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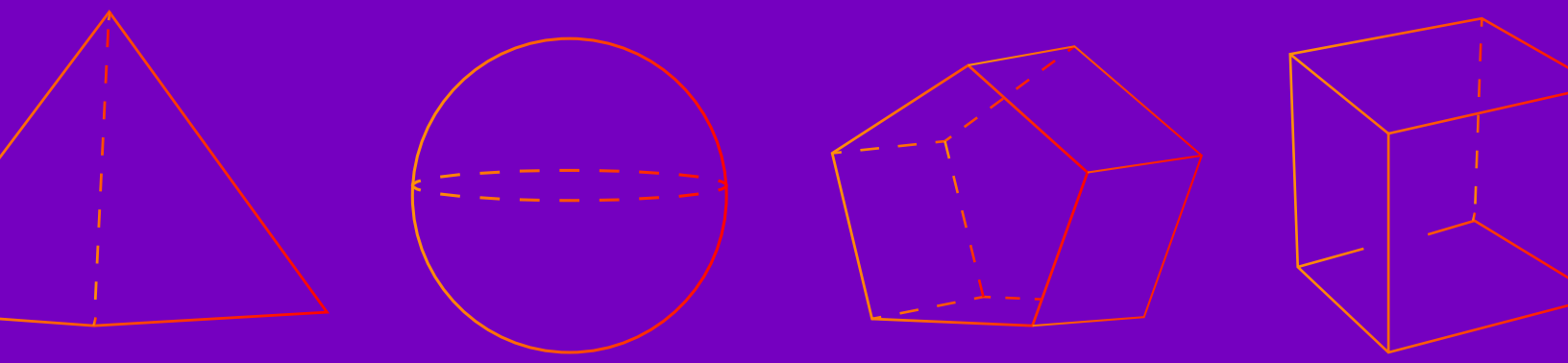
INDUSTRY X.0:

GET READY FOR THE FUTURE OF PRODUCT ENGINEERING

Accenture Labs



The convergence of multiple technologies– including Artificial Intelligence (AI), edge intelligence, analytics and extended reality– is driving a new era of manufacturing. In industries from automotive to industrial equipment, and from pharmaceuticals to raw materials, leading companies are using this development to seize competitive advantage. The result? Mass customization, in real time, with smart connected products.

We call this

"INDUSTRY X.O."

As Industry X.0 becomes established, the industrial landscape is being changed beyond recognition in three ways. First, by offering businesses smarter, more closely connected and data-driven agile processes, Industry X.0 completely transforms the way we work. Second, new tools engage and empower a highly collaborative workforce. And third, Industry X.0 offers businesses a new opportunity to involve customers throughout the product lifecycle via living services. Industry boundaries are blurring and entire product value chains are being reinvented.

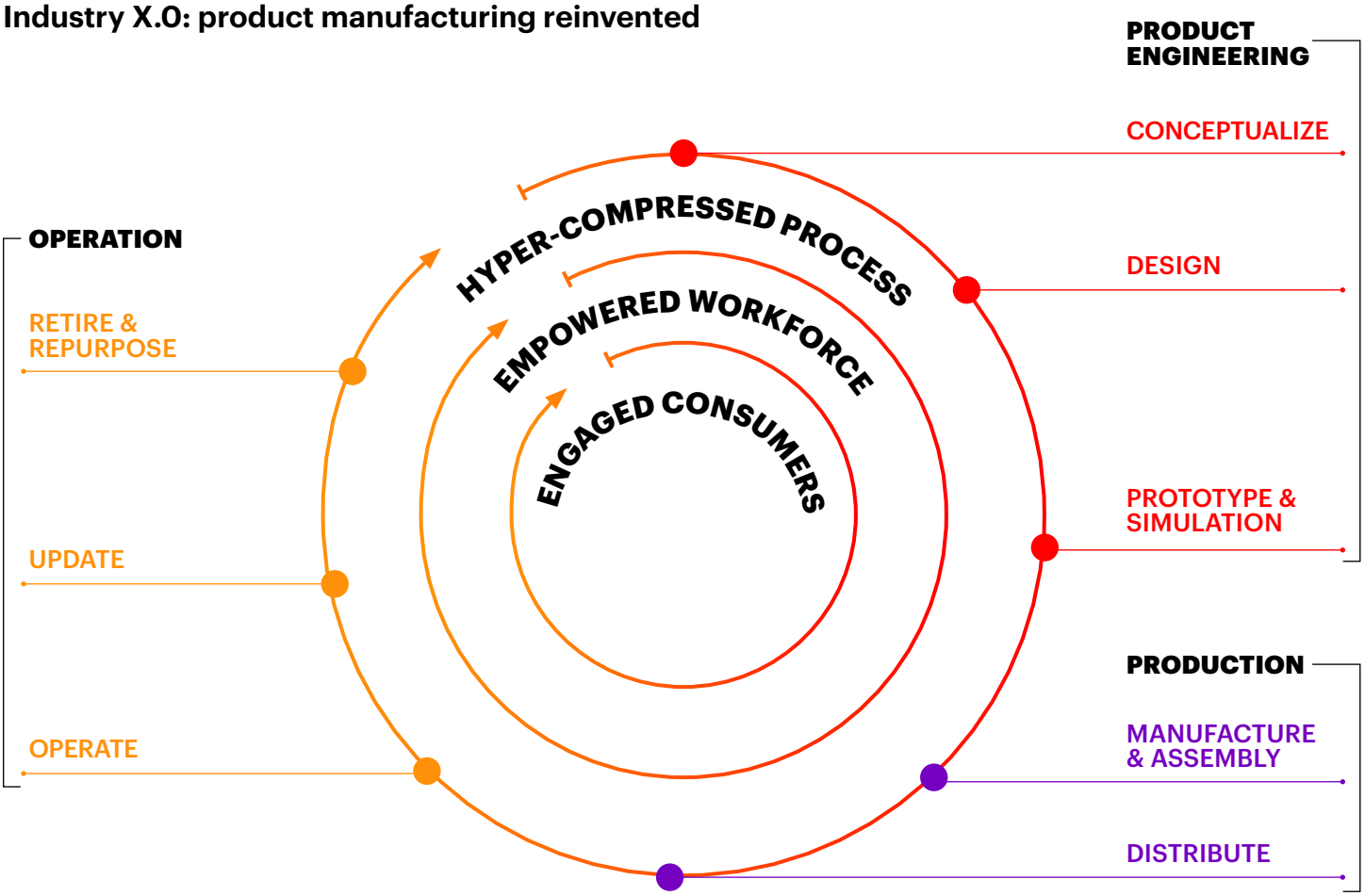
In the industrial sector, the impacts of Industry X.0 will play out at every stage of the product manufacturing process—from product engineering, through production and into operations. Enormous value potential will be released as a result.

How will this transformation happen? In the Industry X.0 era, businesses will take advantage of combinatorial technologies to unlock new competitive advantages. Those technologies include artificial intelligence, the liquid workforce, extended reality, embedded sensors, generative design, and human-collaborative robotics.

Additionally, as people become digitally connected to every product they use, manufacturers will source value from every part of the digital ecosystem. Instead of using new technologies like artificial intelligence (AI), analytics, IoT and mixed reality in pockets of their business, they'll combine them to achieve unprecedented industrial strength.

This report looks at the impacts of

Industry X.0: product manufacturing reinvented



combining advanced technologies for Industry X.0 in the Product Engineering phase. Spanning conceptualization, design, prototyping and simulation, it's a completely new world of rapid, compressed timelines, immersive experiences and exceptional insights. The destination? Embedding new services into solutions from the onset of design. This will set the stage for manufacturing with mass customization, in real time, with smart, connected products that learn from and adapt to their environment and to their customer's preferences.

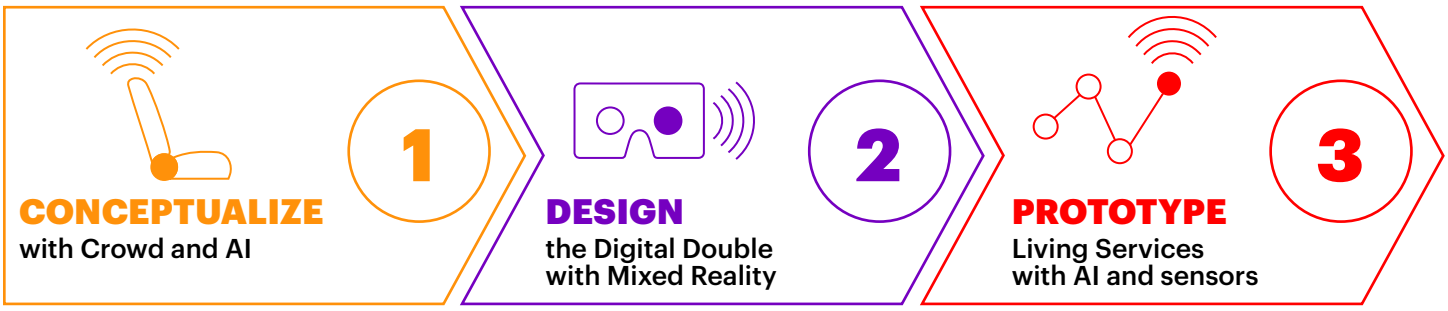
THE FUTURE, **NOW**

Powered by the convergence of a whole spectrum of breakthrough technologies—from AI, edge intelligence and augmented/mixed/virtual reality, to 3D-printing and analytics—
INDUSTRY X.0 IS A GAME-CHANGER.

Tomorrow's leading manufacturers will reap the benefits across the workforce, business processes, and customer engagement channels. Sounds futuristic? Think again.

These developments are happening so rapidly that your industry is already in the front line of change, as we'll demonstrate through several examples.

Industry X.0: Engineering the semi-autonomous rider experience with cutting-edge technology



Smart automobile seats: Combining multiple advanced technologies in product engineering phases allows for hyper-compressed and automated processes, and engages the workforce and the customer to create a better product.

New applications for Industry X.0 in product engineering are emerging all the time. At Accenture Labs, we are developing proofs of concept for every stage of the product engineering lifecycle, and we believe these concepts will be rapidly adopted in the new manufacturing landscape.

FROM CONCEPT

In the conceptualize phase, new technologies can be applied to speed up and focus core tasks. Instead of relying on time-consuming, expensive and resource-intensive market research and analysis, manufacturers can leverage the crowd to conceptualize new products, faster, and immediately test them with their customers. Tesla, for example,[1] gathers data from sensors inside its customers' vehicles to monitor driving patterns and drivers' reactions to road and/or traffic conditions. It can even test its latest autonomous software by remotely installing it on vehicles.

In one proof of concept, Accenture Labs combined Industry X.0 technologies, including artificial intelligence and a crowd workforce toolkit, to massively accelerate ideation for automotive seat design requirements and support the modelling of designs. This includes using AI to scan multiple sources of information, from online reviews and journals to social media, providing near real-time intelligence that we can apply to shape and re-shape new concepts. Hyper-compressing product feature extrapolation from months to days, at scale, applications like this will create exponential business value.

Taking this a stage further, we leveraged the crowd to develop our insights on semi-autonomous automotive seats into concepts. A distributed crowd of individuals turn insights into solutions and builds those into concrete concepts which are fed back to the engineers. This is the application of agile design thinking and advanced technologies to capture the "voice of the customer" before concepts move into design. Looking ahead to the manufacturing and operations phases of the lifecycle, we explored how embedded connected sensors can be used to provide real-time intelligence on usage, posture, comfort and other factors, enabling much more personalized and context-specific products to be developed.

TO DESIGN

We'll soon see Industry X.0 applications flowing through the product engineering lifecycle. The onset of augmented reality, virtual reality and mixed reality technologies will revolutionize design, providing new tools for workers to create in 3D.

Our brains are wired to work in a 3D world, but typically engineers are restricted to working with 2D tools (e.g. CAD allows users to explore a 3D model on a 2D screen). Accenture research in this space[2] points to major worker productivity and collaboration benefits for companies that switch to 3D tools. This empowers their engineers, enabling them to work with "digital doubles"—holographic representations of potentially physical products that can be manipulated and developed virtually.

By engineering products in a digital double context, teams can rapidly move designs through to prototype and simulation. For example, Accenture Labs recently collaborated with a client to build a digital breaker-box. Engineers can view the breaker-box as a hologram, use gesture and voice input to

pull out individual components and inspect them, view them from different angles, reassemble them, and once they're in the right configuration, move on to simulation and prototype. And all this while collaborating with colleagues remotely, wherever they happen to be based. In this instance, we simulated amps through the virtual breaker-box to see how effectively it would perform in the real world.

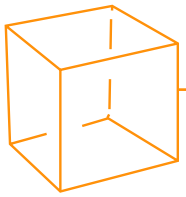
In addition, Accenture Labs are developing product engineering toolkits to allow the conversion of 3D digital objects stored in parametric models like CAD for display on 2D screens into rich 3D models, which can be experienced using immersive technology. This provides designers an easier way to collaborate with other designers and their customers.

Backed by analytics capabilities around predictive maintenance, monitoring and optimization for its products, this design flexibility is plugged into an end-to-end data loop that feeds into R&D and other functions. As a result, the company is equipped to rapidly build and scale new offerings. This is estimated to reduce time from product ideation to market testing from three years to under eight months.

AI is becoming established as a powerful new user interface. In the product design phase, this really comes to life when we explore how mixed reality and AI enhance communication by creating new ways to sense, comprehend, act, learn and optimize.

People augmented with AI have unprecedented power to move rapidly and innovate continuously. To understand the ROI of training workers leveraging virtual and mixed reality, Accenture Labs recently partnered with a mixed reality hardware manufacturer, Meta. We studied 100 people who had been trained to assemble a Lego set with either paper instructions or a mixed reality application. When it came to assembling the set, they were able to complete tasks 50% faster when they were trained using mixed reality.

Similarly, General Electric and Boeing conducted studies and found that when people use mixed reality to upskill their workforce, the tasks were completed up to 46 percent faster.[3] For businesses, this translates into improved worker productivity and a rapid ability to upskill existing workforces.



TO PROTOTYPE & SIMULATION

The pace, efficiency and effectiveness of prototyping and simulation will be transformed by Industry X.0. In some industries, like automotive, the manufacturing process currently takes up to 36 months, with prototyping and simulation accounting for one-third of total costs. New technologies, applied together, will change those dynamics forever, vastly accelerating processes and enabling far deeper flexibility and responsiveness.

3D printing provides a great example of what's in store. Today, 3D printing is being used to prototype and manufacture a small set of parts in industries including aerospace, automotive and medical. But it's yet to be applied at scale in global manufacturing. As the technology continues to mature, however, it will be a powerful driver, helping to shift supply chains from centralized to highly distributed. New concepts engineered in locations across

a manufacturer's global network can be prototyped locally and tested, manipulated and shared with colleagues remotely through virtual/mixed reality technologies.

Combining AI with 3D printing can have breakthrough benefits at the prototype phase. Nike provides a great example.[4] The company applied generative design, which is an AI technique in computational design for modeling, to remove excess weight in Olympic athletes' shoes. Software assimilated the goals of the project and optimized designs to take those goals into account. By feeding data from various sources into an algorithm, the company's engineers 3D printed prototypes and tested them, repeating the cycle until they had the optimal design.

We're also seeing some interesting proof of concepts in the consumer goods space. By overlaying analytics and mixed reality technologies on physical shelves, for example, companies can simulate product displays and optimize them for better space planning and improved customer traction. Concepts can be taken from the lab to the store for real world simulation.

TOWARD **INDUSTRY X.0**

In the Industry X.0 era, manufactured products become a mechanism for understanding the product attributes that consumers value.

Today, new products are launched onto the market only after significant investments have been made into design and prototyping. With always-connected products, that will change fundamentally. The products themselves become a data point for automating the design of new products and modifying products that are already in use by customers in real time. Leveraging Industry X.0, businesses will integrate multiple technologies to compress timelines from months to days, and digital businesses will go to market with new products in a fraction of the time it takes their less digital competitors.

Industry X.0 will be pervasive much sooner than most people think. Encompassing every area of operations from processes, to workers to customers, it will drive completely new digital set-ups across business functions, operating models and new software-enabled connected products. Wholesale digital disruption of the industrial sphere will follow.

To succeed and remain relevant in this transformed industrial landscape, companies will need to grow the "new" across their businesses, combining emerging technologies holistically to reimagine how they operate.

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REFERENCES

[1] https://www.technologyreview.com/s/601567/tesla-tests-self-driving-functions-with-secret-updates-to-its-customers-cars

[2] http://ieeexplore.ieee.org/document/7836522

[3] https://hbr.org/2017/03/augmented-reality-is-already-improving-worker-performance

[4] https://www.wired.com/2016/07/check-nikes-crazy-new-machine-designed-track-shoe

ABOUT ACCENTURE LABS

Accenture Labs incubates and prototypes new concepts through applied R&D projects that are expected to have a significant strategic impact on clients' businesses. Our dedicated team of technologists and researchers work with leaders across the company to invest in, incubate and deliver breakthrough ideas and solutions that help our clients create new sources of business advantage.

Accenture Labs is located in seven key research hubs around the world: Silicon Valley, CA; Sophia Antipolis, France; Arlington, Virginia; Beijing, China; Bangalore, India; Herzliya, Israel and Dublin, Ireland. The Labs collaborates extensively with Accenture's network of nearly 400 innovation centers, studios and centers of excellence located in 92 cities and 35 countries globally to deliver cutting-edge research, insights and solutions to clients where they operate and live. For more information, please visit www.accenture.com/labs.

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