



# TCS Research

Research is the foundation on which robust innovation rises. Research has a special significance in the information technology (IT) space. IT is the agent of the two transformations changing the way we live and interact: digitization of society and the industrialization of software. Technology evolves continuously and in a complex way. Exploring new technology with the scientific spirit of enquiry and advancing knowledge is essential for harnessing it for customer-focused innovation. That is what TCS Research sets out to do.

## Research Focus Areas

In today's digital era, conventional industry boundaries, processes, and operations are being rewritten continuously. Banking and insurance must mimic retail transactions and experiences. Telecom providers now deliver entertainment content and even payment facilities. Across the value chain, customers, both B2B and B2B2C, demand new systems and channels of engagement. Innovation has to be speedy and robust to create true differentiators. This demands the capability to look at new technologies in depth, and advance knowledge and evolve standards for these, so that innovation is quick and easy to consume. To help companies ride each wave of digital transformation successfully, TCS invests in research in areas such as:

1. **Behavioral, Social, and Business Sciences:** We focus on the intersection of behavior and systems in the areas of:
  - Personalized medicine
  - Learning and social implications in the digital workplace
  - Social responsibility and digital citizens
  - Organizational behavior and culture change
  - Personalized informatics
2. **Cyber-Physical Systems:** This involves systems that integrate computing and communication systems of the cyber world with monitoring and control of entities in the physical world, safely, securely, and in real-time. Focus areas include-
  - Smart water- leak detection and management
  - Refrigeration systems in supermarkets
  - Smart buildings covering operations such as HVAC control and optimization
  - Elevator fault diagnosis
  - Dynamic microgrid configurators
  - Intelligent transportation- fleet management
3. **Data and Decision Sciences:** With the objective to support data driven decision making, our research spans the analysis of data in its many forms such as text, image, video, speech, sensor, and so on to mine insights. Through our work, we also aim to address research challenges related to security, privacy, optimization and contextual recommendation.
4. **Embedded Systems and Robotics:** Our research in embedded systems addresses the perception, cognition, interaction, and actuation layers of physical and human systems resulting in new devices and systems TCS' work in this area focuses on-
  - Sensors and devices
  - Robotic platforms and systems
  - Network embedded infrastructure
  - Signals and systems
  - Machine vision and graphics
  - Embedded security and privacy

5. **Engineering and Physical Sciences:** With a vision to advance production processes, we've engaged in deep research in the areas of -
  - Reagents for beneficiation of iron ore slimes
  - Rare-earth processing and recycling, and corrosion inhibition
  - Advanced material development such as nanoparticle production, nanofluids, nanocoatings, and nanofibres
  - Healthcare offerings such as an integrated platform for the design and development of drug delivery and in silico skin modeling
  
6. **Life Sciences:** In the field of genomics, our work includes -
  - End-to-end analysis of multiple human genome samples to identify disease causing mutations using a variety of inheritance models
  - Genome annotation
  - Comparative genomics
  - Genome Assembly and Analysis
  
7. **Software Systems:** Recognizing the far-reaching impact of software systems, our research spans the entire software evolution and application space, with special focus on -
  - Requirements engineering
  - Concepts and technology infrastructure to support model-driven organizations
  - Computational frameworks for multi-factor models of human behavior

Research outcomes are measured by the Intellectual Property created by TCS scientists. However, TCS research is not an ivory tower exercise. Research feeds into 'Programs' that draw on the knowledge created by TCS research and apply them to customer problems to create innovative outcomes within specified timelines. Customer problems are fed into TCS research to motivate exploration with real world impact.

## The TCS Advantage

TCS has invested in research for over three decades, since the establishment of our first lab in 1981, in Pune, India. This lab enabled the creation of the tools and frameworks for software development that have helped TCS deliver large and complex projects for global customers. Importantly, it has paved the way for a fast growing research ecosystem that brings together stakeholders from across the industry, organization, and academia. The most critical element of our research and innovation ecosystem is the human intellect that powers it. Researchers at TCS are from some of the best universities from across the world, and our Research Leads have a notable H index. Currently, over 110 PhDs from various domains of computing expertise are working on cross-functional research vital to the complex technologies of today. TCS researchers publish around 300 papers for Tier 1 conferences each year. This far, we have filed 3200+ patents.

TCS provides a nurturing environment for research to progress, with a dedicated unit under the chief technology officer, who directly reports to the CEO. TCS has also established research partnerships with leading universities known for their technology research capabilities. We believe that the free exchange of ideas is critical to the creativity and advancement of science, and encourage both internships and sabbaticals to stimulate constant growth.

## Awards & Recognition

---



### To know more

Visit the [Innovation Labs](#) page on [tcs.com](#)

Email: [innovation.info@tcs.com](mailto:innovation.info@tcs.com)

Blog: [Research and Innovation](#)

### About Tata Consultancy Services Ltd (TCS)

Tata Consultancy Services is an IT services, consulting and business solutions organization that delivers real results to global business, ensuring a level of certainty no other firm can match. TCS offers a consulting-led, integrated portfolio of IT and IT-enabled infrastructure, engineering and assurance services. This is delivered through its unique Global Network Delivery Model™, recognized as the benchmark of excellence in software development. A part of the Tata Group, India's largest industrial conglomerate, TCS has a global footprint and is listed on the National Stock Exchange and Bombay Stock Exchange in India.

For more information, visit us at [www.tcs.com](#)

### IT Services Business Solutions Consulting

All content / information present here is the exclusive property of Tata Consultancy Services Limited (TCS). The content / information contained here is correct at the time of publishing. No material from here may be copied, modified, reproduced, republished, uploaded, transmitted, posted or distributed in any form without prior written permission from TCS. Unauthorized use of the content / information appearing here may violate copyright, trademark and other applicable laws, and could result in criminal or civil penalties.

Copyright © 2017 Tata Consultancy Services Limited