RESHAPING THE FUTURE OF EXPERIENCES

Industry X.0 Transformation

Accenture Labs
Industry IX.0 is about bringing products, services, and partners together to produce the best outcome. It puts the human experience first, optimizing for specific goals in both work and personal lives. Its confluence of technology innovations will enable companies to reimagine the future of transport, healthcare, entertainment, energy, and more.

Industry X.0 will incorporate smart products and services to transform experiences, even the everyday tasks of modern life. Baking a cake for a family member’s birthday on Thursday won’t require a trip to the store for ingredients on Wednesday night; a smart refrigerator will scan its inventory against your planned recipe ahead of time, adding any missing items to the grocery list and moving a scheduled delivery earlier to occur in time for preparation. Processes like these will be orchestrated on your behalf, using awareness of events on your schedule and the products in your home, all the way through to inventory at the store. Smart products will engage the relevant delivery services needed to ensure a seamless experience, and bridge connectivity gaps with existing home devices.

Similar frictionless orchestration will transform work. Companies are already using Industry X.0 solutions to combine the unique strengths of human workers with situationally-aware artificial intelligence (AI). In oil and gas, the question of how a company should plan its next well to drill now begins with an AI system proposing an initial plan. AI has the capability to review all past drilling data at scale, and even to automatically identify the key features needed to determine well productivity and to avoid adverse events like loss circulation, kicks, and stuck pipes. Rather than drilling engineers initially relying on their varied individual expertise and experience to set the design, they start from the design suggested by the AI system. AI’s unique ability to identify patterns, its data-driven situational awareness, and its computational creativity capabilities give human experts in the resources industry a frictionless jump forward in their planning for future well locations.

The ultimate success of Industry X.0 approaches will rely on ecosystems of partners working together in a self-organized manner to determine and deliver the best outcomes. An orchestrated combination of future tools and processes will deliver the future of experiences—and all of this will be driven by the digital twin and thread.
“Digital twin” refers to a digital model of a physical object, system or process that exists (or could exist) in the physical world. Businesses can use these twins to design, simulate, monitor, and analyze their physical counterparts. “Digital thread” refers to the processes and technologies that maintain the connection between a twin and its physical counterpart, and the many ways they can be used.

Work being done at Labs enables the creation and maintenance of digital twins, and uses extended reality, the Internet of Things (IoT), and artificial intelligence to retrofit existing products and processes, so that they can sense and adapt intelligently to power the future of experiences. Our efforts are creating the intelligence that’s needed at the edge so that smart tools can act on (and become) rich sources of data, whether or not there is network connectivity to the cloud. Labs efforts are changing how companies work together and overcoming the “digital gaps” and impedance mismatches between partners and across teams, enabling digital twins that can be shared and composed across partners for use toward a common objective.

We’ll use digital twins to dynamically adapt Human + AI + Automation in a process. Human workers in roles related to design, implementation, and execution of processes will benefit from automated coaching, assistance, and insight to help create processes that adapt to individual contexts, with minimum friction or coordination overhead. We’ll look at the human interface—from human-to-human, human-to-AI, and human-to-robot—to better create seamless experiences.

The digital twin both powers new experiences and allows the outcome of those experiences to feed back into future efforts. Whether for the workforce or consumers, delivering on the ultimate promise of Industry X.0 requires products and services with this new level of ongoing awareness. We are driving toward continuous optimization of outcomes: an era where the definition of “best” is not only individualized, but also evolves. With the power of the digital twin and thread delivering on the promise of Industry X.0, experiences will be both tailored to the specific circumstances of today, and self-adaptive to ensure that they will be exactly as needed for tomorrow.

75% of organizations implementing IoT already use digital twins or plan to within a year.
Accenture Labs works on the future of the enablers needed to bring together transformational Industry X.0 outcomes.

The Future of Tools is Creative

A new generation of tools are needed to support building, maintaining, and evolving the products and assets that will drive individualized experiences. In making infrastructures that are flexible and adaptive, much of the magic lies in predicting and creating the best design for the future job to be done. Tools need to be stakeholder-centric to consider, predict, and then optimize over several outcomes. They must be computationally creative, prescribing the design and realization for the next generation of products and assets, using learnings from all past experiences as well as predictions of what is to be. This future of tools will enable a new level of access: where previous generations of tools required specialized expertise to use, future tools will infuse AI-driven domain expertise and real-time feedback to guide the user to success.

The Future of Processes is Living

Supporting individualized experiences requires collaboration on multiple levels: humans and machines will work together to support adaptive internal processes, and external partners will work together in opportunistic ways. The resulting process optimization needs to be decentralized, working across partners, and self-adaptive to take advantage of all available services. It requires platforms providing cross-ecosystem automation that continuously optimizes the end-to-end process as conditions evolve. And these processes require understanding the role of the human-in-the-loop, as that role is increasingly augmented with robotics and AI at scale.

The Future of Experiences is Individualized

The human experience, whether on the consumer or employee side, is first—with assets, products, and services working in concert to self-adapt for specific situations. It’s beyond personalization, which customizes a fixed asset for an individual; the promise of Industry X.0 is an experience that’s individualized at scale for the specific context and moment. New assets and products will be designed, and existing ones will be renovated and retrofitted in ways that allow them to be modified on-demand as part of an overall system to meet evolving needs around what makes the best experience.
Applying dramatically advanced technology capabilities such as AI, 3D scanning, IoT, robotics and 3D printing will enable a new set of tools, all driving a broad, human stakeholder-centric approach to the design and manufacturing cycle: these tools anticipate and optimize for requirements from a full range of stakeholders, from end-users, business owners, and society. The resulting cycle is computationally creative in a way that pairs AI with human expertise, expanding opportunities for human workers by augmenting their own skills and experiences with the power of these new tools.

**AI-assisted apparel design**

Labs has developed a suite of design assistants for the fashion industry. These assistants use AI to help designers understand the elements of the best-selling apparel designs. They then apply AI in a second way to generate numerous inspiring designs based on the extracted “winning concepts” from existing apparel and validate the most promising new creations algorithmically. By incorporating elements that have been shown to attract sales, this approach reduces unsold product inventory. The solution provides access that would previously have required specific expertise. It can potentially reduce design efforts and time by half and create designs with double the traditional acceptance rate. What’s more, it can be potentially disruptive by introducing entirely new design concepts. It leverages AI techniques like convolutional neural networks, generative adversarial networks and neural style transfer to balance manufacturing capability with the opportunity to delight the consumer.
Imagine you are a passenger in a ride-share vehicle, where you reach for your cell phone and put it up to your ear to make a call. A smart vehicle might be equipped with cameras and the ability to detect and interpret your activity, and then respond in helpful ways, like rolling up the window and turning down the radio to give you a quiet environment for your call. But do passengers want this behavior? And should the system confirm again when it thinks you’ve completed your call, before restoring the window and radio to the state before the call?

Labs has worked with a company that designs car interiors to create tools that enable quick testing and changes for smart product behaviors like these. We’ve created expandable prototype tools that help designers quickly define detection triggers and behaviors for user testing in prototype vehicles. Behaviors can be reconfigured without coding to rapidly test which ones best satisfy user preferences. This enables designers to prototype the actual working behaviors, rather than relying on imagination and “what ifs.” Moving forward, as we collect more data about the interactions that users have with smart products, we will make the tool increasingly proactive in suggesting improvements to behavior design based on past patterns. It will also be able to probe for edge cases such as ADA compliance.

Between 2004 and 2018, the average cost of a sensor dropped nearly 200% to an average cost of $0.44, making intelligent manufacturing more affordable and accessible for manufacturers of all sizes.²
Robotics surgery platform

Labs is helping to develop a platform that provides a holistic view of the patient profile and interactions throughout the surgical course. The course of action is tailored for the patient and includes the integration of new tools like 3D-printed implements and robot-assisted surgery. This requires collecting, coordinating, and interpreting data from across an ecosystem of stakeholders—the medical care givers, the hospital, the pharmaceuticals, medical device/robotics manufacturers, and research institutions—all to improve patient outcomes.

Labs is helping to define and build out the edge architecture that connects various surgery robots and their customized instruments through to the enterprise IoT infrastructure, supply chain and clinical data management components. This facilitates control over how data is used, as well as powering and governing the AI models that act in concert for the benefit of the patient.

We are developing an architecture that allows connection and teleoperation of the surgical systems by remote physicians. Actions and context around the teleoperation of the robot then provide additional feedback that can be used to improve the overall system.

The Future of Processes is Living

Processes are the means by which individuals, teams, and partners work together to realize planned experiences. Today’s partners and roles on teams are largely fixed and well defined. To enable the promise of individualized experiences, the future of processes needs to be living: it must be self-adaptive and decentralized.

Cross-ecosystem automation continuously optimizes the end-to-end process to fit stakeholder requirements. Optimization is targeted for a common objective but must be decentralized across ecosystem partners. It is self-adaptive, taking into consideration the situation and available capability.

In addition to being self-adaptive and decentralized, the implementation of technologies like blockchain and homomorphic encryption will also enable future processes that support privacy and traceability. These approaches will deliver a future of processes with built-in opportunities for fault tracking and error remediation.
Enabling collaboration across the semiconductor ecosystem

Labs is helping semiconductor ecosystem partners create a trusted, distributed way to share data, unlocking a path to flexible collaboration. Equipment manufacturers need data to deliver better solutions for equipment, parts, and services, but IP concerns present a major barrier. Suppliers need to protect their data as well as that of sub-tier suppliers, and customers restrict data—especially data related to on-wafer, off-line metrology, and integration. Blockchain provides traceability and control of data views, but trust demands more: IP issues are so severe that there is reluctance for analytics from the equipment manufacturer that operates on raw data, even if it runs on-premise.

Sharing data directly with external parties, even masked or obfuscated, is inherently risky, yet unavoidable for meaningful business collaboration. Labs is using cryptographic protocols (e.g., homomorphic encryption) that enable companies to derive insights from encrypted data without decrypting the raw data. Multi-party computation opens up many new opportunities for enterprise collaborations that were not previously possible due to risk or regulations. Beyond traceability and control of data views, this technology allows participants to jointly investigate product quality issues and is a key enabler for decentralized processes across partners.

Digitally-enabled design of physical processes

Production shoots are a very expensive part of making a motion picture, and it all begins with location scouting. This requires careful process planning, and much of it involves anticipating how activities will be carried out in an unfamiliar physical space: equipment placement, shot angles, and motion paths, as well as knowing distances and clearances. Traditionally, the planning that can be done remotely has been limited. Detailed planning requires site visits, and some elements are not possible to fully visualize until time and money has already been invested on a set that has been made, by which time fixing unanticipated problems costs a great deal.

A detailed digital twin, modeling the terrain and the production blueprint, can enable various groups to collaboratively plan details before or even instead of physically coming together on the set. Labs is helping a studio use drone photography, combined with advanced photogrammetry, to create 3D models, then use intelligent immersive applications to provide visualization of the 3D place that process planners can “walk” through and manipulate. The application allows designers to see potential problems early, and also provides basic analytics to uncover the implications of possible choices: for example, how much cabling will be needed if the generator is placed in a certain location.
The Future of Experiences is Individualized

Looking to the future of what’s possible with Industry X.0, the promise of individualized experiences is the ultimate goal. Products, assets, and services will be redesigned or retrofitted to self-adapt to the specific situation, accepting both direct and passive inputs and feedback during specification and design, through digital twin-driven experimentation, and during the ultimate use of a product itself through real-time data and interaction. The level of customization goes beyond personalization; it adjusts for a specific instance, context, and overall outcome-driven objectives. It happens on-demand, where changes are not just immediate but are prescriptive. It’s human-centric in the most individualized way possible.

The idea of putting the human first is not new, but Industry X.0 offers the most comprehensive, holistic way to deliver on that promise. Whether it’s about creating the best experience for consumers or workers, the focus is on how operations and the environment dynamically adjust to optimize the situation at hand.

A high-end buying experience for everyone

Labs is helping to transform the buying experience, providing affordable, scalable means to deliver high-end, high-touch experiences to both the consumer and the b2b space. A traditional high-touch consultative sales experience is very expensive, and logistically difficult to deliver. It requires highly-trained sales representatives who are given the time to fully learn know the customer’s needs, and who have the expertise to know how to conduct a consultative conversation that both elicits detailed customer needs and educates the customer on how products (or well-chosen, integrated combinations of products) can best address those needs. Delivering this type of buying experience is so expensive that only a small percentage of use cases can justify it using traditional methods.

Labs is supporting human-AI teaming to deliver an equivalent high-end experience: equipped with an intelligent assistant that models the deep expertise previously available only via “white glove” service, less experienced sales reps can engage the customer as a much more experienced expert would. IoT and machine learning are used to gather and analyze information about both customers and products, building knowledge-graph representations that inform the sales experience. These data streams will reduce the time and effort needed to develop detailed models of evolving customer needs and preferences, further improving ongoing sales and service conversations. On the customer side, this means democratization of white glove treatment. For the seller, it creates opportunities for more meaningful conversations with customers.
Lights-out data center operations

Labs is helping our clients build toward lights-out operation of their data centers. Such operations offer an interesting implementation of the “human-first” goal: one where the ideal human worker experience is to rarely, or never, need to be on site at all. These data centers can be so large (up to 10 football fields in length) that it takes a human 30 minutes to walk end-to-end. What’s more, some of the on-site tasks involve mundane measurements, inspection, or replacement of standardized blade units, which also involve physical safety risks due to weight and sharp edges. The working environment includes areas of hot aisles that continue to be made even hotter for machine efficiency, creating an environment uncomfortable and potentially hostile to human workers.
Labs is rethinking the role of the highly skilled data center technician. Robotics automation and AI handles fetching a blade, running initial problem diagnosis, retrieving parts, repairing and re-installing; dull tasks, and ones that are dirty or dangerous, are opportunities for physical robotics combined with AI and IT automation to support human workers. This allows the human to devote their expertise to higher order thinking around troubleshooting what happened and how to fix it; the human shifts their role to fixing these specific problems and then relies on the fleet of robots to execute at scale.

To allow for this shift, Labs is building the interfaces needed to enable such human-robot interaction. Success requires interfaces that allow humans to work with robotics and AI without overwhelming or confusing any of the parties involved. In this case, the human is a data center technician—not a data scientist, developer, or robotics expert—so the approach involves creating natural means for human-robot interactions, including multimodal gestures to signal desired behavior and acknowledgements. To allow for remote operation, creating AR interfaces gives human workers a way to look “through” a remote site, seeing where robots in the fleet may be having issues. These interfaces also allow for a feedback loop: as humans teleoperate robots, their actions and results are then fed back into the system to improve AI and automation, so the robots get smarter and know how to handle similar situations in the future.

Sales of collaborative robots are projected to increase 159% between 2018 and 2020.³
Industry X.0 gives companies the chance to deliver the “human first” experience that has been the goal across industries since the digital revolution. Many organizations have latched on the digital twin and digital thread as buzzwords; at Accenture Labs, our work shows that the digital twin and digital thread are the critical fabric supporting the future of experiences for consumers and workers. They enable a new generation of tools that are themselves smart to pair with the human worker, and living, flexible processes that allow partners to seamlessly work together. Accenture Labs is developing the foundation for the ultimate promise of Industry X.0.
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