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**ACCENTURE TECHNOLOGY VISION 2016**

**LABS INNOVATION WORKSHOPS**
INTRODUCTION

This has been a remarkable year for Accenture Labs. In 2016, more than ever, we have contributed to Accenture’s business growth, strengthened our technology differentiation, and supported our clients’ success with powerful technology innovations.

In particular, we:

• Expanded our cutting-edge research in artificial intelligence, cybersecurity, digital and immersive experiences, platforms, and high-velocity software engineering.

• Executed on three strategic innovation initiatives—Digital Customer, Digital Workforce, and the Industrial Internet of Things—and started Industry X.0 initiative.

• Launched a new Cybersecurity Lab in Herzliya, Israel and expanded our capabilities at our AI Lab in Dublin.

• Created a large number of new R&D assets, including 137 proofs of concept and 70 client pilots, such as Intelligent Finance, Remote Patient Monitoring and Digital Store.

• Filed 206 patent applications to further enrich our patent portfolio.

• Expanded our integration with Accenture’s businesses and operating groups across all five R&D areas and at all seven Labs locations.

• Conducted over 450 client workshops and extended the program to deliver it consistently at a global scale, and prepared for the introduction of Nano Labs, which we’ll be launching soon.

• Revamped career paths within Labs to sharpen our focus on acquiring and retaining the right talent.

• Published the record-breaking Accenture Technology Vision 2016, which identifies the key technology trends affecting large organizations, and has had the greatest impact of all our annual Technology Visions to date.

• Launched our Data Ethics Research initiative in collaboration with a dozen external organizations and released a series of publications exploring the most important data ethics issues in the digital economy.

• Launched the Labs Evangelist program to speed up industry-specific technology innovation and scale the rapid adoption of the latest Labs prototypes within our industry practices.
• Made significant impact with our Tech4Good initiatives around the world, driving social transformation with pro-bono projects related to fighting hunger, improving health, gender equality and environmental causes.

This report highlights some of the fantastic achievements of our Labs teams in 2016, across all our different R&D areas and initiatives and spanning each of our seven hubs around the world. Each story represents the culmination of a huge amount of hard work, experience and innovation from our people. Together, we at Accenture Labs are pushing at the boundaries of the digital revolution for the benefit of Accenture and its clients.

Marc Carrel-Billiard
Senior Managing Director
Accenture Labs

Edy Liongosari
Chief Research Scientist
Accenture Labs

THIS HAS BEEN A REMARKABLE YEAR OF CUTTING-EDGE RESEARCH IN ARTIFICIAL INTELLIGENCE, CYBERSECURITY, DIGITAL AND IMMERSIVE EXPERIENCES, PLATFORMS, AND HIGH-VELOCITY SOFTWARE ENGINEERING
Accenture Labs incubates and prototypes new concepts through applied R&D projects that are expected to have a significant strategic impact on Accenture and its clients. Our dedicated team of technologists and researchers work with leaders across the company and business partners to invest in, incubate and deliver breakthrough ideas and solutions that help our clients create new sources of business advantage.

Accenture Labs are located in seven key research hubs around the world: Silicon Valley, California; Arlington, Virginia; Dublin, Ireland; Sophia Antipolis, France; Bangalore, India; Beijing, China; and the newest: Herzliya, Israel. The Labs collaborate extensively with Accenture’s network of nearly 400 innovation centers, studios and centers of excellence in 92 cities and 35 countries. This collaboration delivers cutting-edge research, insights and solutions for our clients, right in the places where they operate, work and live.

**ACCENTURE INNOVATION ARCHITECTURE**

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NEW. APPLIED. NOW.

Accenture Labs is a critical component in the Accenture Innovation Architecture that is designed specifically to scale Accenture’s ability to drive innovation. Labs’ mission is to do applied research with focus on client challenges, leveraging new technologies available now—from the market and from our innovation ecosystem. By embodying the ‘New. Applied. Now’ principle, we help Accenture and our clients lead with innovation. Dive into the report for a sample of high-impact R&D projects from the last year.

For latest news and thought leadership from Accenture Labs, please visit www.accenture.com/labs.
ACCENTURE LABS R&D GROUPS

**ARTIFICIAL INTELLIGENCE** Explores new ways of addressing critical business problems by applying leading-edge AI techniques, including machine learning, natural language processing, knowledge representation and reasoning.

**DIGITAL EXPERIENCES** Develops technology concepts to increase engagement with customers and employees by pioneering emerging technologies and engagement strategies.

**SYSTEMS & PLATFORMS** Develops frameworks and tools that fortify and enhance the architecture for the connected enterprise of the future, handling massive amounts of data, devices and systems in real time.

**CYBERSECURITY** Develops solutions that improve our clients’ cyber defense strategies and capabilities, such as threat-centric management, advanced detection techniques, machine speed response and effective risk management techniques.

**SOFTWARE ENGINEERING** Applies intelligent automation in the software development life cycle to significantly accelerate the software development process while increasing the quality of the overall outcomes.
## ACCENTURE LABS BY R&D AREA

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R&D GROUPS
ARTIFICIAL INTELLIGENCE R&D

DEEP DIVING INTO MACHINE LEARNING

The Artificial Intelligence R&D group explores new ways of addressing critical business problems by applying leading-edge AI techniques, including machine learning, natural language processing, knowledge representation and reasoning.

This year, the AI group collaborated with Stanford Professor Chris Ré’s DeepDive project team to apply advanced machine learning tools in a large hardware manufacturer’s business to improve customer service. A key requirement in applying deep learning techniques is having enough tagged or labelled input data from which a machine learning tool can ‘learn’. Labelling this data is typically a manual, time-consuming and expensive process. Indeed, it’s expensive enough that in many cases it hinders the adoption of these kinds of technologies throughout an organization.
The DeepDive system addresses this critical problem by reducing the amount of manual labelling work involved in preparing data for deep learning. In deploying the solution with Accenture’s client, this meant developing a manageable number of domain rules within the DeepDive framework to identify key concepts in the manufacturer’s customer service logs. We were able to reduce the amount of labelling effort required by 55-60% while maintaining comparable levels of performance. Approaches such as these will be critical to enabling deployment of AI systems at scale economically.

**PROCURING WITH INTELLIGENCE**

The AI R&D group also joined forces with Accenture’s BPO team to develop an intelligent procurement tool in support of their Procurement BPO offering. The offering creates profiles of product spaces, and individual vendors in each of those spaces, providing critical product category intelligence for Accenture’s clients and helping to enable them to remain aware of and be competitive within their domain spaces.

The intelligent procurement tool uses natural language processing to provide automated document comprehension and trend identification. Trends are categorized and tracked over time to uncover the whole lifecycle within a product space. As an analyst searches a space, the tool can suggest avenues to research and then share the results among a team with collaboration tool integration. Even after an analyst finishes their work, the tool continues to operate: discovering more documents and predicting category movements and growth.

By partially automating the tasks involved in understanding each product space and its different product dimensions, vendors and trends, Labs reduced the amount of manual work required by the BPO team. This was a great demonstration of how AI and machine learning technology is changing the nature of business processes by increasing both employee productivity and client value through enhanced business services and insights.

**BETTER, FASTER DECISIONS THROUGH IMMERSIVE ANALYTICS**

In collaboration with Accenture Analytics, the AI R&D group launched the Connected Analytics Experience, an immersive and collaborative analytics capability that makes data more accessible and engaging, and helps insight-driven businesses make faster, more informed decisions. This project combines a high-end collaborative environment with multi-modal interfaces and visualizations, and offers new ways of presenting data to decision-makers.
This environment is further enriched by an Amazon Alexa-enabled business intelligence. Rather than relying on traditional interfaces, it enables users to interact with, request and share business intelligence data through a voice-based interface. This technology has the potential to revolutionize how data is shared within an organization. Imagine the possibilities for sharing business intelligence among decision-makers in a live meeting, for example. A simple dialogue leads to relevant information displayed on numerous devices around the meeting room, simplifying and accelerating decisions.

**DUBLIN SHINING THE LIGHT FOR INNOVATION**

The Dublin AI Lab—in its first full year as a Lab—created the first two proofs of concept for its Centre for Innovation hub. Prototypes for Intelligent Finance and an Intelligent Talent Planner received rave reviews from clients, as well as from other parts of the Accenture business, for their ability to reduce operational costs and improve employee productivity by leveraging machine learning, natural language processing and machine reasoning. The Lab also filed the first patent for the Centre for Innovation—the ‘Generating Exemplar Electronic Documents Using Semantic Context’ patent was a direct result of the Lab’s ‘intelligent enterprise’ strategic planning session early in 2016.

**ACCELERATING AI ADOPTION IN THE ENTERPRISE**

The Accenture Artificial Intelligence Engine (AAIE), developed by Accenture Labs Bangalore, provides a powerful platform for integrating open source AI components and allows Accenture to quickly deliver intelligent automation in an enterprise. AAIE has been specifically developed to overcome the challenges companies encounter with vendor-specific AI implementation options (costs of licensing and implementation, data residence and security, lack of customizability, vendor lock-in, and limited future-proofing). Instead of tying users to a single AI software provider, AAIE has been architected to allow continuous harvesting and reuse of best-of-breed components for the foreseeable future. AAIE has already been deployed by our Application Outsourcing delivery team in incident management applications for retail clients and in email classification applications for transportation clients.
The Cybersecurity R&D team is dedicated to finding technology solutions which can improve the way business operates in today’s highly adversarial environment. The team brings together unique experiences from academia, entrepreneurship and the cyber front-line to provide critical insights and help clients develop holistic and active security and defense strategies.

In 2016, the team developed ASGARD, a dedicated accelerated big data solution for cybersecurity defense. It uses a hybrid of Hadoop, NoSQL, graph databases, scalable SQL and GPUs to push state of the art security to the next level and provide a scalable architecture for the kinds of analytical technique that are ideal for anomaly detection. Its unique visual interface creates a boundary-pushing security solution for hunting down and eliminating cyber threats at scale and in real time.
Marking a key milestone in Accenture Security’s expansion, the group launched a new cybersecurity Lab at Herzliya, Israel. The Lab focuses on technology-leading R&D projects in advanced threat intelligence, active defense and Industrial Internet of Things security. It applies the latest developments in artificial intelligence, blockchain and advanced analytics from across Accenture’s global network of Labs and Innovation Centers. It focuses on stealth monitoring, passive threat detection techniques and incident responses aimed at developing state-of-the-art forensic techniques and malicious code analysis.

The custom-built facility offers clients a unique immersive environment to showcase the innovative and disruptive approaches that are taking cybersecurity capabilities to the next level. And the rich technology ecosystem of venture capitalists, start-ups and universities present in the locality means the Lab can bring together a constant stream of fresh insights and breakthrough technologies through the Accenture Open Innovation program.

**CLASSIFYING SENSITIVE DOCUMENTS THROUGH MACHINE LEARNING**

Beyond traditional firewall and intrusion detection systems, many organizations use data loss prevention solutions to prevent sensitive data leakage. These tools rely on pattern recognition techniques to identify text data containing PCI (payment card industry) data or personally identifiable information. However, these solutions have not been effective in discovering and detecting the leakage of documents or e-mails that contain intellectual property, trade secrets or other sensitive business data. For most organizations today, the sensitivity classification of text documents therefore remains a manual process, which makes it vulnerable to intentional or inadvertent misclassification by document owners. And protecting sensitive data becomes even more challenging in Big Data environments.

That’s why Labs developed a machine-learning tool called SCAML (Security
Classification through Machine Learning), which automatically determines the sensitivity level of text documents in order to apply appropriate data protection controls. DLP tools can then be used to prevent any attempt to leak those documents. By harvesting both a document’s contents and its metadata to predict its sensitivity, the Labs tool achieves better rates of accuracy and classification consistency than existing manual processes. It can work in either batch or offline mode to process large numbers of documents, or in online mode to provide security label recommendations in real time. The tool adapts to new business and security contexts by retraining its classification models periodically. SCAML is thus an innovative solution that reduces an enterprise’s information risk significantly, while increasing document classification efficiency and consistency.

SECURITY TECHNOLOGY VISION 2016

The Accenture Security Technology Vision highlights the technologies and trends that security professionals will use over the next five years to predict, detect, respond to and remediate cyber-attacks. Our 2016 Vision set out a mission for today’s enterprises: to take a more proactive stance on security and empower cyber defenders to enable digital trust. And it highlighted the ways leading organizations are overcoming the challenging cybersecurity landscape they face.

The Vision was launched at the 2016 RSA Conference, where Accenture demonstrated its commitment to industry-leading security technology, processes and experience to nearly 40,000 attendees from more than 80 different countries. Our multi-channel presence, delivered through speakers, client meetings, networking events, workshops and social media, captured the attention of attendees, clients and industry-leading media organizations alike.

TEAMING UP WITH TEAM8 FOR NEW CYBERSECURITY SOLUTIONS

The Labs Cybersecurity R&D team launched a collaborative research and development relationship with Team8, a think-tank focused on developing disruptive technologies and new cybersecurity companies. This relationship is forging new innovations in cyber-defense, industrial and software-defined security, and incident response, with a focus on developing early stage proofs of concept and prototypes designed to defend against cyber threats. Accenture has been collaborating on thought leadership through Team8’s Rethink Cyber initiative—a forum gathering ecosystem leaders and clients, hosted in Tel Aviv, London, and NYC.
The Digital Experiences R&D group harnesses technology to improve Accenture’s clients’ engagement with their customers and employees. It focuses on two core areas: increasing customer engagement, satisfaction and loyalty; and increasing workforce collaboration, productivity and support.

In 2016, the group led the charge in deploying ‘mixed reality’: a groundbreaking technology that combines the best of both virtual and augmented realities and enables users to interact with virtual objects in ‘real’ space and in real time. Accenture Labs have long recognized the enormous potential of this technology for deployment within any number of enterprises. And this year they partnered with companies like Microsoft and Meta to turn great ideas into solutions with real-world application.
Together with Meta, makers of augmented reality systems, the group conducted high-level user research on the impact of mixed reality as a training tool. A Lego assembly test case was undertaken with around 100 participants at the San Francisco Bay to Breakers race exposition. The results revealed a startling fact: users trained with mixed reality noticed mistakes 50 percent faster than those trained by conventional methods. The success of this research led it to be accepted by the IEEE International Symposium on Mixed and Augmented Reality (ISMAR), which published a final report in September 2016.

A major utility client came to Accenture looking for an innovative approach to remote and hands-free collaboration between their product research and development engineers. The Digital Experiences group built a multi-device mixed reality solution for empowering their employees in building and testing breaker boxes. The solution enables users to move around a real-world environment and interact with physical objects and digital content—part specifications overlaid on physical components or simulations of the impact of high electrical current, for example—as if both were really there.

**SUPPORTING EMERGENCY RESPONDERS THROUGH AUGMENTED REALITY**

The Digital Experiences group also collaborated with a major healthcare firm to build a proof of concept enabling emergency responders to diagnose patient symptoms following doctor-led remote guidance received through a Microsoft HoloLens. The development team, which included Chaotic Moon, Avanade and Liquid Studios, pushed the boundaries of the use case by integrating and live streaming data from advanced medical imaging devices into the technical architecture. This first-of-its-kind hands-free medical use case represents a huge leap forward in emergency response solutions.

**TRANSFORMING ADVANCED RESEARCH INTO CLIENT INNOVATION—3D PRINTING AND MIXED REALITY**

The Digital Experiences R&D group this year partnered with BarcelonaTech University to uncover new analytics intellectual property and build new client assets for major leaders in transportation, consumer goods and logistics. The research, which was presented at the IEEE and Euro Operational Research conferences, defined flexible two-stage stochastic supply chain models designed to gain the largest return on investment for 3D printing. The work was supported by Accenture’s Supply Chain Center of Excellence and Digital Analytics leadership who brought their extensive industry insight to the research.

One of the largest US logistics organizations was eager to explore the business opportunities afforded by 3D printing and engaged Accenture Labs to shape its business strategy. The team worked with the client’s
engineers to understand their unique challenges and opportunities, and build business models for nine areas in which 3D printing technologies could be applied. The solutions are establishing the client as the leading innovative company in leveraging 3D printing technology.

A major insurance firm came to Accenture to develop a vision for the use of advanced digital experience tools, such as Google Tango and HTC Vive, in its new insurance agent training center. The Labs team collaborated with Fjord and the client team to build a fully functional first-of-its-kind VR-driven automobile inspection training kit. The group plans to go further with this client and scale the solution with Liquid Studios to expand its use cases.

And the Labs team has also worked this year to transfer some of its existing mature assets into real-world client-facing applications. Its Printability Index offering—a dashboard that lists candidate parts for 3D printing and gives clients all they need to make an informed decision on the technology’s viability for their company—was, for example, expanded, updated and transitioned to Accenture’s Supply Chain Center of Excellence team and its supporting Delivery Center. The Center of Excellence established a full go-to-market offering for the solution, and has jointly presented workshops to clients with Hewlett-Packard.
Our Systems and Platforms R&D group is focused on fortifying and enhancing the architecture for the enterprises of the future. As highly dynamic, connected enterprises increasingly need to handle a proliferation of data and different mobile devices, orchestrate cross-organizational systems, and process complex events spanning vast geographies in real time, the group develops frameworks, tools and services that provide the self-aware, self-managed and self-healing infrastructures and systems that are crucial to support scale and agility.

In 2016, the Silicon Valley Lab piloted an automation-driven solution for analytics model management with an Oil and Gas client. In the data-rich world we now live in, a single organization can have many thousands of predictive models. And all of them need to be managed at scale and with accuracy to preserve trust and prevent false alarms.
That’s why the team, together with Accenture Analytics, developed a model lifecycle management tool—‘DevOps for analytical models’—which helps ensure process rigor through automation as models are created, tested and deployed. Just as DevOps does in today’s software delivery processes, our patent pending approach handles the entire model lifecycle: from creation in the ‘data science playground’, through automation and operationalization, to monitoring performance and automated action when problems arise.

This solution is being piloted at a client with over 5,000 production models and is set to become part of the Accenture Insights Platform Design Studio over the next 12 months.

PUTTING BLOCKCHAIN TO WORK IN THE REAL WORLD

In a world of distributed systems—connected devices, autonomous systems, mobile devices—and distributed interactions and connectivity, issues of security and trust are becoming paramount. And new distributed computing paradigms such as blockchain technology are emerging to tackle these challenges. Blockchain has, for example, enabled new ways of providing peer-to-peer digital payments with crypto-currencies in a distributed infrastructure without any central ledger system.

The Sophia Antipolis Lab explored the potential of blockchain technology with a number of major banking and pensions administration clients in 2016. Blockchain offers organizations a chance to rethink the way they record and maintain data and can potentially cut transaction costs significantly. And it affords clients the opportunity of realizing the full benefits of smart-contract automation based on a distributed single source of trust.
This combination of blockchain technology and smart contracts was piloted by the Lab with a major pensions client, enabling the company to record data in an automated and immutable way. Applied to its customer records over time, for example, it allows the business to keep track of its customers’ current and past circumstances, maintaining an accessible, complete and unalterable history of customer interactions.

The Lab also demonstrated blockchain’s capacity to be used as a messaging platform for recording instructions for peer-to-peer payments between internal customers at a leading banking client. The solution has the potential to streamline settlement and reconciliation processes efficiently, and in close to real time.

And the Lab ran a series of blockchain coding camps and boot camps for Accenture clients in 2016, as well as releasing a host of other blockchain-related proofs of concept relating to the energy marketplace, healthcare, capital markets, real-time payments, and tools for blockchain visualization, total payment confidentiality in decentralized networks, and smart contract enabled e-mortgages.

**ACCENTURE OPEN CLOUD ENGINE**

In collaboration with the Accenture China Infrastructure Service team, the Beijing Lab contributed to Accenture’s strategic partnership with Alibaba in 2016 by completing an in-depth technical evaluation. The results of that evaluation led the Lab to identify and focus on container technology as an important strategic direction. Leveraging both the global ecosystem insight of the San Jose Lab and the Beijing team’s connections with the startup community in China, the Lab defined a viable technology roadmap and then developed a Proof of Concept (PoC) using leading open source components. Having successfully demonstrated the PoC to high-profile clients from the energy sector, the Beijing Lab developed it into a formal solution—the Accenture Open Cloud Engine—which was launched by Accenture China at Huawei Connect 2016. The solution helps Accenture clients adopt agile DevOps mechanisms to gain a competitive advantage in a fast changing marketplace.

Using the Accenture Open Cloud Engine as a foundation, the Beijing Lab also developed an Industrial Data Service Platform (IDSP) which adds deep domain knowledge and an analytical engine to the cloud platform. This tremendous effort played a key role in winning smart plant engagements in the resources industry.
The Accenture Software Engineering R&D group embeds intelligent automation in the development lifecycle and applies advanced technology-based, patent pending intellectual properties in areas like natural language processing, model-based engineering, program analysis, application security analysis and cloud computing.

This year, the group collaborated with Hewlett-Packard Enterprise to explore how a predictive analytics-based approach to testing and software delivery (analyzing in-production application data and proactively acting on the results) can transform an enterprise through improvements in quality, higher productivity and an exceptional customer experience. The Labs team called the model it developed ‘Shift Right’.
Enterprises that want to stay ahead of the competition in today's fast-paced and complex digital age need efficient testing and software delivery teams. These organizations are faced with increasing pressure to build and test software quickly without sacrificing quality. That's why Shift Right takes an analytics-driven approach to leveraging post-release data (performance, user interaction, customer feedback, resource use and other operational metrics) and continuously assessing the functional and non-functional qualities of software under use. It enables continuous and adaptive feedback to development teams for optimizing delivery, as well as enhancing user experience and, ultimately, providing a competitive differentiation for an enterprise.

This work was described as a key differentiator in the latest NelsonHall NEAT report on Software Testing, and Accenture’s position on data-driven testing and predictive delivery was published to great reviews at the 38th International Conference on Software Engineering (ICSE 16).

ACCELERATING TEST AUTOMATION FOR A MAJOR HOTEL GROUP

The Software Engineering R&D group this year piloted its Accelerating Test Automation Platform (ATAP) for a major hotel group headquartered in the United States—who saw efficiency savings as high as 25% as a result. In developing the platform, the group set out to resolve one of the key challenges in efficient automated testing: how to reduce the manual effort required of test editors in both authoring and maintaining automated scripts. The ATAP solution to this challenge is ingenious: automatically generate the test code from simple, easy to maintain, natural language commands, without any need to develop or maintain code in complex programming languages.

The pilot demonstrated how a client's test engineers and business analysts could use ATAP to author and maintain automated test scripts by writing simple instructions in the solution's intuitive English-like input language. The platform then took those instructions, converted them into best-practice Java test automation code, and executed and reported on the tests using Selenium, the open-source software testing framework.
The result? Industry-leading, best-practice automated testing scripts which are easy to write and maintain. And, even better, which come at a lower cost and with a faster time to market—a winning scenario for the client. The pilot clearly demonstrated ATAP’s potential, and the solution is set to have a major impact as the group adds new features and explores more extensive deployments.

**EXPERT ASSISTANT**

Artificial intelligence is set to revolutionize the software engineering space, and this year the Bangalore Lab has continued to explore the technology’s potential by developing RHEA—the Robotic Humanoid Expert Assistant—an open source artificial intelligence stack with potential application in numerous areas, such as application management, as a testing savant, or for the wider social good.

RHEA uses a wide-ranging mix of advanced technologies to perform functions of ever-increasing complexity: from simpler active and reinforcement learning, through more complex comprehension tasks and question answering (using deep learning, machine learning, case-based reasoning, dialog strategies and knowledge graphs), to advanced active speech recognition and natural language understanding.
STRATEGIC INNOVATION INITIATIVES (SIIs)
The Labs Digital Workforce initiative continues to expand its cutting-edge crowdsourced ‘virtual workforce’ experiments, in close cooperation with other parts of the Accenture business, such as Accenture Operations, the Technology testing practice, the CIO organization and Accenture HR. To this end, the Labs teams established a cohesive strategy and governance framework to support the growing adoption of online labor markets within Accenture itself and developed tools and techniques to extend Accenture’s liquid workforce capabilities.

This work has included the development of an early-stage prototype, the Accenture Crowd Platform, which integrates, automates and streamlines Accenture’s use of both internal and third-party crowdsourcing applications. It offers the business the potential to source skilled experts fluidly from either internal labor pools or external talent markets such as Upwork or Applause. And it can be used to quickly bring together crowdsourced resources in ad-hoc ‘flash teams’ using cloud-based workspaces and intelligently integrated collaboration tools.
The prototype consists of several innovative components:

- **A unified interface** lets users operate across a range of internal and external crowdsourcing platforms without having to master the idiosyncrasies of each separate interface or vocabulary.

- **A private profile repository** allows each organization to store its own information about any crowdsourced worker it has experience working with. This sits on top of each worker’s public profile and means a greater degree of fine-grained and organization-specific information can be recorded to improve the future matching of tasks with workers.

- **A collection of wizards and templates** streamlines the crowdsourcing of common project types. This brings a critical degree of scalability to the process—the content and structure needed to create an ad-hoc team for a common project type are all packaged together.

- **Highly differentiated intelligent assistants** advise managers which crowds and resources should be selected to effectively crowdsource particular projects and tasks. This is a key differentiator for Accenture: one of our prototype assistants offers multi-dimensional, parametric assessments of crowdsourced experts based on advanced analysis of data from leading crowdsourcing vendors. It supports quick and reliable hiring decisions.
This innovative system is the subject of both a patent filing and several top-tier research publications. The team also presented original research papers on crowdsourcing at a number of high-profile academic conferences and workshops, including the International Conference on Software Engineering (ICSE), the International Conference on Global Software Engineering (ICGSE), India Software and the Asia-Pacific Software Engineering Conference.
A SINGLE INTEGRATED IOT PLATFORM AS A SINGLE PRODUCT

Working with Accenture Analytics and Accenture Mobility, the Labs teams have made it easy to develop and deploy secure IoT solutions. By integrating Accenture Mobility’s Connected Platform-as-a-Service (CPaaS) and Accenture Analytics’ Insights Platform (AIP), the Labs were able to bring together a cutting-edge solution for device management with a managed big data analytics package allowing model promotion across batch and real-time streaming.
The result is a solution that closes the IoT loop and is capable of driving action at the edge based on insights derived from a huge number of devices. The integration presents a single platform as a single product: one set of terms, one set of prices, one set of management tools. This is a leading-edge solution for clients in need of an IoT platform.

**AARDVARK—A RAPID VISUALIZATION DEVELOPMENT FRAMEWORK**

Deriving the full value from IoT data assets remains a challenge for most organizations. It requires employees to have specialized skills in navigating different architectures and siloes and converting data into usable formats. It means having the ability to quickly create new data pipelines, add new sources, and enable direct access to the original or ‘true’ source of each piece of data. Agility and data democracy are key: new opportunities must be captured in days or hours rather than months or weeks and data must be opened up beyond specialists to all parts of a business.

That’s why creating data visualizations at pace is so critical. And this year, Labs have delivered just that type of capability: a rapid visualization development framework which lets developers create custom visualization applications with an agile approach. Labs called the solution ‘Aardvark’. Built in collaboration with Accenture Analytics and now transitioned to Fjord, it represents a set of tools and templates that enable developers to create data visualizations in a standardized, reusable way.

Aardvark augments today’s business intelligence tools with additional visualizations that can be customized for specific industry solutions or presentations. Its use of templates means teams get a head start on coding and creating or customizing visualizations from most open source libraries on the web. And Aardvark can create visualization apps that support contextualized decision-making.

After several successful pilot projects, Aardvark is now ready—and is set to go open source next year.
SECURING THE INDUSTRIAL INTERNET OF THINGS

The Industrial Internet of Things (IIoT) is bringing a host of opportunities and benefits to enterprises across the world, through the harnessing of sensor data, machine-to-machine communication and automation, combined with machine learning and big data technology. But those benefits come with challenges, including a variety of operational technology architectures—in healthcare, manufacturing, transportation and energy—with inherently different threat vectors to enterprises’ traditional IT systems.

Whichever IIoT enterprise architecture is used, today’s IT-centric cybersecurity frameworks are not adequate to address the unique security and resilience needs of operational technology in the industrial domain. Accenture Labs, working with Accenture Mobility and Security, set out to fill this critical gap.

We developed a holistic, scalable and strategic framework for IIoT security. It’s a solution that can be used to assess, prioritize, implement and optimize both security architecture and security capabilities within IIoT environments. In developing the framework, we had both trustworthiness and resilience requirements front of mind from the outset. And we considered implications across both information and operational technology architectures, including impacts on data integrity and privacy. The framework can also be used to secure Accenture’s integrated IoT Platform CPaaS and AIP.
Accenture’s Customer Genome is a unique and powerful personalization approach capable of delivering a truly individualized customer experience at scale. It uses next-generation technical architecture and big data analytics to build highly specific, actionable profiles for customers at an individual level.

Now the Customer Genome is helping Coles Grocery customers solve that age-old critical question: ‘what’s for dinner?’ Using each Coles Customer Genome, the company’s recipe app, Cookup, suggests quick and easy meal ideas via an intuitive swiping interface. We rolled out the app in a pilot covering 100 Coles customers. And we found that over 40 percent were inspired to purchase ingredients as a direct result of finding recipes in the app.
This year saw the culmination of nearly four years of research into personalization and analytics, and the formal transition of the Customer Genome asset to the Accenture Interactive personalization practice. The Labs R&D teams worked directly with product managers and engineers from the Accenture Digital Asset and Platform Team (ADAPT) to develop the Customer Genome product and pilot delivery at Coles supermarkets.

The result was an innovative pilot for Coles, showcasing how the Customer Genome can find new ways of helping businesses help their customers find what they want. The Genome will form the basis of Accenture Interactive’s go-to-market personalization strategy, and has wholly graduated from a Labs project to an Accenture Digital asset.

BLENDING DIGITAL EXPERIENCES WITH PHYSICAL SPACES AT THE DIGITAL STORE

Internet of Things technologies are enabling new kinds of interactions between consumers and businesses. And those new interactions can drive more customer visits, better engagement and higher sales. In 2016, Labs began their investigations into the Digital Store, a stream of work looking at how digital experiences can blend into physical spaces, and how the Internet of Things will change the ways customers and brands interact, both at home and in store. This work was undertaken in partnership with the Intel Joint Initiative, and resulted in the development of two proofs of concept that were showcased at the Digital Signage Expo and Millennial 2020.

The Restaurant of the Future demonstrated how a digital menu board could detect customers with RFID-enabled loyalty cards and adapt its displayed content accordingly. And it showed the potential offered by tablet-enabled ordering direct from a restaurant table, with personalized suggestions, hands free motion controls and entertainment options.
The Interactive Brand Experience showcased ways in which a blended digital experience can be used to highlight new brands to consumers. Its ‘beer bottle detection’ allowed customers to access more information about unfamiliar micro-brews and leveraged a social network called Untappd to provide Customer Genome powered recommendations and personalized beer profiles to customers via a simple text message.

Next year the Labs teams will go further and examine how digital can blend into physical spaces throughout a shopping journey. A potential technology application includes a dressing room that lets a customer try on clothes virtually and provides tailoring suggestions while in a store.

**USING DIGITAL CHANNELS TO REDUCE CUSTOMER FRUSTRATION**

This year Labs set out to explore what happens to customer care when a business takes full advantage of all the digital channels and data available to it. We sought to show how customer frustrations and customer care operational costs could be significantly reduced using dynamically generated personalized user interfaces and videos. Our demonstration applied this thinking to a real-world scenario: a customer self-install process for a telecommunication company. Our solution allowed customers to communicate through their preferred channel (video or text) in an interface that was capable of understanding each specific context (in that it began exactly where the customer’s issue started) with assets that matched the customer’s specific equipment.

**NEXT YEAR THE LABS TEAMS WILL GO FURTHER AND EXAMINE HOW DIGITAL CAN BLEND INTO PHYSICAL SPACES THROUGHOUT A SHOPPING JOURNEY.**
Accenture’s signature Technology Vision has long been a highlight of the global technology calendar. And our record-breaking 2016 report took the Technology Vision to the next level, holding top spot as the number one download on Accenture.com and generating extraordinary coverage across both traditional and digital media channels.

The annual Technology Vision sets out to highlight the technology trends most likely to impact large enterprises over the coming year. Our 2016 report focused on the idea that ‘digital means people too’. It demonstrated how, as technology advances are accelerating at an unprecedented rate and are dramatically disrupting the global workforce, it’s the companies that equip their employees, partners and consumers with new skills that are fully capitalizing on the innovations that the digital revolution is offering. The 2016 report picked out five trends essential to success in the digital economy:

- **Intelligent automation.** Artificial intelligence, robotics and augmented reality are fundamentally changing the way business operates and are driving a more productive relationship between people and machines.

- **Liquid workforce.** Leading companies are creating highly adaptable and change-ready workforce environments able to meet today’s dynamic digital demands.

- **Platform economy.** Platform-based business models are capturing new growth opportunities and driving the most profound change in the global macroeconomic environment since the Industrial Revolution.
**Predictable disruption.** Fast-emerging digital ecosystems are creating the foundation for the next wave of disruption by straddling markets and blurring industry boundaries.

**Digital trust.** Trust is a cornerstone of the digital economy and businesses must focus on digital ethics as a core strategy.

The reaction to this year’s report has been remarkable. As well as being Accenture’s most viewed online resource—over 438,000 unique visits to the content—the 2016 report generated over 13,000 engagements across social media channels and was the subject of over 100 media articles. The 2016 Vision is also live in eight languages, and has been customized for 39 different industry, geography and platform segments.

The world’s media are clearly paying attention—the 2016 report was the subject of notable articles throughout the year in Bloomberg Business, VentureBeat, InformationWeek, ZDNet and TechCrunch in the United States, and across the world in publications like the Times of India, Enterprise Innovation (China), LesEchos.fr (France), CIO (Spain), Computerwoche (Germany) and IT Brief (New Zealand).


The 2017 Vision will be coming soon to [https://www.accenture.com/techvision](https://www.accenture.com/techvision).

**OUR 2016 REPORT FOCUSED ON THE IDEA THAT ‘DIGITAL MEANS PEOPLE TOO’**
The Accenture Labs Innovation Workshops program uses interactive workshops and technology demonstrations to bring our R&D to life for our clients. The program aims to foster thought-provoking discussions about what it means to operate a next-generation digital business in today’s global economy. In 2016, we sponsored over 600 client events across all our Labs locations for both internal audiences and a large number of high-profile clients—a huge increase over previous years. Client leadership teams visit the Labs to envision and learn about cutting-edge technologies, and to define new strategies and solutions in collaboration with Accenture scientists, technologists and business consultants. The location of the events is flexible: they can be held onsite, offsite or virtually. Formats are customized to address the business priorities of each particular client and can include full-or multi-day workshops, full-or part-day educational seminars, and Labs overviews and demonstration tours.

These workshops have facilitated sales for Accenture, strengthened client relationships, informed internal audiences and afforded Labs researchers opportunities to run proofs of concept and pilot studies across all R&D areas and Strategic Innovation Initiatives.

Over the coming 12 months, we’re excited to be launching our Nano Labs showcases and leveraging the Workshops Council as a forum to manage global best practices, design thinking strategies and the breadth of resources across Accenture.
As part of a nationwide effort from the White House Presidential Innovation Fellows and the Department of Commerce to encourage developers, designers and data scientists to build tools and products to close the gender pay gap, Accenture Labs took up the challenge of developing a solution to address gender bias in the freelance economy.

Launched at the White House #hackthepaygap demo day, the Labs’ Freelance Economy Equalizer (FrEE) prototype was designed to extend any online freelancer platform with intelligent assistance and data visualizations to empower both hiring organizations and candidates to improve fairness and reduce gender bias. Specifically, the prototype addresses four key hiring challenges that collectively contribute to the gender pay gap:

**Gender-neutral job posting.** Text analytics help job posters write more gender-neutral descriptions and avoid subtle biases that unintentionally filter out diverse candidates.

**Consistent candidate vetting.** Online exercises and metric-based tasks help recruiters vet all candidates equally.

**Clear hiring processes.** Gender data visualizations help executives and hiring managers see more easily where diverse candidates are dropping out.

**Comparable data to guide pay negotiations.** Access to relevant comparable salary and hourly wage data allows all parties to negotiate more consistently and fairly.
The Bangalore Lab continues to establish Accenture as a leader in accelerating social transformation through technology. We launched the Million Meals pilot with Akshaya Patra, one of the world’s largest NGOs which is fighting malnutrition and striving to help poor children in India continue their schooling. Akshaya Patra is feeding 1.5 million children every day in 10,948 schools in 10 states and 27 locations across India. The solution Accenture Labs is developing uses blockchain, Industry 4.0, machine learning and human-centric design to help Akshaya Patra scale and optimize their operations, delivering an estimated 8 million extra meals a year. Accenture Labs will continue to support Akshaya Patra with technology solutions to help reach their ambitious goal of feeding 5 million children a day by 2020.

This project is just one element in Labs’ ongoing efforts to help scale social impact in India.
Accenture is at the forefront of turning recent advances in healthcare technology into practical solutions. New tools are emerging to better connect healthcare providers and patients while controlling costs, and Accenture Labs, along with its co-innovation partner, a UK-based digital health startup, has developed a system that continuously monitors patients’ vital signs in real time using a wearable digital plaster, various digital technologies and powerful analytics.

The solution requires significantly lower capital expenditure than traditional bedside monitoring equipment, making it a cost-effective way to keep a constant eye on patients even as they move out of intensive and critical care units. The system continuously analyzes vital signs from the digital plaster, and alerts appropriate physicians and staff via their digital devices when a patient’s condition is likely to deteriorate.

The solution is easy to scale and is truly revolutionizing patient safety. This real-time, unobtrusive monitoring device helped save a life within the first week of deployment at a leading hospital chain in Asia. And the solution could potentially help extend care to better serve the needs of people in remote or vulnerable populations.

The Accenture Remote Patient Monitoring System is reinventing patient care with digital technology, delivering efficiency and cost-savings to hospitals, and, more importantly, saving lives and extending care to underserved populations.
As technology becomes the new global language, it’s critical that social innovators take up the challenge of putting its power to use in driving societal changes. Ashoka is doing just that. It’s one of the largest networks of social entrepreneurs worldwide, comprising over 3,000 Ashoka Fellows in 70 countries who are looking to create large-scale global impacts through innovative technology.

Last year, Accenture’s Bangalore Lab partnered in a 12-week program with the Ashoka Tech GlobalizerX program, which provides access to advice, partnership opportunities, inspiration and ideas. The Lab provided business and technology advice to six Ashoka Fellows in India to help them scale their work in agriculture, education, health and other areas using technology.

This year, Accenture Labs also became the exclusive technology advisor to the NASSCOM Foundation, a leading Indian nonprofit organization that advocates the use of technology solutions for social ends. The Foundation’s Social Innovation Forum aims to apply cutting-edge technology and research in support of social entrepreneurs and foster innovations that create sustained social impact. Since 2008 this program has supported and scaled ICT projects which have the potential to address critical gaps in key social developmental areas. The Forum’s focus aligns with the Indian government’s development priorities: education, primary healthcare, accessibility, livelihood, agriculture and the environment. Labs have supported the Forum in providing technology development and advisory support and mentoring to selected NGOs and social innovators.
LABS FY16 R&D IN NUMBERS

DELIVERED IN FY16:

- 207 Patent Applications filed globally
- 137 Proofs of concept developed
- 70 Client pilots enabled
- 145 External presentations/peer-reviewed journal publications
- 497 Media mentions related to Tech Vision and other thought leadership
- 618 Innovation workshops conducted
We kicked off FY17 with a continued focus on artificial intelligence, cybersecurity and immersive experiences, while adding a new strategic innovation initiative: Industry X.0. Our Digital Workforce initiative will continue to be an area of focus in the coming year, aimed at supporting rapid changes in workforce models.

**INDUSTRY X.0**

Accenture’s Industry X.0 initiative will focus on the next wave of transformation in manufacturing technologies and processes. In the age of the always-on product, we see the Industry X.0 era as representing a comprehensive digital transformation of manufacturing. We see products and services being designed, prototyped, manufactured, assembled, distributed, and operated in ultra-automated digital lifecycles at unprecedented speed and on an unprecedented scale. We see workforces being highly collaborative, connected and augmented. And we see consumer inputs and market trends being incorporated early and often to help ensure products and services are adaptable to market needs.

In 2017, Labs will show how Industry X.0’s Digital Product Lifecycle represents an opportunity for manufacturers to completely rethink the way they produce products and services, dramatically reduce turnaround times, and transform the way companies engage with their workforces and customers. The team will demonstrate how the use of intelligent automation (combining artificial intelligence, virtual and mixed reality, the Internet of Things, and other digital technologies) brings innovation to the manufacturing lifecycle. And Labs’ prototypes will focus on innovative end-to-end digital product lifecycle management, accelerated product ideation, prototyping, development, testing and support.
INNOVATING WITH QUANTUM

Last year also marked the start of our increased focus on quantum computing—an area with the potential to significantly impact the enterprise space once the technology matures. We have embarked on early stage research into quantum, focusing on a variety of use cases for the enterprise across different industries, including financial services and healthcare.

Each Nano Lab will be hosted by a dedicated ‘Innovation Sherpa’ who will give clients a sense of the R&D we do in our seven global Labs and showcase the Accenture Technology Vision. Participants will be offered demonstrations illustrating key technology trends and follow-on discussions with Labs experts.

Our R&D ecosystem is expanding and becoming more robust too. We’re intensifying our university program with the aim of accelerating our strategic research and deepening collaborative work with key universities. We’re also expanding our internship and post-doctoral positions to strengthen our ability to recruit and retain key talent.

EXPANDING OUR REACH

In 2017, we’re excited to be launching our new Nano Labs in over 20 locations around the world. We’ve long known that the Accenture Labs are a fantastic way of building client relationships and showcasing our innovative technology solutions. And now Nano Labs will bring the Labs experience much closer to a much greater number of clients.

We’re proud to have a talented group of people at Accenture Labs, inventing new concepts that will have a significant impact on Accenture and our clients. From artificial intelligence and software engineering to blockchain and cybersecurity, our dedicated team of technologists and researchers deliver breakthrough technologies that lead to innovative products and services for our clients, and truly differentiate Accenture.
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 Accenture and its clients. Our dedicated team of technologists and researchers work with leaders across the company and business partners 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; Herzilya, 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.

ABOUT ACCENTURE

Accenture is a leading global professional services company, providing a broad range of services and solutions in strategy, consulting, digital, technology and operations. Combining unmatched experience and specialized skills across more than 40 industries and all business functions—underpinned by the world’s largest delivery network—Accenture works at the intersection of business and technology to help clients improve their performance and create sustainable value for their stakeholders. With more than 394,000 people serving clients in more than 120 countries, Accenture drives innovation to improve the way the world works and lives. Visit us at www.accenture.com.