



Accelerating Our Future

2020-2021 Intel IT Annual Performance Report





■ We are committed to a culture of constant innovation and business partnerships to accelerate value for our customers.

— Archana (Archie) Deskus, Intel Senior VP and CIO

Insights From Our CIO

As one of the world's largest semiconductor chip makers, Intel's vision is to be the performance leader that unleashes the potential of data. In this era of rapid change and distributed intelligence, we see artificial intelligence (AI), 5G network transformation and the intelligent, autonomous edge as the fastest growing opportunities for Intel and our customers. As we have transformed to position our company and our customers for growth, Intel's Information Technology (IT) team has partnered with the business to drive innovative solutions with emerging technologies.

Adapting and Delivering in a Time of Challenges

Our digital transformation was well underway when the COVID-19 pandemic made computing power even more essential and caused us to expedite our plans. As an essential industry, Intel's ability to meet its customers' demands for more product depended on keeping employees safe and productive under extraordinary circumstances. We needed to enable our worldwide manufacturing operations to continue uninterrupted even as the world changed overnight.

Most of our 110,000-strong global workforce transitioned to working from home in a matter of days. This required us to enable remote capabilities to monitor and control our factory operations; install and troubleshoot manufacturing equipment; keep a complex global supply chain flowing in the face of burgeoning customer demand; and connect our extensive ecosystem of employees, customers and suppliers to communicate and collaborate to keep our business moving.

We had built a strong foundation prior to the pandemic and we worked together with our business partners to identify priorities and swiftly implement changes that would drive the best results for employees and Intel's ecosystem. In a world of social distancing, restricted travel and working from home, we learned to adapt our culture and work styles to support an effective and motivated team. We continue to address these challenges while supporting Intel's strategic transition for a world in which everything looks like a computer and enabling a significant expansion of the company's capacity.

Innovation at the Heart of Change

Companies that embrace innovative technologies and adopt new approaches are better positioned to develop new products, services and business models; create new market opportunities; and meet changing market demands. Multi-cloud, AI and machine learning, edge-to-cloud, 5G and advanced cybersecurity are the next wave of game-changers. These innovative technologies are opportunities to develop new products, change the way we go to market, meet changing market demands and deliver new value to our customers.

As Intel takes advantage of these disruptive technologies, our products become more intelligent and highly integrated, driving greater complexity and a higher volume of transformative programs. Intel IT sees this as an opportunity not only to help drive Intel's product innovation but also fundamentally change the way we do business. We are rapidly embracing new technologies, adopting differentiated hyperscale computing and have doubled our high-performance computing (HPC) capacity to simulate new complex product architectures in our energy-efficient data centers. Furthermore, the value proposition of AI is being realized across Intel. For example, we are using AI to automate and enhance our product validation capabilities, and to create more intelligent products that reduce power and improve both performance and battery life.

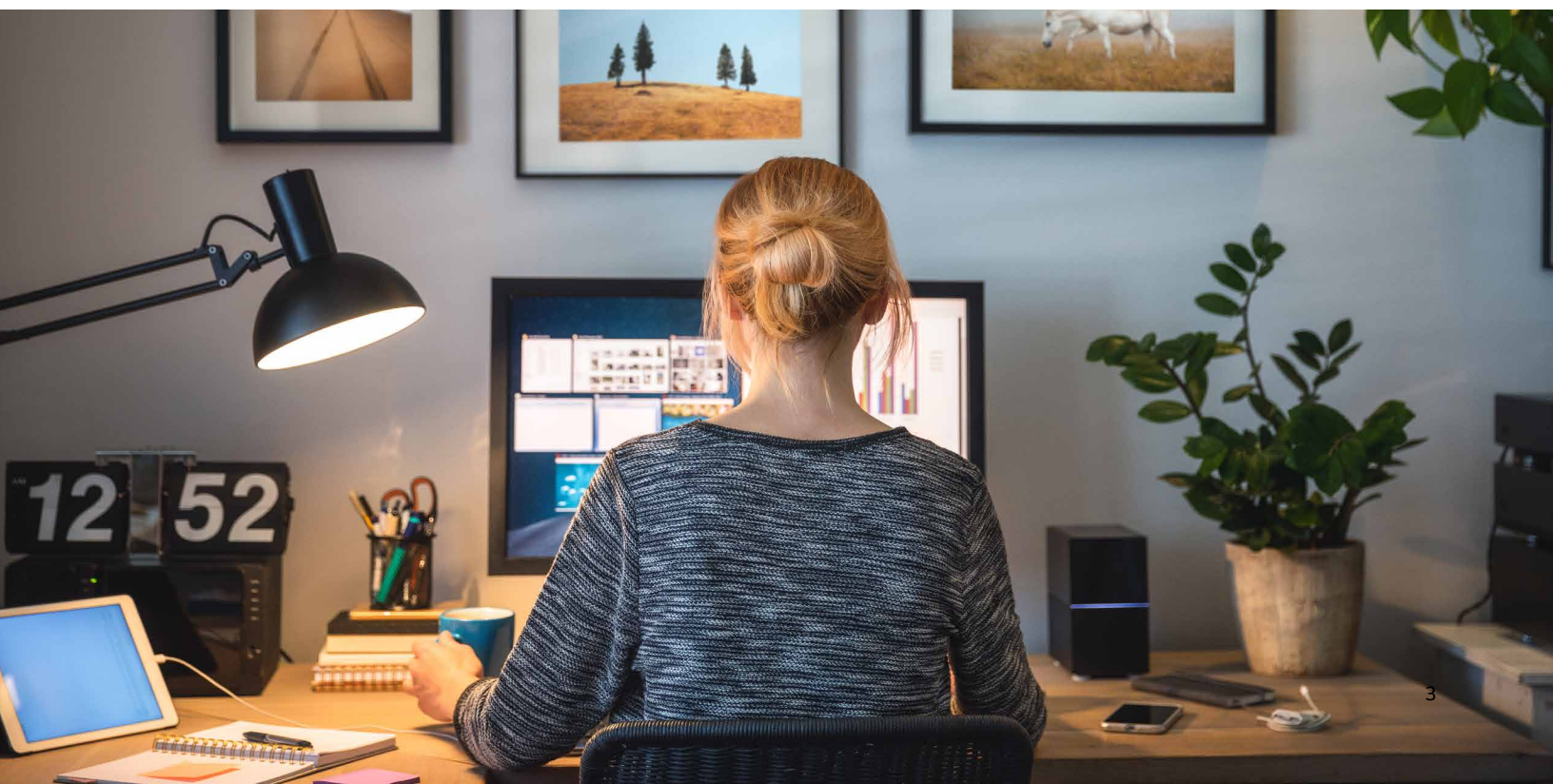
Focusing on the Experience

Our employees, customers and partners live in a world of consumer technology with intuitive, powerful and engaging experiences. We're inspired by the power of giving people intelligent, usable tools that abstract away complexity.

The rapid expansion of technology, creating millions of smart connected devices, has generated an unprecedented amount of data with immense insights into customer behavior. Unleashing the potential of this data is central to providing the experiences customers want and need. For example, AI provides data insights that enable Intel's sales force to better target customers with relevant and valuable solutions, as well as the ability to determine the right product performance and pricing structure for customers. We are also reorganizing and consolidating our data for greater availability and reuse, enabling us to get products and solutions into customers' hands faster. These solutions help transform both our employees' work and Intel's relationships with customers.

Modernizing Business Continuity

Traditionally, business continuity plans assumed a subset of business operations may be impacted by limited disruptions, such as a natural disaster that



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impacts certain areas, loss of power at a site, or supply chain issues for a product line. Before 2020, planning for a risk that stretched across an entire global business was rare. But, while it unfolded over a few weeks, COVID-19 ultimately hit every segment of our business across all geographies and sites simultaneously. Traditional business continuity concepts were suddenly insufficient. The lessons learned from the pandemic will result in more mature capabilities and more resilience against future risks.

As the business environment changes, we must constantly reassess the risks. On the security front, Intel IT has been keeping Intel IP, company and employee data secure for decades. However, the explosion in the number and complexity of cybersecurity threats makes it imperative to move to a “zero-trust” model. Today, with our extensive global footprint, partner ecosystem and solutions running in the hybrid cloud, we believe this model will best protect Intel's most critical IP, data and assets in a more flexible and distributed future.

Purpose, Potential and the New Normal

A crisis can bring people together, enabling innovative thinking and change. The pandemic showed opportunities to improve operations, deepen collaboration across the company and accelerate change in ways that will help us better serve customers.

We're still defining what the future of work will look like, but what we've learned will aid us as we move toward more flexible, personalized and immersive work environments that support different roles and work styles, and power new levels of collaboration.

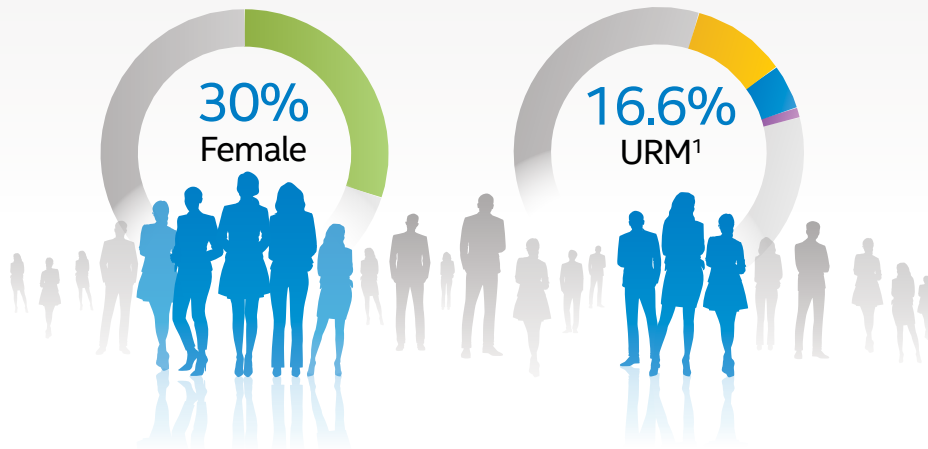
Our digital transformation journey continues by accelerating product engineering cycle times and enabling the end-to-end integration and automation of our core business processes to strengthen our execution. Engaging our employees and putting them at the center of driving our digital transformation is our key to continued success.

Intel's purpose is to create world-changing technology that enriches the lives of every person on Earth. That purpose continues to inspire us as we build on our achievements from the past year to accelerate Intel's growth and in turn help our customers and partners grow.

Please share your insights and reactions with me on [LinkedIn](#), follow me on [Twitter](#) or learn more at intel.com/IT.

Archie Deskus
Senior Vice President and
Chief Information Officer,
Intel Corporation

~5,000 IT Employees Support 110K Intel Employees in 53 Countries



Innovation

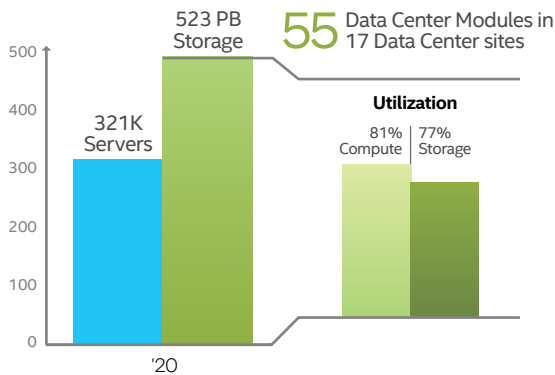
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Patents Granted

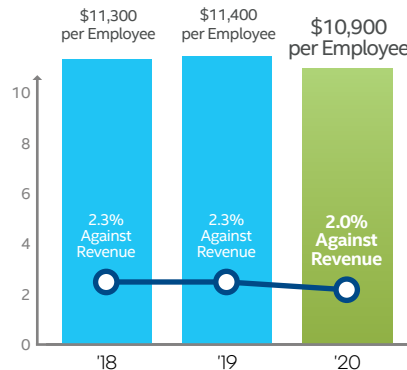
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Invention Disclosure
Form Submissions

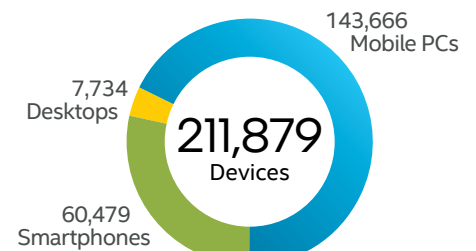
Our Infrastructure



How We Spend



Managed Devices



Accelerating Our Future



USD 1.56 B

Direct business value
delivered through
new solutions



72 Hours

To transition
100,000 remote
workers



22 Weeks

vs. two years for
factory start up to
production ready



USD 1.2 B

Revenue influence through
partnership with sales



UP 2.6x

Conference minutes
post-COVID

¹ U.S. Under-represented Minority (URM) Diversity: 10.8% Hispanic; 4.9% African American; Less than 1% Native American
Data as of January 1, 2021. Employee count represents an average of beginning and end of year.

Digital Acceleration

As we look to the future, we can seize additional opportunities to enable a continuum of transformation empowered by technology innovation.

Allowing the Unexpected to Accelerate Digital Innovation

Intel IT has spent years investing in automation and digitization, which helped us deal with the unexpected during the 2020 pandemic. As we look to the future, we can seize additional opportunities to enable a continuum of transformation empowered by technology innovation.

If COVID hadn't occurred, the digital innovation strides we made in the past 12 months may have occurred at a much slower pace. Out of necessity, we were driven to go faster and we learned that we can do more than we thought.

We quickly adapted our formal processes (such as equipment procurement) to accelerate our response. Adhering to typical processes could have resulted in thousands of employees being unable to do their jobs – something that could have brought Intel's business to a near halt. Everything we did was filtered through the lens of keeping Intel's operations uninterrupted and Intel's products shipping. Our mission remains – keep Intel's business operating, no matter what happens or how the business evolves.

■ Out of necessity, we were driven to go faster.

This year was a real test of that. While we don't have all the answers, we have learned a great deal that challenged our traditional mindset and implemented some innovative solutions. Our vision is that we will continue to accelerate IT's response to unexpected business needs – helping Intel to better serve its customers around the globe.

Managing a High-Tech Factory Network from Home

Our manufacturing processes are already highly automated, and we had a proven Manufacturing IT global operation model in place long before COVID. However, pandemic travel restrictions for Intel employees and suppliers, along with the mandate that employees should work from home if possible, led us to develop innovative solutions to keep employees safe while still maintaining factory excellence.



Running Factories from Home

While the pandemic drove us to adopt remote operations more quickly than we might have otherwise, the payoffs will stretch far into the future.

To keep Intel's factories running, we developed a hardware and software platform for Remote Operation Center (ROC) technicians to use to monitor and control factory operations from home. To support ROC employees working from home, we:

- Enabled and scaled multiple remote communication and diagnostic capabilities
- Engineered new ways for factory technicians and engineers to work from home
- Scaled remote access and IT collaboration capabilities
- Provisioned a large increase in personal computing laptops
- Accelerated upgrades to a more modern collaboration framework to enable better video conferencing quality

Behind the scenes, we scaled up (by approximately 6x) a third-party tool for remote control computer connections to manufacturing equipment to provide access for vendors, factory engineers and technicians. We also enabled remote video conferencing and relaxed geofencing regulations regarding cell phone camera use in the factory to assist troubleshooting and remote install support.

While the pandemic drove us to adopt remote operations more quickly than we might have otherwise, the payoffs will stretch far into the future. Having more flexibility and more options to increase agility is beneficial for Intel.

■ We're exploring immersive technologies, such as mixed reality, that can enable new kinds of complex work and collaboration.



Reimagining Manufacturing with Augmented Reality

For several years, we have been exploring use cases for augmented reality (AR) throughout Intel factories. New social distancing and restricted travel rules expedited the AR program, which is now being implemented globally across Intel's factories. To date, we have identified nine manufacturing AR use cases that can deliver significant performance breakthroughs in terms of yield, tool error recovery, technician training and flexibility in who can perform certain tasks.

"This effort has now been supercharged by COVID," says Jason Solomon, director of operations for Intel's Assembly and Test Technology Development. "Not only was it a good idea when it originated, now it's a lifesaver and clearly one of the ways we're going to be doing business in the future."

Pictures and videos, presented in real-time through AR glasses, help provide clarity for technicians when they need to perform a specific sequence of actions required to service a tool. Instead of performing "over the shoulder" training, trainers can now take advantage of AR's "remote assist" functionality. The trainer wears a headset and performs the operation, while the trainee observes on his or her laptop and asks questions for clarification. Roles can also be reversed; the trainee performs a task while the trainer observes. The trainer can see what the trainee is seeing and is able to give much more in-depth training. In addition, the trainer can view documentation on another screen and refer to it throughout the task. This makes the training process

more seamless and efficient. AR can also enable remote collaboration with suppliers, which can help reduce mean time to repair and provide technicians with new skills, while avoiding travel and quarantine issues.

We have observed concrete benefits from AR in Intel's factories. For example, technician certification can occur 25 percent faster, while live fab-to-fab video calls enable technicians to perform a new task twice as fast compared to using standard written documentation.

We also took an IT enterprise approach to AR. Security is managed using our standard governance system that controls access to applications and data. We use standard Wi-Fi connections and integrate the AR equipment with Intel's office productivity suite. As we move from just a few pilot projects to deploying AR worldwide, we are using a "smart cabinet" to automate the process of checking AR glasses in and out. Future plans include integrating AR capabilities with other factory plan-of-record systems such as the Manufacturing Execution System (MES).

Dig Deeper

- White paper: ["Instant" VPN Scaling and Continuity During Crisis](#)
- White paper: [Building a Multi-Cloud-Ready Enterprise Network](#)
- White paper: [Multi-Cloud Network Supports Private and Public Cloud Use Cases](#)



Customer First

We improved operations, accelerated change and evolved in ways that will help us better serve our customers.

Supporting Customer Obsession as Intel Broadens Its Industry Scope

Intel's purpose is to create world-changing technology that enriches the lives of every person on Earth. We are on a journey to transform for a world where everything computes, requiring technology to move, store and process data faster than ever before.

IT plays a critical role in helping Intel achieve the goal of growing revenue to USD 100 billion, through expansion of external channel partners working with us to sell and market Intel® products and technology.

To strengthen partnerships, bolster collaboration and ensure the right solutions are reaching the right customers, Intel has begun rolling out the new Intel® Partner Alliance (IPA). A major One IT/One Intel program, IPA consolidates multiple programs that mutually benefit Intel and our channel partners. Its aim is to grow Intel's partner base and enable companies to collaborate with Intel and drive new solutions.

"IPA runs on IT-developed and -managed systems, and our ability to deliver the capabilities that drive the business wouldn't happen without them. We're joined at the hip with IT – it's a great collaboration," said Eric Thompson, general manager for global partner enablement.




We're joined at the hip with IT – it's a great collaboration.

— Eric Thompson, Global Partner Enablement

Beyond the IPA, we also help provide a customized customer experience that makes it easier for customers to get what they need. We are using several strategies to achieve success, including innovative uses of AI, finding ways to accelerate our processes and helping to improve the online experience for Intel's customers.

Using AI to Help Customers Find Solutions

Our Sales AI platform covers 2,500 sellers and 31,000 accounts. The Sales Assist application provides insights (also called "assists") that help Intel's account managers find better opportunities to approach customers with the right offers and increased efficiency so they can better serve their accounts. The Autonomous Sales application creates automatic sales motions (a combination of actionable steps and general sales philosophy). These include emails, web notifications and newsletters that offer relevant products to Intel's partners. The Autonomous Sales application operates daily and automatically, with no human intervention. It applies to all the partners' accounts, even if they are not covered by an Intel sales team. Together, these Sales AI applications generated more than USD 168 million in revenue for Intel in 2020.



Automation and a
“One Intel” mindset
enabled us to open a
factory in 22 weeks –
nearly 80 percent less
time than is customary.

Of course, finding potential customers is just the first step – next, the customer must decide to buy. Especially in these uncertain financial times, customers appreciate the right product performance and at the right price – a delicate balancing act. Until recently, price and performance up and down the stack of a product family were determined by experts through a largely manual, time-consuming and laborious process. Now, unique AI algorithms recommend optimal price and performance combinations across the stack of a product family in near real time, shortening time to insights by 30x and creating a win-win for the customer and Intel through increased product value. The use of AI in product price-performance optimization has delivered over USD 1 billion in business value in three years, including more than USD 600 million in business value in 2020.

We continue to develop new applications, algorithms and use cases for AI as we strive to connect Intel customers with the solutions they need. Armed with data and proof points, we hope to drive a cultural shift and digitally transform how Intel does business.

Responding Quickly to Increased Customer Demand

Even before the pandemic, customer demand for Intel's products often threatened to exceed factory capacity. In response, Intel doubled its combined 14nm and 10nm manufacturing capacity over the past three years. As the pandemic persisted, customer demand continued to increase. Technologies that were once “nice to have” suddenly became critical to Intel's customers. We had to continue to build out our factory capacity, even during a time when we couldn't be onsite. Spurred by the urgency to increase production, Intel decided to reopen a manufacturing facility that had been closed for five years.

Normally, completing a project of such magnitude would take two years, but thanks to the use of automation and a “One Intel” mindset, the team opened the factory in just 22 weeks (a nearly 80 percent reduction in time to production). The team used a “follow the sun” work model, where teams in different time zones tag-teamed the work. Travel and site restrictions meant the team had to work remotely and use collaboration tools.

For example, a person on site would have to be the hands and eyes of someone working remotely. Although challenging, people got creative with their problem solving.

“The team displayed amazing commitment – working weekends and nights – and a great dedication to customer obsession,” said Jeff Walsh, vice president, Information Technology and general manager, Manufacturing IT. The factory, which manufactures 2nd Generation Intel® Xeon® Scalable processors, shipped a million units within 20 weeks of ramping and stabilization and shipped a total of 3.3 million units by the end of the year.

Even as Intel accelerated the pace of business and dealt with the challenges posed by the pandemic, Manufacturing IT scored two of its best quarters for manufacturing operational performance in more than three years, sustaining a record 99.9 percent uptime across 11 factories.

We also completed the startup of a new third-party logistics finished goods warehouse in the record time of nine weeks – 40 percent faster than the standard 15 weeks, again using the follow the sun work model. We also enabled the digitization of our outsourced manufacturing supply chain, providing a clearer picture of what inventory is on hand and where it is located at any given moment. During the pandemic, this much-needed capability helped to significantly shorten the response time to a customer request for product.

We can learn from these successes and significantly accelerate our ability to respond to new business and customer needs as they arise.

Providing Customers with a Targeted Online Experience

At the end of the day, Intel IT's greatest value is to help create satisfied customers. This is the ultimate goal that underlies everything we do. Here are two examples of how we worked to deliver a better customer experience, which in turn can result in more business for Intel.

Creating a better web experience

360 million people visit intel.com every year. We have significantly transformed the infrastructure underlying intel.com and Intel's digital asset management sites. This included migrating the platforms to the cloud while enhancing support and dynamic content that

can be scaled based on customer needs and usage. The newly renovated site provides best-in-class current feature functionality, auto-scaling and global performance – such as page load times – for Intel's customers worldwide.

At the end of the day, Intel IT's greatest value is to help create satisfied customers.

Giving customers the information they need

The Intel® Automated Relational Knowledge Base (Intel® ARK) is the external-facing home for all Intel product information. ARK is one of the most-visited Intel web properties, averaging more than 13 million views per month. Working with Intel's sales and marketing group, we migrated ARK to an IT-supported enterprise standard solution and single repository for product data distribution across multiple channels and platforms. It provides a consistently defined interface and user experience with a new recommendation engine. The data migration involved the consolidation of multiple databases spread across more than 100 virtual machines to create a simplified back end and seamless user experience on intel.com, resulting in a global 9.2 percent faster page load. Bringing this kind of consistency to product information is vital to Intel because it helps Intel's customers make informed decisions.

As Intel broadens its product portfolio and reaches more customers, ensuring a targeted, dynamic and enjoyable customer experience will continue to be of utmost importance to the company's success. Intel IT is committed to putting our skills to work to show Intel's customers that we take their needs seriously.

Dig Deeper

- Web page: [Discover the All-New IPA](#)
- White paper: [Improving Sales Account Coverage with AI](#)

AI in Digital Transformation

Data is a transformational force, and we are using AI to drive product innovation and improve product execution.



Using Automation and Data as an Asset

While many companies' AI journeys are in their infancy – many are still conducting small proofs of concept – Intel is already reaping substantial business value from AI initiatives.

For example, under constrained capacity, AI algorithms helped improve factory yield by an extra 3.7 million units (USD 372 million) for a combination of several Intel® processors. By embedding and enabling Intel's use of AI across our critical business processes, we have delivered more than USD 1.56 billion in value in 2020.

Providing Customers with Smart and Adaptive Products

An important way for Intel to stay competitive is to continue to improve product performance; however, as silicon complexity increases, it becomes more difficult to make performance gains. Working with Intel's Client Computing Group (CCG), we are helping integrate AI into Intel products. AI algorithms embedded into Intel products can dynamically adjust a processor's power limits, based on the actual workload. This technology, called Intel® Dynamic Tuning Technology (Intel® DTT), uses AI-based pre-trained algorithms to predict workloads, enables higher turbo burst when responsiveness is needed and allows extended time in turbo for sustained workloads. 10th and 11th generation Intel® Core™ mobile processors use Intel DTT to identify usage patterns and classify

workloads. This information enables Intel® Mobility Boost Technology – a new innovation that enhances the user experience through better responsiveness and performance while improving battery life.

We are excited to continue working with Intel's business units and design teams to put automation, AI and data to work to serve Intel's customers and for our own Intel product consumption as we provision our data centers and employee devices.

Supporting Quality and Product Innovation


Data is a transformational force, and we are using AI to drive product innovation and improve product execution across the entire product lifecycle.

High-quality manufacturing


Through automation and AI, every wafer, each of which produces roughly one gigabyte of data, is checked as it's processed to ensure the highest quality standards are enforced. In addition, our use of advanced analytics to process more than five billion data points per day, per factory enables engineers to extract imperative information in 30 seconds instead of four hours.

Fast customer response

Traceability of a product and its components across the company is critical to solving issues quickly. Connecting disparate puddles of data has enabled us to find the software or IP quickly, which helps to identify specific



Data is a transformational force, and we are using AI to drive product innovation and improve product execution across the entire product lifecycle.



Through automation and AI, every wafer is checked as it's processed to ensure the highest quality standards are enforced.

issues within 10 minutes where it may have taken up to 400 hours previously. We are also speeding product development through the consolidation of software and IP, enabling reusability and reducing time to market.

Better product design processes

By automating and augmenting human-validation capabilities with AI, we optimize the time-consuming pre-silicon validation stage, which has improved product-validation processes, lowered costs and reduced time to market. Our Intelligent Test Execution Management (ITEM) capability helps validation teams run the most efficient and cost-effective tests. ITEM has reduced the number of required tests by 70 percent and has been deployed in 60 different validation teams across Intel, resulting in improved validation results, reduced validation cost and faster TTM.

We are also helping to improve predictability and visibility of quality, optimize delivery schedules and reduce test time for each system on a chip (SoC) product. This work with SoC products has generated a one percent chip area reduction for two key products and reduced sample unit spending by 10 percent. Overall, in 2020, our data-centric product-design initiatives generated USD 360 million in business value.

More compute power to support chip design

We adopted HPC to address the large computational scale associated with product design. Our HPC solution has enabled a 252x growth in compute capacity and we have reduced the number of compute issues by 107x. We also migrated critical design workloads to a state-of-the-art high-performance compute zone in one of our most energy-efficient data centers (PUE of 1.06). This change has delivered a 50 percent increase in performance at 30 percent lower cost – coupled with increased stability and additional on-demand burst capacity.

Dig Deeper

- White paper: [Faster, More Accurate Defect Classification Using Machine Vision](#)
- Solution brief: [Streamline Deep-Learning Integration into Auto Defect Classification](#)
- White paper: [AI Reduces Cost and Accelerates Time to Market](#)
- Blog: [IT Collaboration Leads to Unique Product Innovation](#)
- White paper: [Data Center Strategy Leading Intel's Business Transformation](#)
- White paper: [Extremely Energy-Efficient, High-Density Data Centers](#)

■ We learned the importance of a digital-first business, how to move fast under fire and that the way we work has forever changed.

— Archana (Archie) Deskus, Intel Senior VP and CIO

Looking Ahead

2020 was an unprecedented and extraordinary year where our capability and resiliency were tested. We learned the importance of a digital-first business, how to move fast under fire and that the way we work has forever changed. The relevance of technology was pushed to the forefront this year and proved that those who were further along in their digital transformation journey fared better.

Crisis brought us closer together, and the ability to focus on our priorities enabled us to move faster. Going forward, we have an opportunity to build a culture that maintains that same sense of urgency and acceleration to deliver greater value for Intel and our customers.

Keep an eye on the future by joining us on our journey at intel.com/IT.

Read more from our IT leaders and subject matter experts on the **IT Peer Network**.

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