

THE POWER AND PROMISE OF 5G INTEGRATION FOR MANUFACTURERS

commissioned by



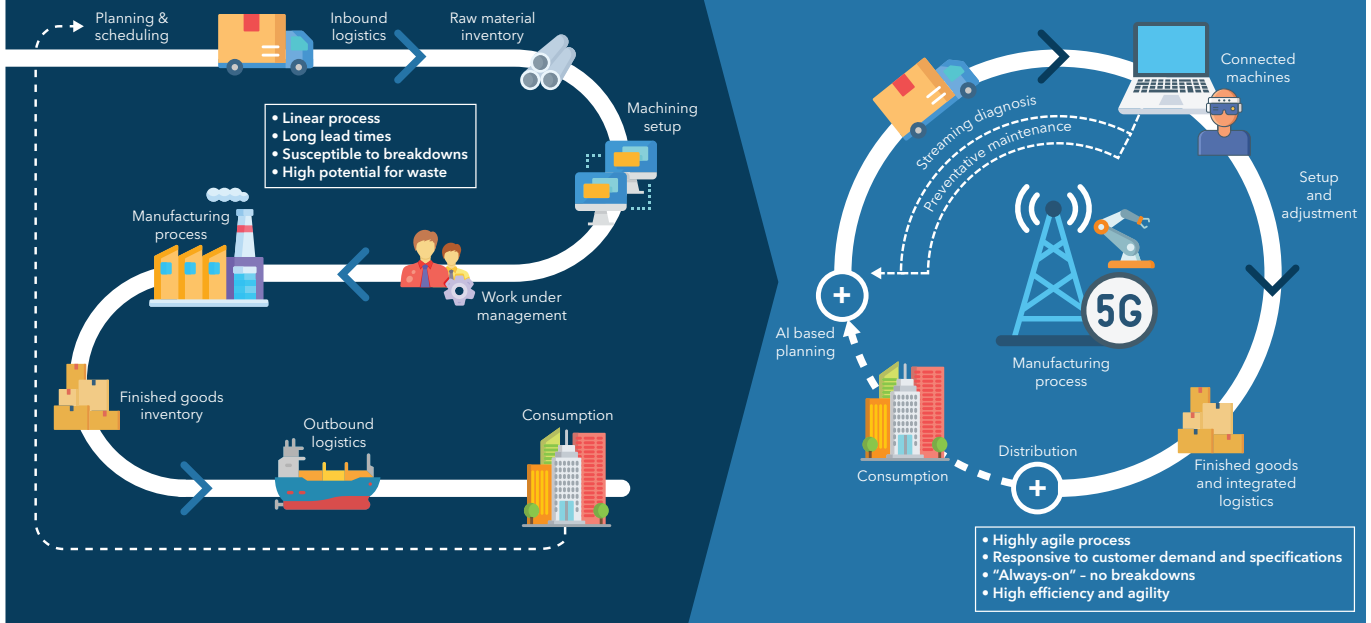
Solutions

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EXECUTIVE SUMMARY

Manufacturers are moving from linear to 5G-enabled ecosystems



Source: KPMG

The survey of 300 executives worldwide tested the proposition that, to maximize the business value derived from private 5G networks, manufacturers should embrace 5G technology and implement it in tandem with other emerging technologies. The survey found:

1. Integration breeds success

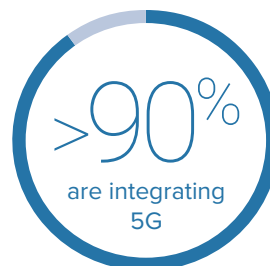
- **Combining 5G with other technologies leads to operational improvements and benefits.** Manufacturers are likely to derive the greatest benefits from integrating 5G with other technologies, such as artificial intelligence (AI) and the Internet of Things (IoT).
- **There are many successful ways to integrate 5G with other technologies.** The survey finds that many are implementing 5G along with other technologies and many have not yet done so. Among those that have, their approach to doing this varies widely. No single method works for everybody.
- **Aligning 5G integration with overall strategy is the key to success.** By aligning the technological goals with overall strategy, companies are more likely to succeed in delivering the business benefits they are aiming for.



Source: Newsweek Vantage

2. The benefits of 5G integration

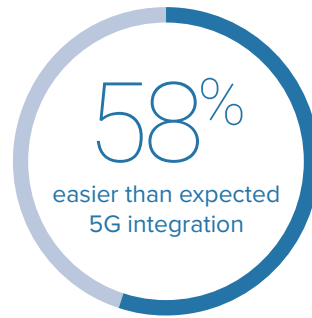
- **Most manufacturers are seeing the combinational effect of 5G integration.** While 5G implementation is in the early stages for most companies, 86 percent are experiencing a wide array of benefits already, mainly around efficiency and decision making.
- **5G is being widely integrated into global manufacturing operations, yet implementation lags in some places.** More than nine in 10 executives are integrating 5G into their operations, and 55 percent have had a 5G strategy for at least a year. By contrast, 38 percent of respondents haven't begun to implement a plan.
- **5G integration is already yielding better results for many manufacturers.** Almost one third say they're able to deploy other technologies faster or that they're making better business decisions now, and a quarter say they are making even better use of 5G than anticipated or are seeing benefits faster than planned.



Source: Newsweek Vantage

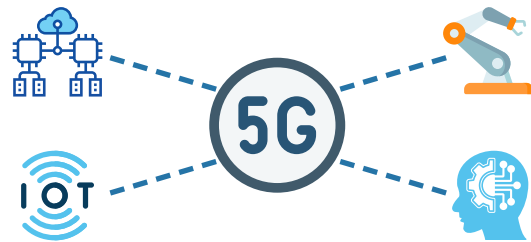
3. Combining 5G with other technologies

- **Exploring and integrating 5G with as many other technologies is becoming scaled up to the extent possible.** Most respondents are implementing 5G using an integrated approach with multiple other technologies, and about one in four are rolling it out with as many other technologies as possible.
- **AI is the top technology being integrated, along with 5G.** Other important technologies include IoT, edge computing and robotics.
- **The ease of integrating 5G is critical to manufacturing competitiveness and the success of innovation.** Fifty-eight percent have found integrating 5G with their top-priority technologies to be easier than they expected, with one-in-five saying that the integration process was “much easier” than expected.



1 in 5 said integration was “much easier than expected”

Source: Newsweek Vantage



4. Faster innovation

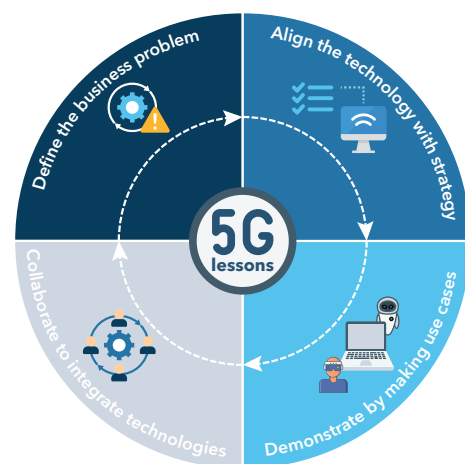
- **Optimizing delivery of products and services to suppliers and customers is a top priority area that 5G innovation will help improve.** Executives aim to use 5G to enhance open innovation in their ecosystem. The most important external value driver from 5G implementation over the next two years is accelerating innovation in collaboration with business partners.
- **Overall, R&D and manufacturing processes are predicted to be the primary beneficiaries of 5G implementation over the next two years.** It is also expected to benefit logistics and the supply chain.
- **Better supplier networks, reduced labor costs and better global production integration are big opportunities for 5G.** The biggest business opportunities afforded by 5G over the next two years is to enhance supplier networks, cut employment costs through automation and connect more effectively with production facilities across the world.

5. Challenges to implementation

- **The key challenge of implementation and integration of 5G is cost.** Cost overruns are top-of-mind concerns for executives in terms of the difficulties of 5G implementation, both in terms of the expense of implementation and the risk of the financial savings being smaller than anticipated.
- **The design and implementation of 5G strategy is a concern as well.** Respondents face a variety of challenges in designing their 5G implementation programs, from their own operational complexity, to skills shortages and governmental regulations.
- **External vendor support is an issue for supply chain implementation of 5G.** Supply chain networks present a special challenge when it comes to 5G implementation. Executives say a big issue when designing a strategy is the lack of vendor support.

6. Paths to success

- **Rapid implementation of 5G is leading the way for now.** Companies are approaching the task of 5G implementation in different ways. The most popular method is to implement 5G in a few large, rapid stages, but a sizeable number prefer to take incremental steps. Others have developed a long-term plan with milestones.
- **A combination of internal and external resources is needed to support implementation.** To deal with the complexities of integration, a third are hiring external experts to design a strategy that reduces complexity. A similar number are designating an in-house executive to manage 5G integration.



The sections of the report that follow present a more detailed discussion of the key findings and contain interviews with 5G specialists. The report concludes with an outline of some of the lessons derived from the survey findings and interviews that may help companies reach their 5G goals faster and more effectively.

INTEGRATION BREEDS SUCCESS

The transformation of global manufacturing is entering an exciting new phase, enabled by a range of technologies. Perhaps the most important of these is fifth-generation (5G) telecommunications technology and private cellular networks, a mobile communications standard that connects not only people, but also sensors, devices, machines, factories, vehicles, ships and much more. The implications of 5G adoption are immense: Analysts estimate that 5G technologies could generate \$12.3 trillion in sales activity worldwide across multiple industries and support 22 million jobs by 2035.¹

To find out whether and how manufacturers are taking advantage of 5G, Newsweek Vantage surveyed 300 manufacturing executives around the world. In this report, commissioned by UL Solutions and with guidance from Greg Corlis, Emerging Technology Leader, KPMG, and Maan Ghanma, Director of Smart Solutions in the Consumer, Medical and Information group at UL Solutions, the statistical findings of the survey were supplemented by interviews and written answers from ABB, Audi, Bosch, GE, and Siemens. In addition to this, AT&T provided the perspective of a major 5G telecom operator.

“Every manufacturing customer of ours is looking for industrial transformation. It’s critical for 5G networks to support the pace of that process. At the core is the need among factories for networks and connectivity. 5G really makes it possible to use latency-sensitive applications that require information in real-time,” says Ande Hazard, Vice President, Manufacturing Solutions, at AT&T. “It also makes the data safer from cyber-attack. Manufacturers will be able to optimize their operations and enhance automation.”

With data rates of up to 20 gigabits a second, 5G is 20 times faster than the previous generation of telecommunications technology, 4G. It can transfer data virtually instantaneously with a latency of one millisecond, and is up to 99.9999 percent reliable, making it almost as safe as data transmission through a wire. 5G also makes critical communication possible in real-time, so even applications that have to work absolutely reliably and securely can be realized wirelessly.

Designed for industry

“5G is the first communications technology developed with industrial requirements in mind,” says Sander Rotmensen, Head of 5G, Director of Industrial Wireless Communications, Siemens Digital Industries. Siemens joined the 3rd Generation Partnership Project in 2016 to ensure that the needs of industrial users were included in the discussion of 5G telecommunications standards. “We did this by sharing the telecommunications challenges from the industry with others to find common solutions, and we are now seeing the first fruits of our labor,” he says.²

5G technology first became commercially available in 2018, at a time when Industry 4.0 (i4.0), as it is called, was taking shape. Manufacturers and other industries were beginning to design and implement transformation programs around a range of i4.0-related technologies, including artificial intelligence (AI), machine learning, Internet of Things (IoT), cloud and edge computing, as well as 5G. This process accelerated during the pandemic and shows no sign of abating.³

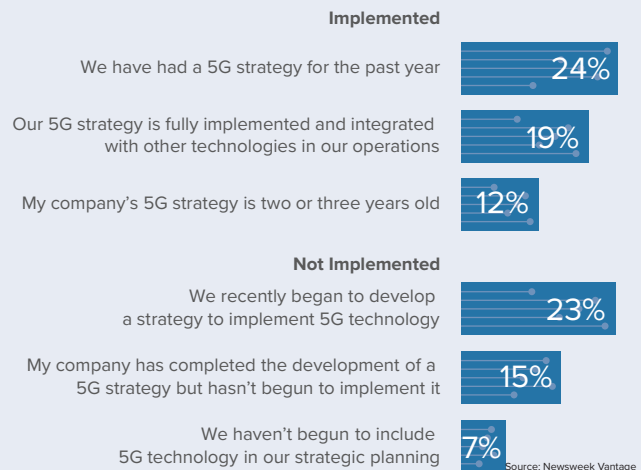
This report is published at a critical moment in industrial evolution. The global economy is slowing. Supply chains continue to be strained. Geopolitics is taking its toll on globalization. Climate change has come to dominate long-term strategic planning. To compete in such a difficult environment, manufacturers must intensify their efforts to innovate. 5G, in tandem with other i4.0 technologies, promises to enable companies to raise productivity, improve decision-making and operate more effectively in their ecosystem.

“The adoption of innovative technologies such as 5G, edge computing, cloud computing, IoT and digital twins is going to revolutionize manufacturing. For optimal results, executives should approach these technologies with a clear understanding of the business values they bring, rather than solely focusing on their technical capabilities.”

— Maan Ghanma,
Director of Smart Solutions in the Consumer,
Medical and Information group at UL Solutions

The survey finds that more than nine in 10 executives around the world are moving toward the goal of integrating 5G into their organization and 55 percent have had a 5G strategy for at least a year. But the rest haven’t begun to implement a 5G strategy: 15 percent have only a strategic plan; 23 percent have recently started to develop one and 7 percent have not even started. They have a long way to go to catch up with many of their competitors that are far along the journey toward full integration.

How mature is your 5G strategy?



The regional picture of 5G maturity is slightly different from the global one. In the Americas, 60 percent have had a strategy for more than a year, compared with the same proportion in Europe and 54 percent in Asia. This suggests the latter is lagging, but the sample of 300 executives does not necessarily mirror the actual situation on the ground, because China, Taiwan and South Korea are regarded as world leaders in 5G, compared with other countries, including the U.S.

Whichever way the data is cut, the survey, therefore, finds that many are implementing 5G along with other technologies and are doing so in a range of different ways that suggest no single method works for everybody. While they all see the benefits that 5G brings, to achieve a successful integration requires skills of coordination and careful planning, as well as a deep knowledge of the capabilities of 5G and the other technologies.

THE BENEFITS OF INTEGRATION

Manufacturers are beginning to experience 5G networks' many benefits—data speed, latency, efficiency, reliability, capacity and security. The technology is as fast and dependable as fiber and offers the same capacity at a lower cost, with more flexibility. The connectivity advantage inherent in i4.0, enables manufacturers to create a fully integrated ecosystem designed to optimize manufacturing, distribution and the product-consumption lifecycle.

5G enables the enterprise to connect all stages of the planning-to-sales process in a continuous loop, in which data is fed to analysts and decision makers from sensors installed throughout the operations of the manufacturers, its suppliers and, in some cases, its customers. Data no longer flows in a straight line but back and forth throughout a multidimensional ecosystem, enabling producers to respond quickly to potential breakdowns, shifts in customer demand, and constantly changing vendor supplies.

Internet of Things

An example of a technology that works well in tandem with 5G is IoT, whose use is growing rapidly. International Data Corporation predicts there will be 55.7 billion connected devices worldwide by 2025.⁴ Thanks to IoT devices, massive amounts of data are collected, enabling manufacturers armed with predictive analytics to undertake preventive maintenance and to plan to retool for product redesigns whenever the need arises. In addition to optimizing manufacturing processes, the newly flexible global ecosystem means that fully customizable manufactured products are no longer a distant goal, but are now within reach.

"The high speed and low latency of the 5G spectrum enables the rapid expansion of the IoT environment," says Hazard of AT&T. This allows clients to compute faster and accelerate business decision making. "Many customers are leveraging machine learning predictive analytics and looking for more efficient greenfield and brownfield operations. 5G enables everything from older, legacy facilities, all the way to the 'future factory.'"

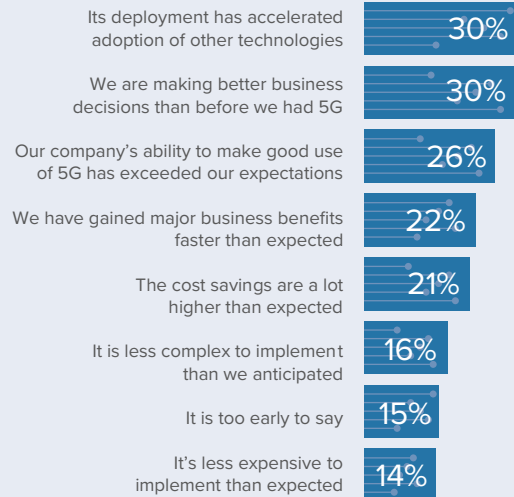
Network slicing

To integrate the 5G network into their digital strategy, enterprises can create network slicing on demand, enabling a high level of customization to integrate the many applications the manufacturer uses. Network slicing allows vendors and customers to be merged into a network platform easily and more securely. It also provides discrete information that is relevant to each use case, enhancing connectivity and security in one step.

"Network slicing will revolutionize the industrial world," says SM Hasan, 5G Platform Leader at GE Research. "You can have the same network hardware, but in the virtual world, you can create different network slices focused on a particular application, such as a slice for healthcare, another for energy and another for aerospace." In January 2023, GE began to split itself into three distinct companies focusing on these areas. Each of the three companies will be able to use the 5G cross-industry testbed at its Niskayuna Research Campus in New York.

The survey shows that many manufacturers are experiencing the advantages of 5G. Almost two-thirds of respondents say they're seeing the benefits of 5G implementation, though many in this group say the value is only just beginning to show up and are only observing a few benefits so far. But even so, most companies surveyed see a diverse array of positive results from 5G. Almost one-third say they're deploying other technologies faster or that they're making better decisions now. Others say they are making even better use of 5G than anticipated or that they're seeing benefits even faster than planned.

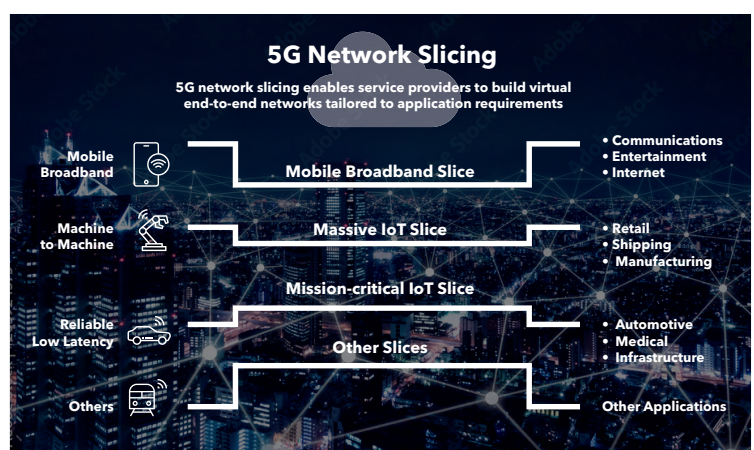
What aspects of your company's rollout of 5G technology have most exceeded expectations?



Source: Newsweek Vantage

Augmented & virtual reality

With 5G, manufacturers will no longer need to rely on both fixed and mobile networks for their communication needs. For example, workers equipped with augmented reality/virtual reality (AR/VR) headsets are free to move about the factory floor, connected at all times to the 5G network. While interacting with IoT devices and data, they can simulate every process in three dimensions right up to the final product. Since even the smallest mistake in design or layout can be expensive, AR/VR's ability to spot potential errors through simulations is just one of the valuable attributes of this system.



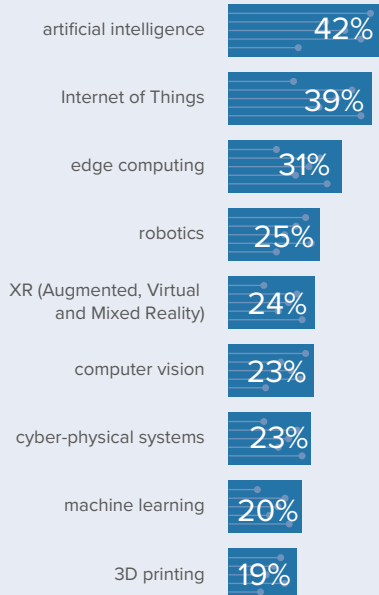
Source: Digi

COMBINING 5G WITH OTHER TECHNOLOGIES

5G networks are best implemented in tandem with other technologies because, when used together, they help manufacturers to be competitive in the face of new pressures, such as shorter business and product life cycles, scarcity of skilled workers, and the need for improved production processes. This integrated approach is likely to speed up innovation and yield gains in efficiency and profitability.

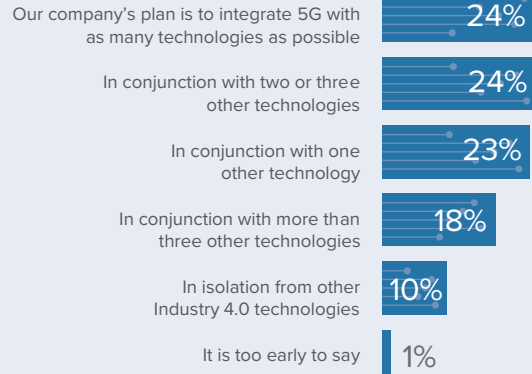
Companies are therefore taking a holistic view of 5G and other technologies that enable i4.0. Ninety percent of executives surveyed are implementing 5G in combination with other technologies, and 42 percent are planning to do so with more than three technologies. Artificial intelligence is the top technology being integrated with 5G, and this figure is even higher when combined with machine learning. Other important technologies in the integration include IoT, edge computing and robotics.

Which are the most important technologies your company is integrating with its 5G program?



Source: Newsweek Vantage

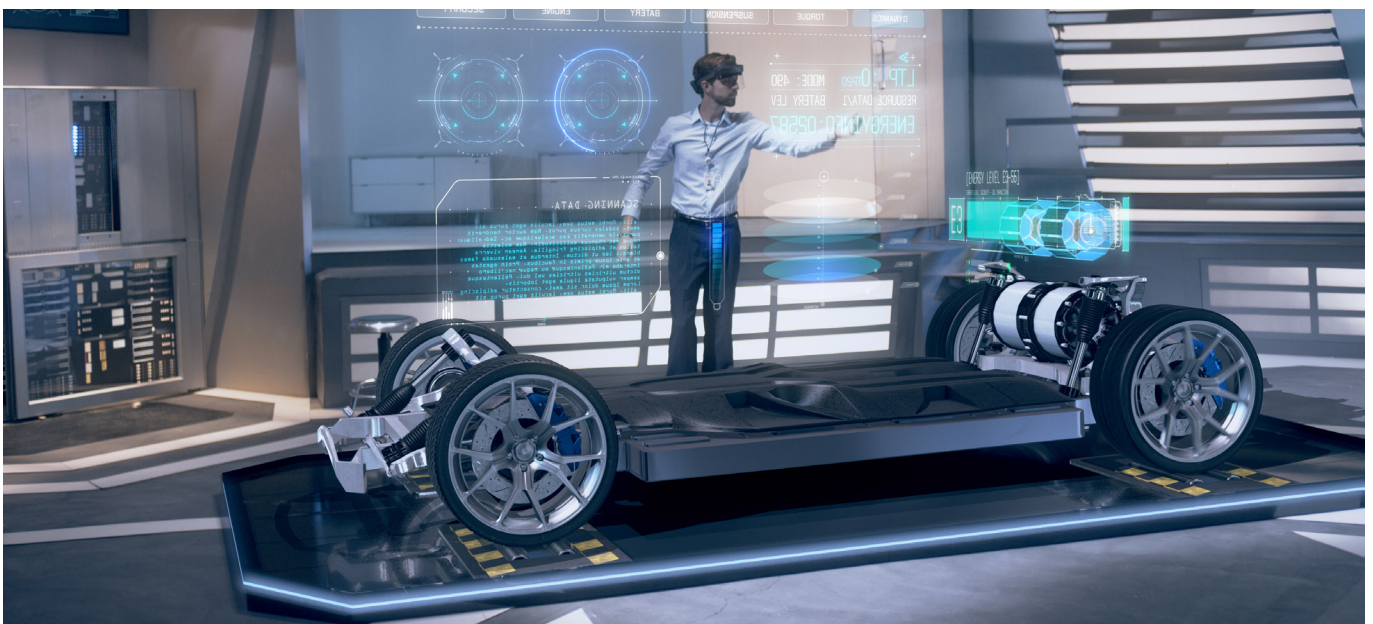
On current plans, to what degree is 5G being implemented (or will be implemented) in association with other technologies?



Source: Newsweek Vantage

"It's exciting to see the culmination of different technologies at the right moment to bring the best benefits to our customers," says Raj Radjassamy, Director, Product Management, 5G Wireless Power Solutions, at ABB⁵. "A lot of technologies—5G wireless, the cloud, edge computing, IoT—are put in a cauldron and this magic emerges so that the customer will see the benefits. The interplay of technologies is the biggest factor for me. For the customer, the benefits include getting things done faster and consuming less energy and maximizing throughput."

Rotmensen of Siemens says, "We look at a complete factory where all technologies are working together. We have a cloud-based solution, an IT solution and industrial edge-computing. If the client sets it up, they can integrate all the applications they need. We have our 5G network and are collaborating with device vendors to create a full ecosystem."



Some experience more 5G benefits than others

Going deeper into the survey findings, it is possible to explain why some executives are seeing more benefits from 5G than others. Almost a third (32 percent) of those surveyed have either gained lots of benefits and are measuring them or have found many tangible (albeit unmeasured) benefits.

The most striking contrast between this segment and the other executives who were surveyed is the level of integration. The 32 percent segment that has experienced a lot of business gains from 5G is far more likely to have fully implemented and integrated 5G with other technologies (46 percent versus 7 percent).

This segment is integrating 5G with as many technologies as possible (39 percent versus 17 percent), the most important of which are AI and IoT. And they're more likely to have found integrating 5G to be "much easier" than previous types of integration (31 percent to 15 percent).

Manufacturers have gained a great deal of experience integrating technologies at previous stages of industrial transformation and see that 5G will add value. Fifty-eight percent of executives have found integrating 5G with their top-priority technologies to be easier than they expected, with one-in-five saying that the integration process was "much easier" than they had thought it would be.

Siemens has already installed several prototypes of their 5G private industrial network at customer sites, says Rotmensen. It has also implemented these at three Siemens locations: an automotive showroom and test center that focuses on the car industry; a visitor center, and at the company's Karlsruhe factory, where there is an autonomous mobile robot (AMR) system. At Karlsruhe, "we had an idea of doing an AMR application and it worked. The implementation of our prototype in a factory went easier than expected. It was developed and implemented, while keeping the challenges of the shopfloor in mind, so that it was smooth sailing," he says. "The biggest challenge was finding the time to implement it in between production cycles. Getting the spectrum we needed was easy in Germany."

Another example of the impact of 5G facilitating the flow of other technologies is in enhancing car safety, efficiency and automation. Rohith Hegde is a Technical Regulations Manager, Connected Vehicles, at Audi in Munich and a senior delegate to the 5G Automotive Association, a global group of telecom operators and automotive manufacturers. His primary area of focus is cellular and 5G vehicle-to-everything (V2X), using 5G to enhance car safety, traffic efficiency and, ultimately, automated driving. Hegde's team works with other groups in the company responsible for, respectively: AI, connectivity, the Subscriber Identity Module (SIM), data processing, and automated driving & assistance. These teams are in very frequent contact, discussing how to combine capabilities to create a successful solution for connected vehicles.

Audi calls the result of this collaboration "the extended vehicle." The car generates a lot of data, much of which is processed through on- and off-board edge computing to make decisions for steering, braking and turning the car, says Hegde. The data is "cleaned and enriched" in the cloud for use in data analytics and then made available for third-party applications, such as usage-based car insurance and predictive maintenance.



FASTER INNOVATION

As 5G becomes more common in manufacturing, companies will be able to pursue some key objectives, such as transforming their ecosystems by working more effectively with their suppliers, customers and other corporate partners. The survey shows that the most important external value driver expected to flow from 5G implementation over the next two years is the acceleration of innovation, in collaboration with business partners. R&D and manufacturing processes are predicted to be the primary beneficiaries of 5G implementation over the next two years in terms of corporate operations as a whole.

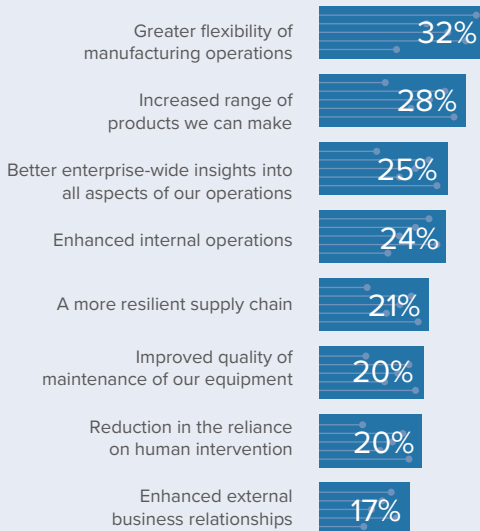
According to the survey, the biggest perceived business opportunity afforded by 5G over the next two years is to build better supplier networks, reduce labor costs through automation and connect more effectively with production facilities across the world.

What is the most important external value driver you expect to flow from 5G implementation in the next two years?



Source: Newsweek Vantage

What does your company see as the biggest business opportunity afforded by 5G over the next two years?



Source: Newsweek Vantage

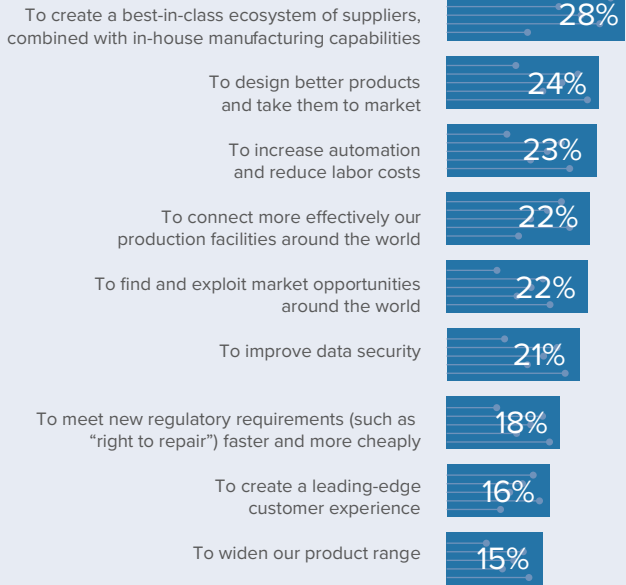
"5G is an open technology, meaning everybody can create products for it," says Rotmensen of Siemens. "Where we integrate different kinds of technologies, the ecosystem can benefit from this as a whole. In the future we might see an on-premise cloud being connected to a private industrial 5G network. You might have assets in the field where a factory applies edge-computer technology and a worker is wearing VR glasses and these are all connected to the same network."

Hasan of GE Research has led the development of 5G technology in a number of areas. One is smart warehouses, where GE Research is working with the U.S. Department of Defense to increase logistics efficiency. Another is the electric grid in the U.S. As in many countries the grid is either fiber connected or not connected at all. "We want to enable every device in the grid with 5G, so we can monitor and control each device in real time. If they are all wirelessly connected, we can create a digital twin of the grid and can provide data analysis to customers before something goes wrong."

A third area is healthcare, in which GE is installing 5G technology in mobile patient monitors to enable people to be released early and return home. "We are streaming patient data from the intensive care unit wirelessly almost in real-time so that medical staff can intervene proactively, if necessary," he says. The monitor continuously tracks the patient's respiration rate, oxygen saturation and pulse rate in the ICU, in the general ward, at home, and all points in between.⁶

Adaptability and flexibility characterize the benefits that respondents want to see from integrating 5G with other technologies. About one-third say their chief objective is greater flexibility of manufacturing options (32 percent) and an additional 28 percent want to increase the range of products they can make. Other top answers include getting better operational insights across the enterprise, enhancing internal operations and strengthening the supply chain.

What are the chief objectives of integrating 5G and your most important technology?



Source: Newsweek Vantage

"The product is becoming part of the network," says Rotmensen. A new car model contains roughly 8-10 gigabytes of data and it takes 25 minutes to upload the data in the factory before going to the customer, he adds. In future all newly manufactured cars will have a 5G communications module that allows for the software to be downloaded during production. This could save 25 minutes in the manufacturing process "and in three years the amount of data is likely to double, so it'll save up to an hour per vehicle."

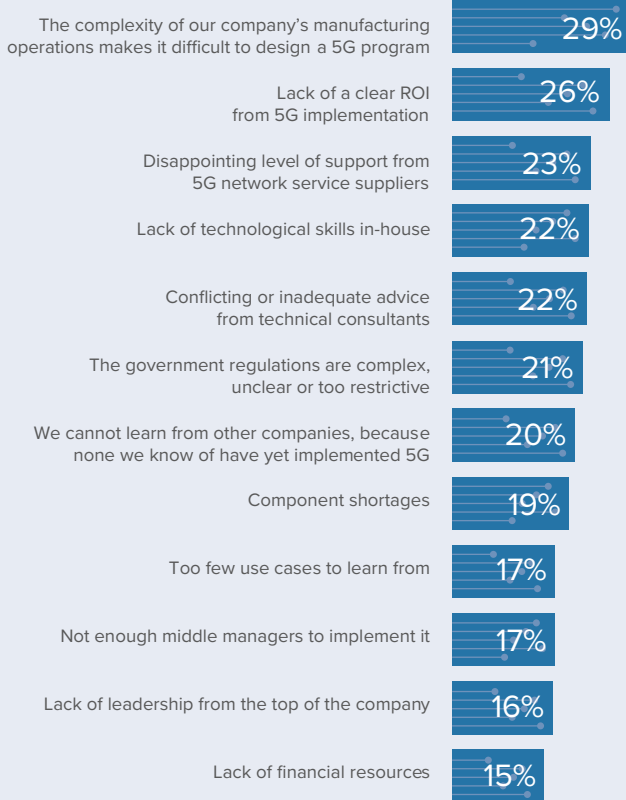
One use-case Rotmensen sees for 5G in manufacturing in the near future is transporting various subcomponents from multiple factories to one location for final assembly using a combination of public and private 5G networks. "The moment the container with parts leaves the factory, it is tracked with GPS, and its location can be accessed via the public 5G network, so you know exactly when it arrives and can plan production accordingly," he says.

Robert Bosch, the German engineering and technology company, has been testing and evaluating the new mobile communications standard in about 15 pilot plants worldwide. This is done to evaluate and validate the performance that 5G can achieve in real-world production environments and to build up relevant know-how, regarding the operation and optimization of private 5G networks. Bosch also wants to make its own industrial products and solutions 5G-capable. Prototypes include a 5G-enabled version of existing products, such as the ActiveShuttle, an autonomous transport system, that is being developed and extensively tested.⁷



CHALLENGES TO IMPLEMENTATION

What are the most urgent challenges your company faces in designing a 5G program prior to implementation?



Source: Newsweek Vantage

"If there is a lack of collaboration among IT, operational technology or a business unit and they are working in siloes, you will have challenges," says Hazard of AT&T. "Looking at the problem from a design perspective, you must ensure you understand what it is that you are trying to connect to this environment. If you go to 5G, you will have a good inventory of what is connected today. But what third parties are connecting to those facilities and what are the latency and bandwidth requirements? If you don't have a strong, fundamental architecture, you're going to struggle to succeed."

For Audi, "the biggest challenge in implementing 5G technology is to negotiate with the telecom operators to provide connectivity coverage throughout a geography where we expect cars will be driven, so that they can move from one jurisdiction to another seamlessly," says Hegde. "We need the co-operation of the telcos to provide ubiquitous coverage so that cars never go outside their operational designed domain." The 5G Automotive Association is a key forum where technical standards are harmonized. Other industry associations around the world have formed working groups to achieve similar ends.

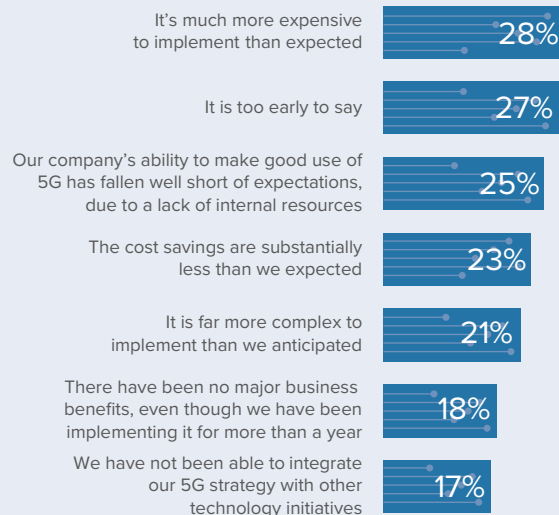
Although executives regard 5G integration as beneficial, overall, to their business, they acknowledge that there are some difficulties in making it a success. When it comes to designing their 5G programs, they face a variety of challenges ranging from the complexity of their manufacturing operations to skills shortages and governmental regulations. Another big challenge of designing a strategy is the lack of support from vendors.

There are significant regional differences in perceived challenges. Thirty percent of executives in the Americas complain of a lack of in-houses skills, compared with 18 percent in Asia and Europe. By contrast, thirty percent of executives in Europe say they receive conflicting or inadequate advice from technical consultants, versus 18 percent in the Americas and Asia.

Bosch installed its first operational 5G campus network at its plant in Feuerbach, Germany. Dr. Andreas Müller, head of communication and network technology in the corporate sector for research and advanced engineering at Bosch, says that the challenges began at the network planning stage. This focuses on network coverage and the rate of data transfer, as well as latency and reliability. "Guaranteeing 99.9999% reliability is not so easy from a planning perspective," he says. "Working out the details of how to integrate it securely into existing structures, for example the existing Bosch network, was also very challenging."⁸

When it comes to 5G implementation, costs are top-of-mind for manufacturers in the survey. Sometimes, it is much more expensive to implement than expected and at other times, cost savings are substantially smaller than anticipated. Other major challenges include the fact that 5G integration is more difficult than expected. Some say they have not been able to use 5G as much as hoped, due to a lack of resources. Others complain that the process of 5G integration is more complex than anticipated.

What are the most disappointing aspects so far of your company's rollout of 5G technology?



Source: Newsweek Vantage

PATHS TO SUCCESS

Executives are implementing 5G in a range of different ways that suggest no single method works for everybody. The most popular approach is to implement 5G in a few large, bold leaps, but a large number prefer to take several small, incremental steps one by one. Others have developed a long-term plan with measurable milestones at regular intervals.

To deal with the complexities of integration, a third of executives surveyed is hiring external experts to design a strategy that reduces complexity. A similar number is engaging consultants to carry out the task of integration on behalf of the company. Equally popular, though, is for manufacturers to designate an in-house executive with the authority and budget to manage the task of 5G integration. Indeed, it is highly likely that many companies are taking both internal and external steps to achieve integration, combining the use of outside experts with steps to strengthen the leadership of the effort within the company.

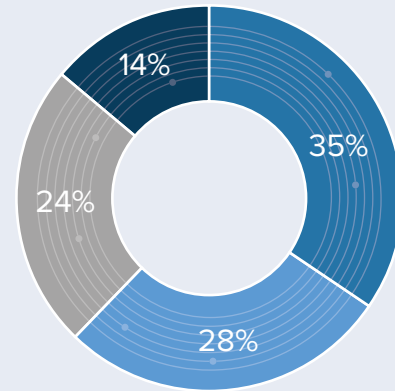
If companies do hire the expertise externally, they need to make sure there is proper coordination between different providers in the ecosystem, says Radjassamy of ABB. “You are going to need a telecom equipment vendor and/or telecom service provider, and access to spectrum whether private or public, as well as a supplier of the power equipment that will feed the network, not to mention installation and management of the system. The customer would expect seamless service and may not want to deal with five or six different providers individually. They would prefer to engage with one provider who would act as the ecosystem aggregator.”

Creating a proof of concept is a popular method of moving forward with 5G. “Most of our customers are taking a programmatic approach to that rollout and doing it through proof of concept by putting all the elements of success into a small scale such as an incubation facility. That way they can easily show the outcomes to the business in small wins and then go to scale,” says Hazard of AT&T.

GE Research is taking a step-by-step approach. “We need to convince people all the way up the hierarchy to our executive leaders about this technology. We try, through infrastructure capabilities, to be more focused on developing different proof-of-concept types of products.

By demonstrating the use of 5G infrastructure, it will resonate well with our senior leadership and with our customers in healthcare, energy, and aerospace,” says Hasan of GE. “We are not just showing a slide in a PowerPoint, but actually demonstrating the use of 5G in our products. We started by showing the benefits from very small applications and then we move to the next step, which is the proof of concept. It’s incremental.”

Which of the following statements about 5G implementation most closely reflects your view?



- The best way to implement 5G is to take a few large, bold leaps
- The best way to implement 5G is to take several small, incremental steps one by one
- Our company has developed a long-term 5G implementation plan with measurable milestones at the end of each 12-month period
- Finding the right technology partners is critical to the rollout of 5G and realizing the expected value

Source: Newsweek Vantage



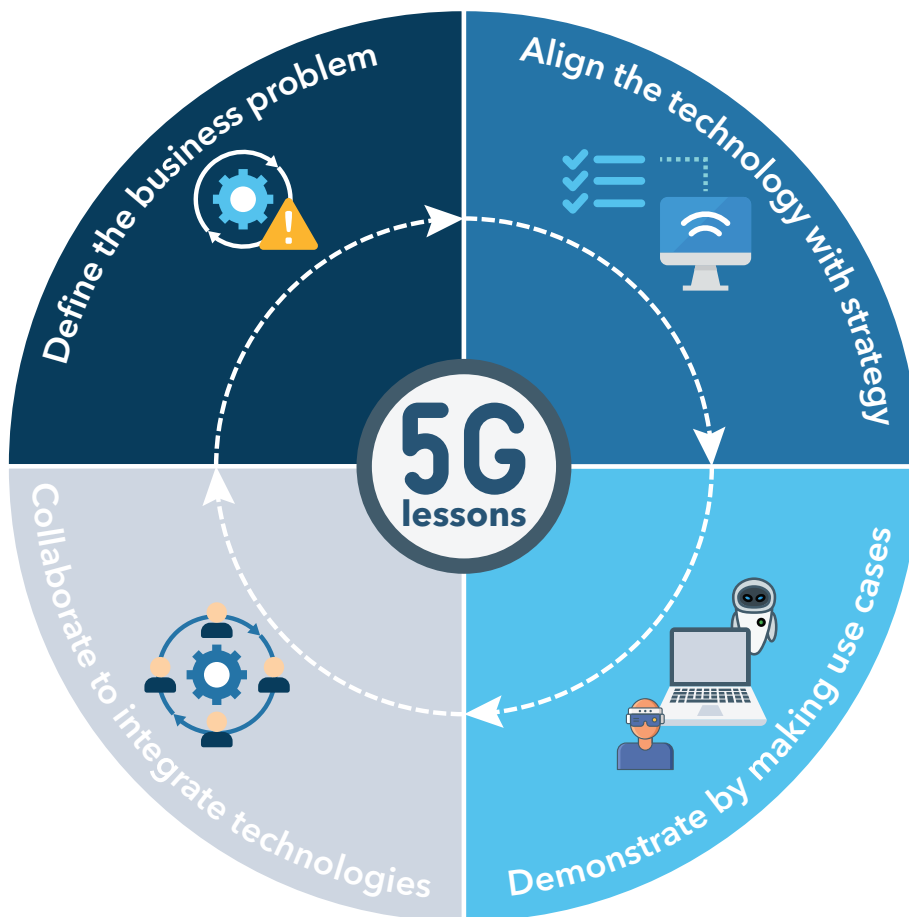
5G towers (above) are becoming ubiquitous

“The cost of rolling out a private 5G networks for an enterprise is surprisingly low, versus some Wi-Fi 6 network upgrades or managing wired networks. The flexibility of private 5G will accelerate innovation for most enterprises if they take a realistic approach to execution, define a clear ROI, and realize that not one size fits all”

— Greg Corlis
Emerging Technology Leader, KPMG

LESSONS FOR THE FUTURE

This report demonstrates the 5G is no longer regarded as a technology whose perceived benefits were exaggerated by some proponents. Now, evidence is accumulating of its effectiveness in a wide range of manufacturing applications. The survey and interviews show that companies are beginning to reap dividends by integrating 5G into their industrial transformation and that the communications technology works best when it is combined with other technologies into an effective i4.0 strategy.



The lessons that companies can apply to their future work with 5G are the following:

- As with any successful implementation, the organization must first define the business problem that 5G is intended to solve. Only then can the implementation be designed to achieve measurable outcomes. Most business problems and technologies change markedly over time, so create an implementation plan that allows for modification. It is a journey, not a destination.
- Align the technology with the company's overall strategy. As with any tool, 5G is a means to a business outcome. Its implementation will succeed only if it is designed to further the business objectives and creates value for the enterprise.
- Although 5G technology has moved beyond the stage of exaggerating its benefits, manufacturers continue to need to be educated about the ways in which 5G can enable operational improvements within not only the company, but also the ecosystem. The best form of education is creating use cases with measurable results that can be shown to the company's leaders.
- Successful integration of 5G with other technologies can only be achieved through close collaboration among teams that are dedicated to implementing the different technologies. They need to stay in continuous contact at every stage of the integration process and resolve technical difficulties together in a coherent way.

Survey Demographics

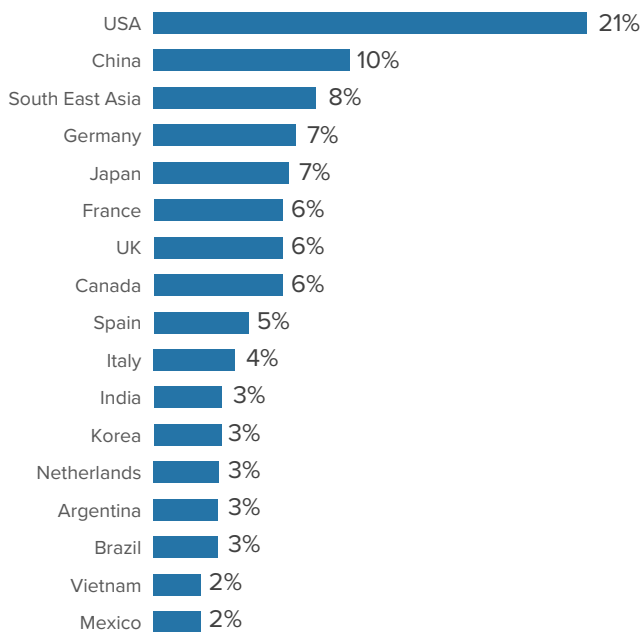
The survey was fielded between September 8 and 21, 2022 and collected 300 responses. Two-thirds of the respondents are C-level executives (60 percent) or Members of the Board (7 percent). The remainder are VPs and above.

There is a diverse geographical distribution, with the locations of respondents evenly spread among the Americas, Europe and Asia. Seventeen percent are in the U.S. and 10 percent are in China. Seven percent of respondents are from each of the following: Canada, Japan, the UK, Germany and France. Responses were also collected from Brazil, Argentina, Mexico, India, Vietnam and other countries in Southeast Asia.

The survey asked for functional responsibilities and found that 66 percent are in IT, 22 percent in general management (which includes the office of the CEO), and 15 percent in each of operations and supply chain management.

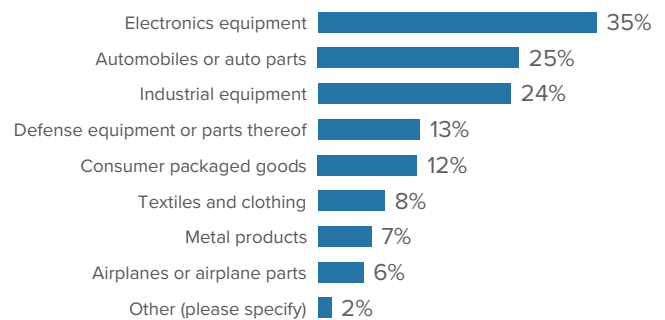
Almost all the companies are large: 16 percent have annual revenue greater than \$50 billion and 26 percent have \$26-50 billion in revenue. We asked for a breakdown by product. Some 35 percent are in electronics equipment, a quarter of respondents are in automobiles and 24 percent are in industrial equipment.

Where is your company headquartered?

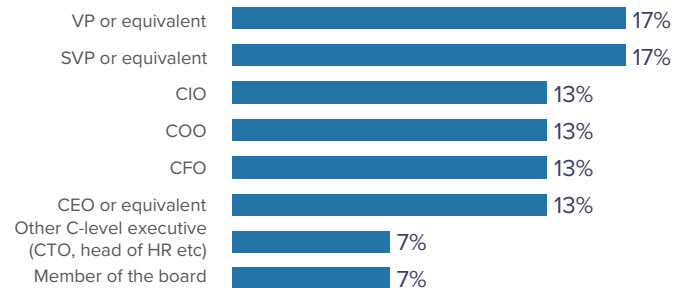


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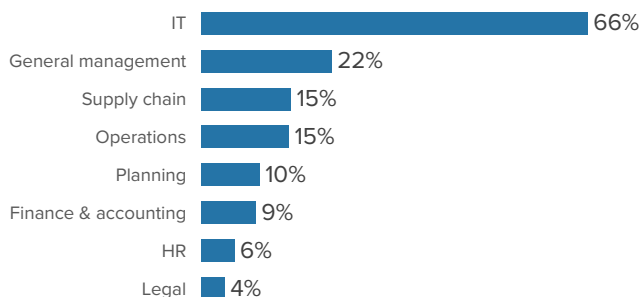
What does your company produce?



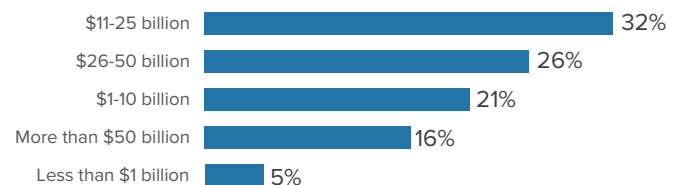
Which of the following best describes your job title?



Which of the following functions are you responsible for?



What is your company's revenue in USD in the most recent financial year?



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