT/OT challenge facing manufacturers at present, cited by 58% of respondents. Moreover, 49% of those surveyed pinpointed not utilising data to its fullest potential as their biggest IT/OT challenge. Having to use manual processes despite achieving a certain degree of convergence was the third biggest challenge highlighted (44%).

CHAPTER 4

IT AND OT CONVERGENCE: A PIVOTAL PIECE OF THE PUZZLE

In terms of data, the Innovation and Digitalisation Manager at a global automotive manufacturer told us that capturing data has uncovered the limitations in their own IT infrastructure. The company was capturing data in huge quantities because it assumed it was all important, but wasn't doing anything beneficial with it because it didn't have the capabilities.
Now, rather than just capturing and saving every piece of data available, the company has worked to determine what is valuable and what's not. Not only has this led to additional storage space becoming available for the valuable data and associated cost savings, it has also given the manufacturer a renewed sense of purpose when it comes to leveraging data to its advantage.

A similar situation was revealed after we spoke with a senior decision maker at a global automotive manufacturer. They explained how their IT and OT convergence journey has been progressing. But one aspect that wasn't suitably accounted for was the vast amounts of data they would have access to as a result. This raised questions in terms of scalability and the need to capture all this data going forward, so they could obtain the valuable insights it contained.

"The data we're getting now has far surpassed anything we've seen before. And this leads to decisions about whether we need to bring in additional technologies, such as AI, to help manipulate all of the data.

"The next stage is then to ask ourselves, how do we connect the business up to all this data and all these valuable insights automatically, without it needing to ask us. Once we have achieved this, our operational teams will be in a position to make data-driven decisions based on what they have available firsthand, rather than needing to ask us to supply it.""When quality is the fundamental foundation of everything you produce, a simple supply change can have a significant impact," he said.

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The biggest operations management challenge manufacturers are trying to overcome in the next two years is supply chain fragility/ disruption.

CHAPTER 5

AN APPETITE FOR THE CLOUD AND NEXT-GEN TECH

In a vote of confidence for how manufacturers are looking to leverage the latest innovations, our survey found that 96% of companies are using at least one next-generation technology in their organisation.

Automation/robotics was the most widespread of these, currently used in some form by 70% of the manufacturers we polled. Smart sensors (57%) and 3D printing/ additive manufacturing (46%) placed second and third respectively, while artificial intelligence/machine learning was fourth, used by just over two out of five firms (41%).

Just 4% of companies said they currently do not use any of the technologies outlined. However, one Managing Director of an SME manufacturer we spoke with indicated that while their business is not taking advantage of next-generation technologies at the moment, there are a number – namely automation/robotics, 3D printing and smart sensors – that they are looking to harness the power of going forward.
In terms of the benefits manufacturers are reaping from these next-generation technologies, it became clear during our discussions that downtime and maintenance monitoring were high up the list.

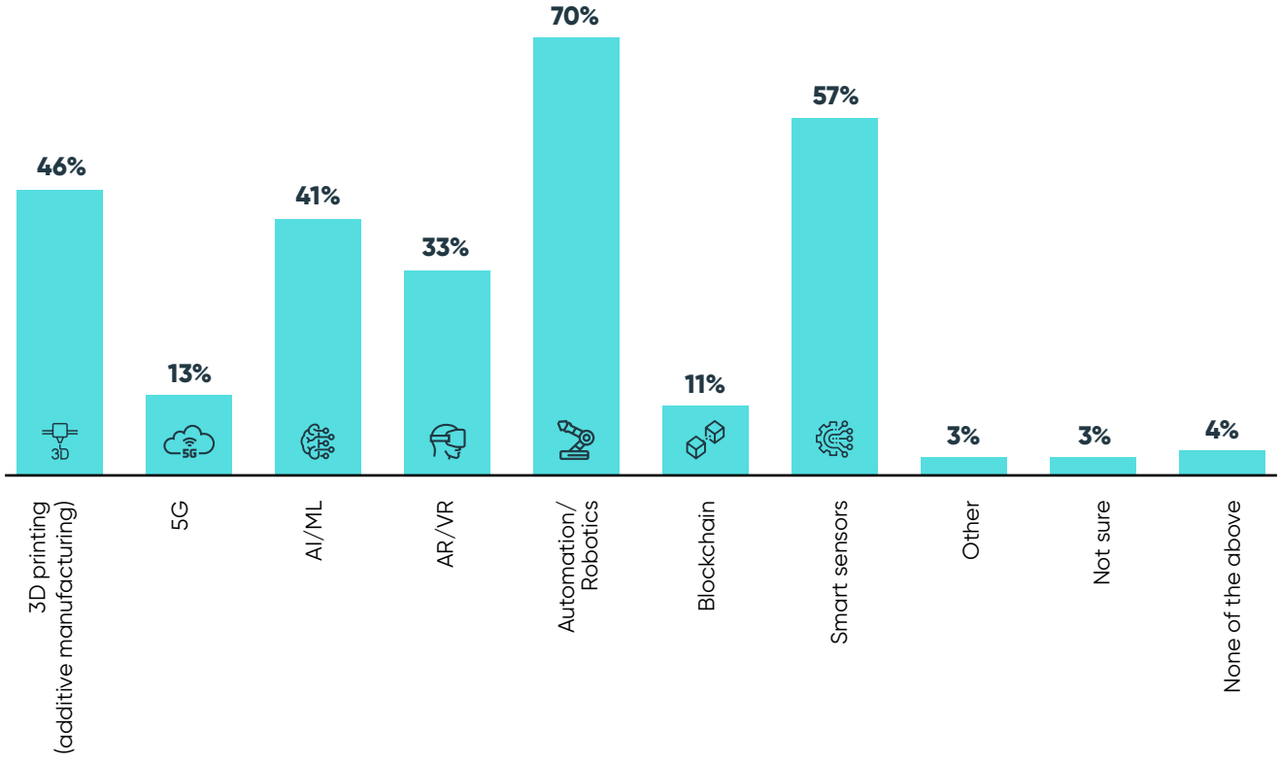
96%

of companies are using at least one **next-generation technology** in their organisation

One manufacturer we talked with explained how they have implemented smart sensors on a range of ageing operational machines – some of which are decades old. This has enabled the organisation to obtain and utilise valuable real-time data pertaining to the equipment's efficiency and productivity by analysing downtime – something that used to be recorded manually, entered into a spreadsheet later and was prone to errors.

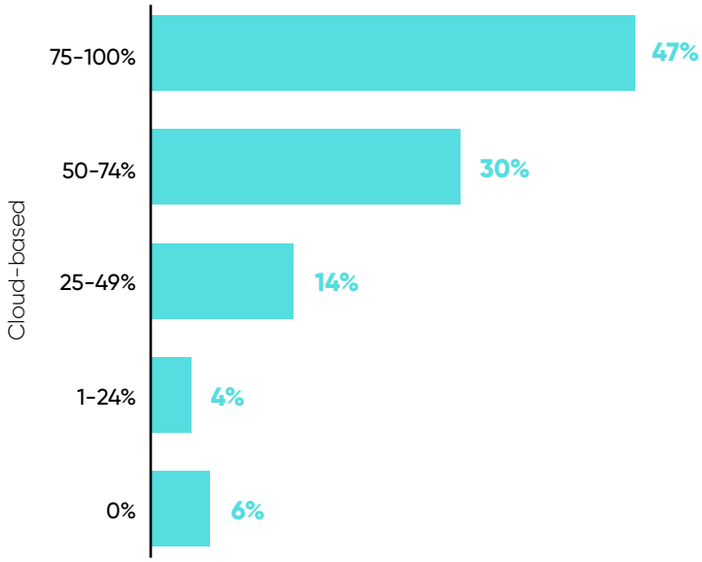
"With machine breakdowns now tracked in real-time, our maintenance teams can resolve issues much faster, as well as perform additional root cause analysis to see if there is a recurring theme.

What next-gen technologies currently feature in your manufacturing operations?



AN APPETITE FOR THE CLOUD AND NEXT-GEN TECH

How are your ops management system structured - % of cloud-based vs. on premise?



"The level of insights we are now getting has enabled us to fix a number of underlying issues and boost our shop floor productivity. It has also freed up some of our operators' time to focus on their core responsibilities and the value-add tasks."

When it comes to the cloud, manufacturers are also displaying a healthy appetite, with 77% of companies now at least 50% cloud-based in terms of architecture and a further 14% at least 25% cloud-based. Just 6% of the manufacturers we polled said they were still not using any cloud services. Upon further investigation, security and risk again emerge as the driving forces behind manufacturers' reluctance to leverage the cloud more.

Risk/cyber security was seen as the biggest barrier to cloud adoption, cited by 41% of manufacturers. A lack of knowledge/skills was the second biggest barrier (35), while a perceived lack of benefits was third (21%).

Cloud caution and apprehension in the face of security risks is not all that surprising, especially given the critical nature of manufacturing operations. As a senior decision maker in a leading UK automotive organisation told us, while the cloud presents numerous opportunities and a significant proportion of systems have been moved there, there is a line they are not willing to cross.

"Our primary design system that manages the very core of our build process contains immense amounts of intellectual property and proprietary rights. As a result, even with the best security protocols in the world, it's unlikely we will ever have an appetite to move it to a cloud-based setup," he said.

77% of companies are now at least 50% cloud-based in terms of architecture.

Similarly, the same was true for the multinational chemical manufacturer mentioned earlier in this report. With some systems containing so much intellectual property and proprietary rights, he said it is unlikely they would ever be moved to the cloud. However, the organisation is reaping the benefits of the cloud in other areas. They cited simplified support as being a big factor for them moving other, non-critical systems to the cloud.

"Where we once had disjointed support mechanisms and even situations, particularly with legacy equipment where support routes weren't always clear, we now have greater clarity. Most of the time, any issues with our cloud-based systems are detected and proactively investigated by our provider, leaving us with one less thing to worry about."

> "The level of insights we are now getting has enabled us to fix a number of underlying issues and boost our shop floor productivity

ELIMINATE SILOES AND ACHIEVE COMPLETE CONNECTIVITY

In today's global economy, manufacturers can't afford to be isolated. To stay competitive, plants must be directly connected to the entire supply chain infrastructure.

Manufacturers need data mobility and governance to move data from on-prem to the cloud and everywhere in between. Success depends on managing production across the entire lifecycle all the way to the customer.

NetApp is an industry leader in enabling operating technologies/information technologies (OT/IT) convergence to connect plant operations to outside suppliers, vendors, and customers. By leveraging a data fabric powered by NetApp, manufacturers can achieve complete connectivity from production line to enterprise.

With product inspection and equipment condition monitoring inferencing happening on the edge and enterprise resource planning databases operating in the cloud, manufacturers need to be able to move data efficiently and synchronise analytic models seamlessly from the cloud. NetApp provides the capabilities to connect real-time insights from AI analytics to deliver actionable data to stakeholders across the enterprise.

Raw materials providers, production line operators, plant managers, vendors and customers join the communication network. When analytics report problems in production, the system notifies the appropriate people allowing immediate intervention, and planning for remediation. Managers have a real-time activities monitoring system for product quality, production throughput, and worker and environment health and safety.

Succeeding in the modern manufacturing landscape means eliminating siloes and achieving complete connectivity – production line to enterprise. NetApp has the solutions, tools, and expertise that manufacturers need to create a connected supply chain built for Industry 4.0.

Learn more about NetApp solutions for manufacturing: www.netapp.com/industries/manufacturing

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THE MANUFACTURER

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