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Accelerating Breakthroughs

A Constraint-Elimination Framework for Engineering Organizations

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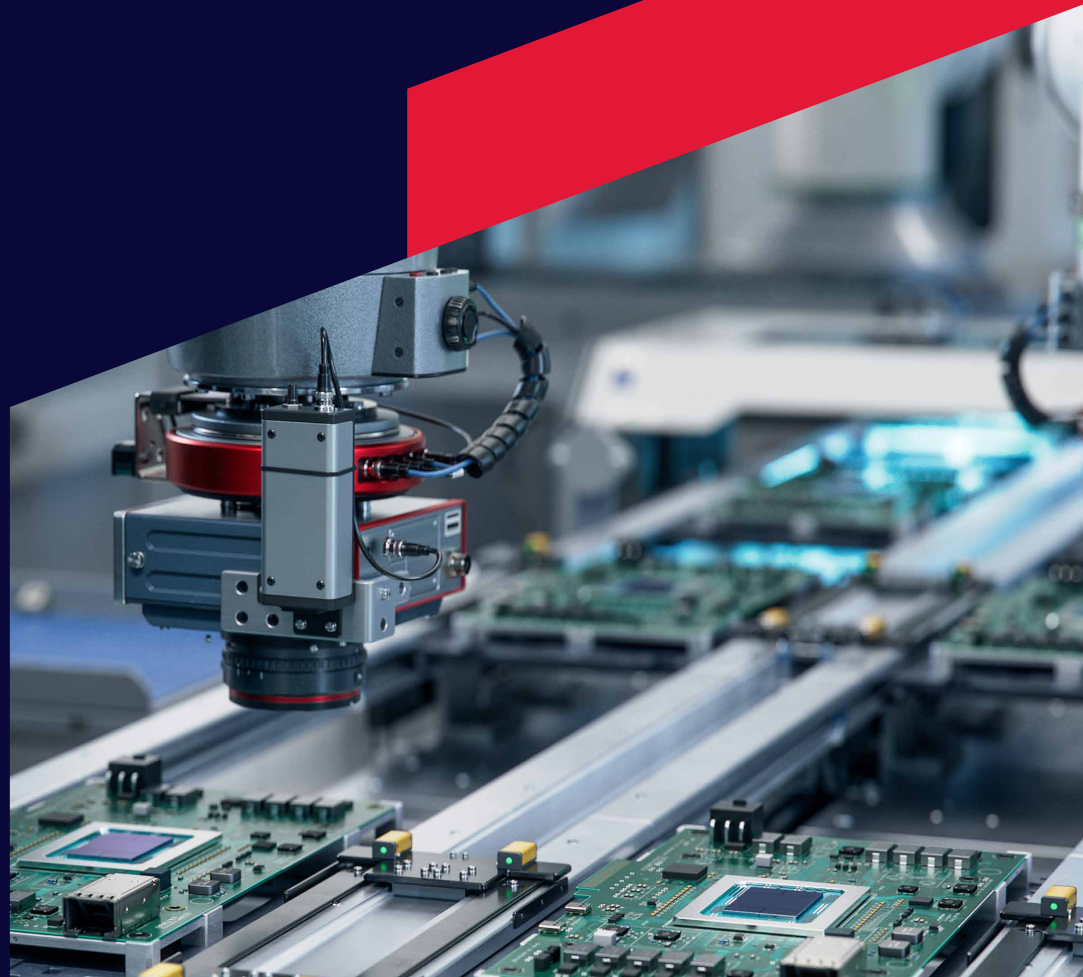


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Executive Summary

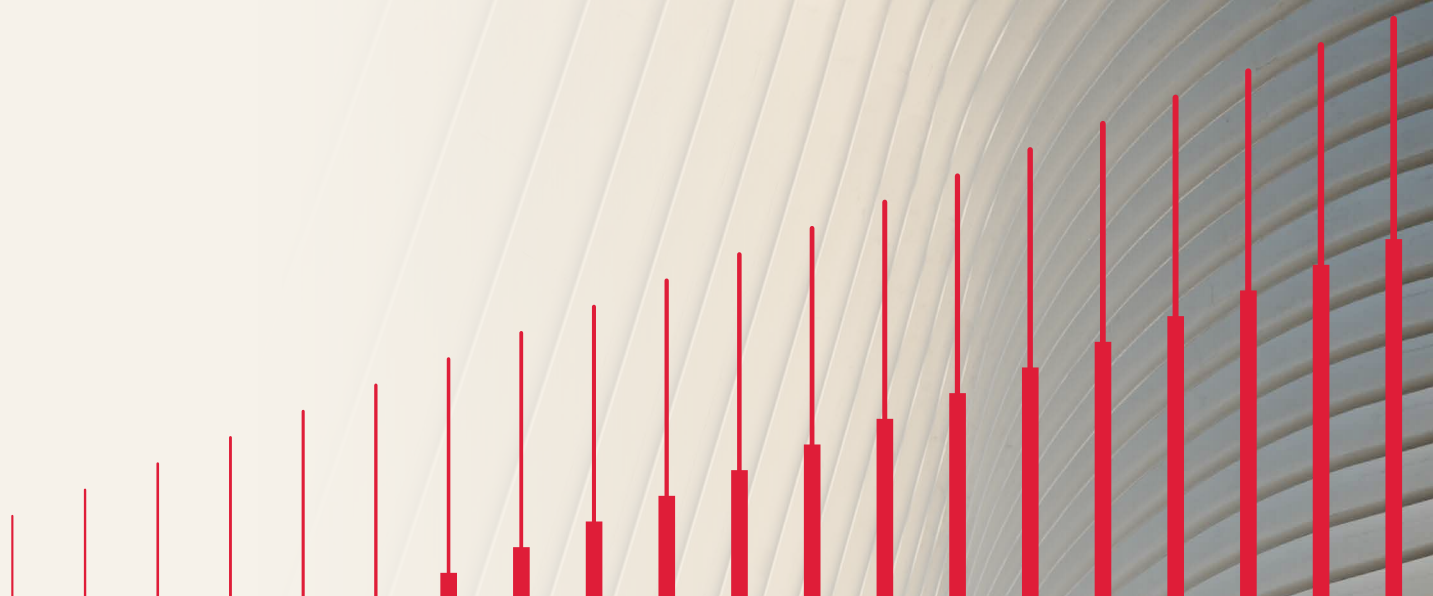
The transformative volume in the engineering services industry is increasing steadily, with organizations showing intent for higher spending towards major programs.

The paper argues that breakthroughs in engineering come from eliminating critical constraints that cap what an organization can achieve with AI.

It introduces Accelerating Breakthroughs Framework, a three-discipline framework, comprising of Solve for Simplicity, Orchestrate for Agility, and Augment for Ingenuity.

Market Signal

In 2026, companies are projected to double their AI spend from 0.8% to approximately 1.7% of revenue.[1]



Introduction

The Diminishing Returns of Transformation Activity

A clear dichotomy is emerging within organizations. Transformative initiatives and resource allocation are rising substantially. As disruptions grow in number and complexity, current methods are increasingly becoming less effective. To achieve lasting breakthroughs, engineering organizations should focus on the targeted elimination of systemic constraints, including increased product complexity, fragmented lifecycles, and others.

Market Signal

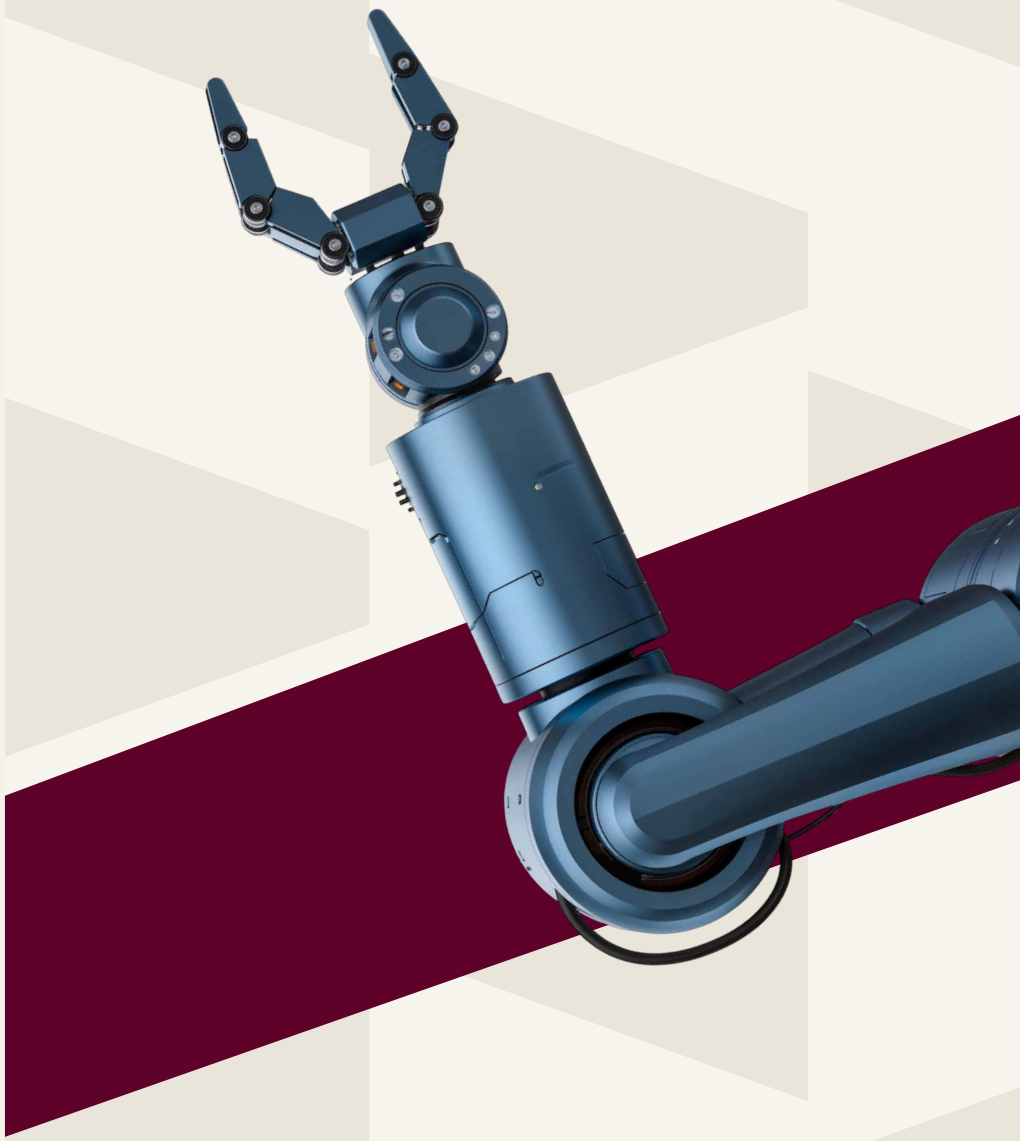
Among companies that pursued significant transformation initiatives over the past year, only 3% successfully met all of their objectives, whereas 30% fell short of achieving most of their goals.[2]



Defining the Breakthrough

Constraint Elimination as the Unit of Progress

Engineering teams often confuse linear transformation programs with breakthroughs. The former improves how work is executed, but the latter eliminates a binding constraint at its source, thereby enabling outcomes that were previously unattainable. Breakthroughs need a different mindset, to address fundamental challenges, than to go with “flavor-of-the-day” tech fixes. Both are vital: while transformation keeps you competitive today, breakthroughs secure leadership for tomorrow. This distinction reframes how investment decisions are made. The focus shifts from “what should we do next?” to “what is currently constraining the business, and what becomes possible if that constraint is removed?” In most cases, the limiting factor is not the absence of a tool but a critical constraint that has normalized over time.



The “Accelerating Breakthroughs” Framework

Three Interlocking Disciplines for Overcoming Critical Constraints

In our experience working with engineering organizations across automotive, industrial, aerospace, and high-tech, the constraints that cap engineering execution fall into three distinct types. Each type requires a distinct paradigm (simplicity, agility, and ingenuity) to remove constraints, and together, these form what we call the “Accelerating Breakthroughs” Framework.

Complexity that has accumulated in products, architectures, and ways of working is addressed by **Solve for Simplicity.**

Fragmentation across the value chain that prevents the engineering organization from moving as one is addressed by **Orchestrate for Agility.**

The inability to effectively apply new technologies like AI for impact at scale or to amplify/complement human capabilities is addressed by **Augment for Ingenuity.**

The value of the framework comes ideally from applying all or a combination of them as a system. Simplification creates the conditions in which agility becomes possible. Agility creates the data flow and process foundation on which augmentation can scale. Augmentation, in turn, generates lifecycle insights that inform the next round of simplification. Treating the Accelerating Breakthroughs Framework as a system is what produces the compounding effect.

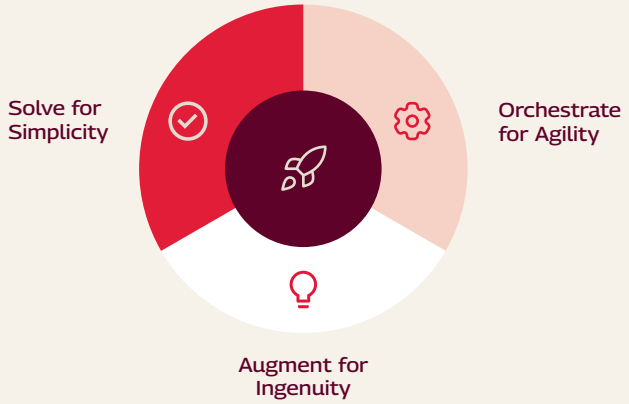


Figure 1: Accelerating Breakthroughs Framework – the Three Interlocking Disciplines

Solve for Simplicity

Reducing Entropies in Products and Processes

Complexity is the silent drag on engineering velocity. An Arthur D. Little study states that product complexity increases costs and inefficiencies, leading to significant R&D resources spent on maintenance rather than innovation.[3] This restricts opportunities for introducing a step change.

Solve for Simplicity is the discipline of reducing this entropy at the points where it most constrains the breakthrough. It operates across four dimensions.

Design simplicity: Standardization and modularization of components, interfaces, platforms, and data to eliminate redundancies and sharpen design trade-offs..

Architectural simplicity: Modernization of legacy systems and tools so that aged foundations stop dictating cycle times and constraining future change.

Experience simplicity: Remove experience constraints in interactivity, interpretation, and decision-making so that systems and processes not only perform but also reduce cognitive load.

Elemental simplicity: Establish a new product or service category by challenging foundational assumptions and replacing conventional paradigms, thereby achieving fundamental simplification.

Tech Mahindra's methodologies blend AI-led complexity diagnostics with design thinking, phygital design, value engineering, process mining to identify process breaks, and 3D printing/additive manufacturing, all guided by consulting assessments to target binding complexity.

MARKET SIGNAL

Software complexity in the average vehicle platform has grown by ~40% per year since 2021, while software development productivity has grown by only ~6%.[4]



Success Stories

A Multinational Consumer Goods and Personal Care Products Company

Designed and developed an innovative pocket-sized sensor (5% of the size of the previous version, at 90% lesser cost) to measure parameters before and after product application. Thus, democratized the field trials.

USA-based Trading Communications OEM

Modernized the R&D trading communication system, which was previously tied to proprietary hardware, into a cloud-based SaaS platform with scaled-agile releases, reducing cycle time from 12 months to 6 months.

Orchestrate for Agility

Aligning Capability and Capacity So the Organization Moves as One

Even as simplification is underway, a parallel constraint must be addressed: fragmentation. Restoring the conditions for movement means dismantling the silos themselves. Engineering, manufacturing, regulatory, supply chain, service, and the wider partner network still routinely operate as disconnected silos with their own tools, data, and timelines. The result is a coordination tax that compounds at every handoff and shows up as delays, rework, and missed releases.

"Orchestrate for Agility" is the discipline of aligning capability and capacity at coordinated speed so the organization moves as one, serving as the control plane that scales AI impact across functions. It reduces delays between decisions and action, operating across four dimensions:



Product agility: Software-defined architectures and harmonized hardware-software cadences that allow products to evolve at software speed rather than hardware speed.

Process agility: AI-driven development speeds up product engineering, while digital twins and threads support faster operational decisions through simulation and early validation.

Lifecycle agility: Model-based engineering execution (MBSE/MBE) for a single source of truth, integrated lifecycle workflows, and toolchain interoperability, enabling cross-functional collaboration across design, validation, manufacturing, and service.

Business agility: Partner and supplier network orchestration, leveraging platform thinking, composable architecture, and commercial models to orchestrate business value.

The deeper rationale is enabling hyper-localization and hyper-personalization at scale and cost, with agility as the enabler for rapid market response. This relies on composable, plug-and-play architectures where orchestration acts as the control plane carrying AI signals across engineering, manufacturing, and aftermarket. This is essential for AI to flourish at enterprise scale.

Market Signal

World Economic Forum Lighthouse sites deploying these capabilities report strong outcomes. Eaton's Changzhou facility, managing 164,000 SKUs and 5,000+ custom designs annually, cut lead times 39% and grew revenue by 129% without headcount growth.[6]

Success Stories

European Aero OEM

A digital thread that unifies design, manufacturing, procurement, and quality support, enables faster and effective Make-or-Buy (MoB) decisions, accelerating the new product introduction time by 15%.

Global EPC Contractor Operating in the Middle East

A unified asset view with digital twins across design and asset management supports predictive analytics to reduce decision time and minimize downtime by ~10-20%. Real-time ESG tracking, together with optimized operations, delivers ~10-15% reduction in carbon footprint.

MARKET SIGNAL

According to a recent World Economic Forum Lighthouse Network report, 75% of companies within the World Economic Forum Network are now capable of deploying new advanced use cases within six months.[5]

Augment for Ingenuity
Embedding Intelligence into Products and Workflows

The third constraint is the inability to effectively apply and scale in both software and physical engineering. Augment for Ingenuity uses AI and advanced technologies like quantum computing, AR/VR, and blockchain to enhance human creativity, not replace it. Industrial AI extracts value from siloed engineering data with OCR, computer vision, and inference—predicting failures, fixing design flaws, and finding bottlenecks early. Physical AI applies this learning to field assets for continuous improvement. Together, these approaches enable adaptive, self-tuning engineering beyond occasional redesigns.

"Augmenting for Ingenuity" is about identifying the right context and use cases that determine RoI, as much as it is about scaling the technological advantage from pilot to production, seamlessly by rewiring the operating model and embedding the technology as part of the larger technology estate.

Success Stories

US-based White Goods Manufacturer

Achieves a 95% reduction in inspection errors and a 98% increase in inspection throughput using a machine learning- and computer vision-based product inspection system that operates in real time, augmenting human speed and accuracy.

Leading Logistics Company

Enabled 19,000+ additional truck turnarounds and $1M savings each in inbound and outbound logistics by leveraging AI/ML on a private 5G network for tracking serial shipping code detection, freight condition, and dock loading/unloading status.

Augmentation operates across four dimensions:

Capability ingenuity: Enhance or create new concepts, products, and ways of working by augmenting human creativity and expertise with next generation technologies.

Contextual ingenuity: Close the loop by harnessing data from real-world usage to design—augmenting human judgment with real-time feedback and operational insights for relevance, performance, and decision-making.

Capacity ingenuity: Agentify and automate engineering across design, development, and validation to amplify human capacity—offloading repetitive and high-volume work and accelerating execution.

Scaled ingenuity: Proof-to-scale rollout that turns isolated pilot wins into enterprise-grade impact, by rewiring people capabilities and operating models. The focus is on industrializing new-age interventions, turning ingenuity into consistent enterprise value.

MARKET SIGNAL

According to a McKinsey report, AI could substantially accelerate R&D processes, with doubling the rate of innovation for products that consist of intellectual property (IP) or whose R&D processes are closest to scientific discovery, and accelerating the R&D process by 20% to 80% for industries that produce complex manufactured products.[6]

Cross-pillar Synergies
Compounding Effects of Simultaneous Constraint Elimination

The value of the "Breakthrough Acceleration" framework is multiplicative rather than additive. It identifies three disciplines as concurrent layers of a single system, by addressing all or a combination of which, in tandem, engineering organizations can unlock higher potential for continuous breakthroughs.

Simplicity contains and eliminates complexity, providing clean inputs; orchestration serves as the control plane/network reliably carrying AI signals across functions; and ingenuity delivers the industrial AI signals that get learned from and acted upon. Run together, they compound simplification, minimize trustworthy data/workflows, and each layer accelerates the others, helping organizations convert ideas to impact faster.

The pattern is strongly evident in cross-pillar engagements. One of our clients, a process manufacturing leader, encountered execution friction due to fragmented data, isolated tools, manual checks, and delayed detection of design issues. We standardized data models across engineering, procurement, and operations and orchestrated more than a dozen systems to build a digital backbone.

This improved workflow traceability, design simulation, and early validation. Enhanced data and workflows enabled embedded analytics and AI to achieve learning and insight communication at scale, shifting decision-making from reactive to predictive. The result: reducing program costs and improving the machinery uptime by 20%. The models, when worked together, produced the outcome the client envisioned.

The key leadership decision, therefore, is not which pillar to invest in first, but how to continuously generate cross-pillar synergies so that each improvement supports the next.

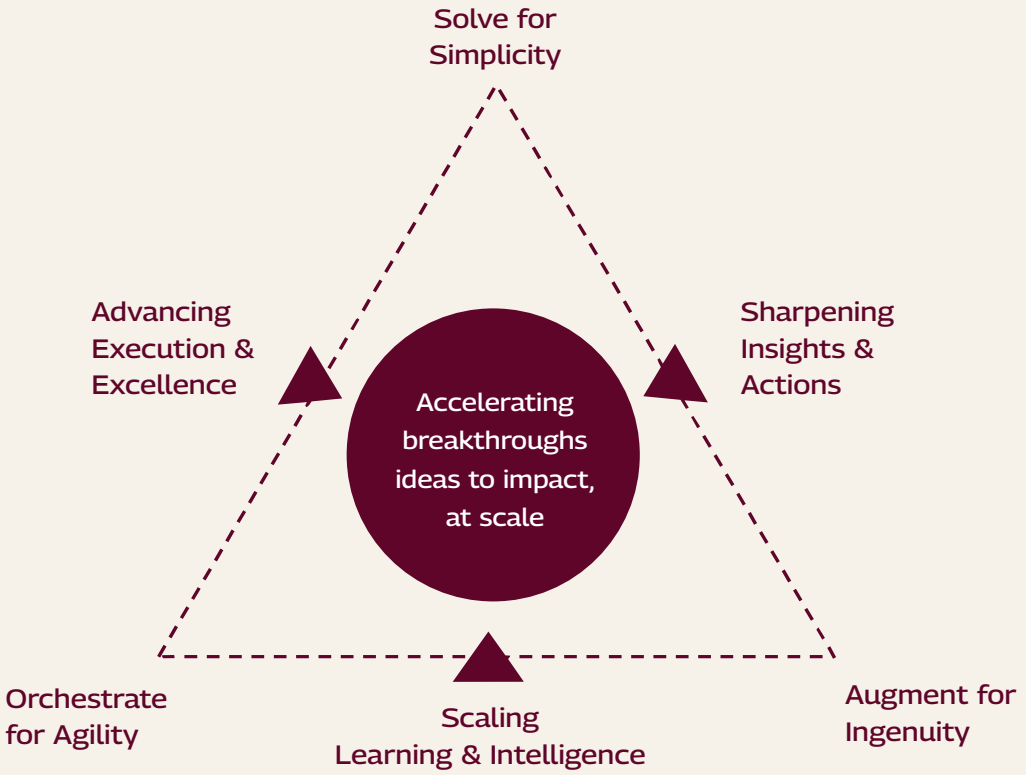


Figure 2: Cross-pillar engagement of synergies

The Value Realization Mandate: A Constraint Elimination Guide

A practitioner's guide for engineering leaders ready to apply this framework the practical sequence is four steps.

Constraint audit: Identify the binding constraints currently capping your organization's ability to deliver. The right question is not "Where are we behind?' but 'What would we be able to do that we currently cannot, if a specific constraint were removed?"

The 'Accelerating Breakthroughs' mapping: For each binding constraint, determine which discipline (Simplicity, Agility, or Ingenuity) is the appropriate primary lever and which secondary moves will be needed to sustain the gain.

Ecosystem leverage: Engineering breakthroughs are rarely achieved alone. The right partner brings external pattern recognition, proven accelerators, and execution methodologies to enable these.

At Tech Mahindra Engineering, the focus shifts away from tools and technology programs alone toward a more rigorous task: identifying and eliminating the constraints that hold back products and engineering, so ideas translate into impact faster, accelerating breakthroughs.

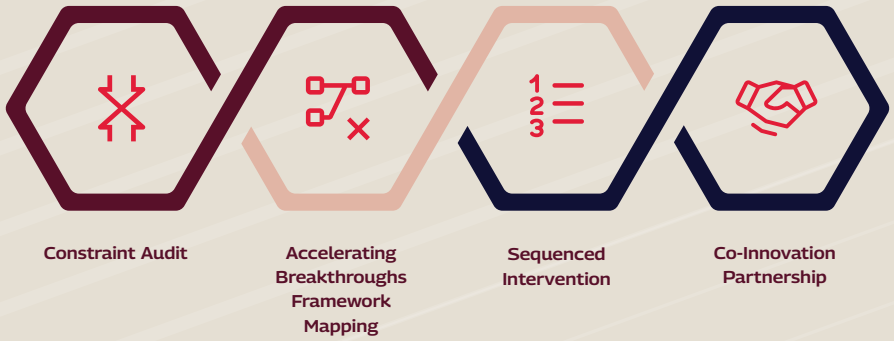


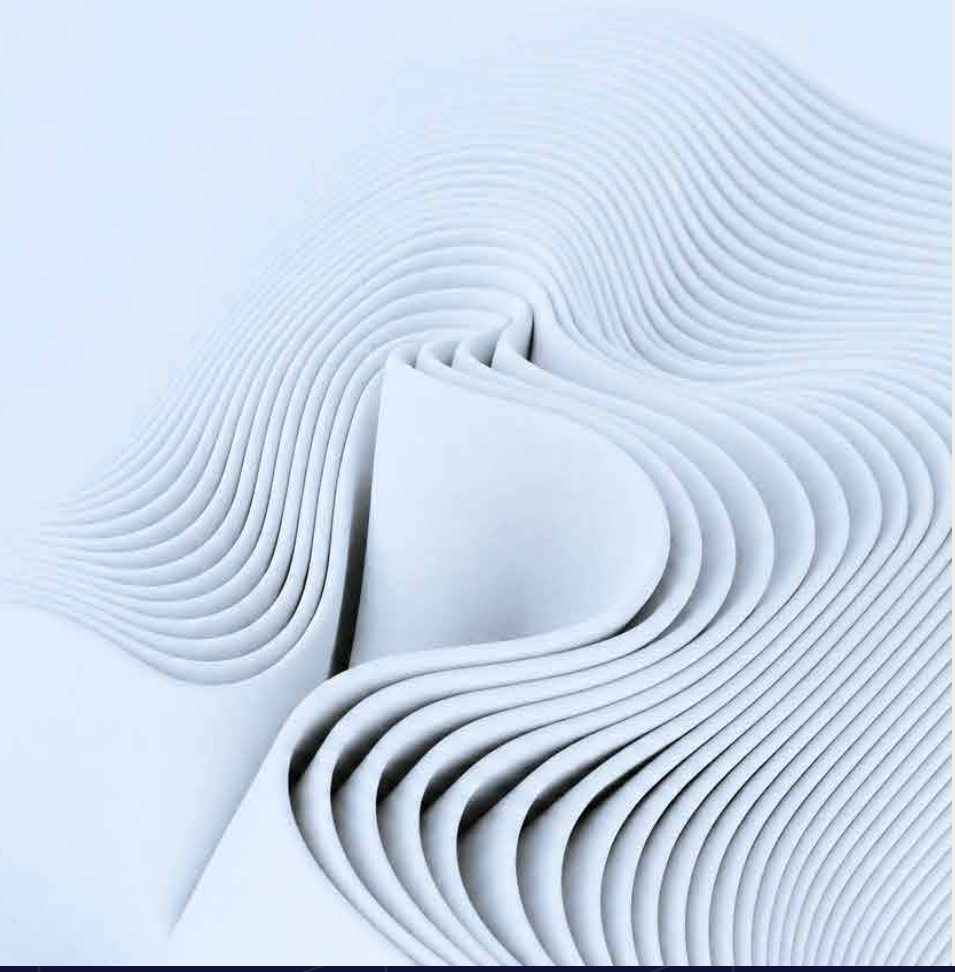
Figure 3: The value realization mandate: A guide for engineering leader



Conclusion
Toward a Theory of Engineered Breakthroughs

Engineering-led competitive advantage is determined less by the volume of transformation activity and more by the systematic elimination of binding constraints.

The path forward is to treat breakthroughs as the unit of progress, define them rigorously as the elimination of a binding constraint, and apply the Accelerating Breakthroughs Framework as a coordinated system rather than as three parallel workstreams. Organizations that do this will close the gap between transformational activity and breakthrough impact. For Tech Mahindra, this is the operating commitment behind **Accelerating Breakthroughs.**



NEXT STEP

To open a constraint-audit conversation with the Tech Mahindra Engineering team, contact ES.Marketing@TechMahindra.com

About the author

Rohit heads the Engineering Services business for Tech Mahindra, globally. Across his three decades of experience, he has been a constant proponent of engineering, having enabled ER&D organizations to evolve and stay ahead with every new wave of technology.
Rohit has built and scaled product engineering teams into innovative and high impact functions, that have been core to multi-billion-dollar portfolio, catering to a diverse client base.

Rohit was heading the Digital Engineering Services business at Tech Mahindra, before heading Large Deals, Strategic Solutions & Transformation, globally at Tech Mahindra. He has been instrumental in conceptualizing, developing and realizing multi-tower value propositions that have resulted into impactful long-term transformations for customers. These include various industries such as Communications, Hi-tech, Media & Entertainment, Manufacturing, HLS, BFSI and others. Under his leadership, product engineering teams have demonstrated significant scale and speed, underpinned by robust full-stack engineering. Previously, he has held leadership roles at Infosys, Wipro, Aricent, and GlobalLogic.

Beyond numbers and milestones, Rohit is an engineer at heart, who finds resonance in solving complex problems and delivering meaningful outcomes. He strongly believes that curious mindset and constant learning are companions for sustainable evolution.
He is a well-respected media spokesperson with active engagements in key industry forums such as the Mobile World Congress, TM Forum, Qualcomm DX Summit, NASSCOM, ARM Summit, and others. He has been widely and exclusively featured as an established thought leader in The Industry Outlook, Dataquest, TechGig, Mobile Magazine UK, TechCircle, NCN Magazine, EFY Magazine, Gulf Today and many more.



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About **Tech Mahindra Engineering**

TechM Engineering is a global Engineering Services provider with over three decades of engineering heritage. Our approach to accelerating the idea-to-impact cycle is anchored in Accelerating Breakthrough Frame — designed to systematically remove binding constraints and drive breakthroughs in engineering, with AI as a force multiplier. With product and platform capabilities spanning innovation to industrialization and silicon to software, we operate across 10+ industries (Automotive, Aerospace, Industrial, Process Manufacturing, Semiconductor, Communications, Hi-Tech, etc.). This is enabled by a diverse set of problem solvers, 50+ labs, industry-specific solutions and platforms, and a portfolio of 500+ global patents. Together, we strive to engineer for a sustainable, progressive, and human-centric future.

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Tech Mahindra (NSE: TECHM) offers technology consulting and digital solutions to global enterprises across industries, enabling transformative scale at unparalleled speed. With 149,000+ professionals across 90+ countries helping 1100+ clients, Tech Mahindra provides a full spectrum of services including consulting, information technology, enterprise applications, business process services, engineering services, network services, customer experience & design, AI & analytics, and cloud & infrastructure services. It is the first Indian company in the world to have been awarded the Sustainable Markets Initiative's Terra Carta Seal, which recognizes global companies that are actively leading the charge to create a climate and nature-positive future. Tech Mahindra is part of the Mahindra Group, founded in 1945, one of the largest and most admired multinational federation of companies. For more information on how TechM can partner with you to meet your Scale at Speed™ imperatives, please visit https://www.techmahindra.com/.

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