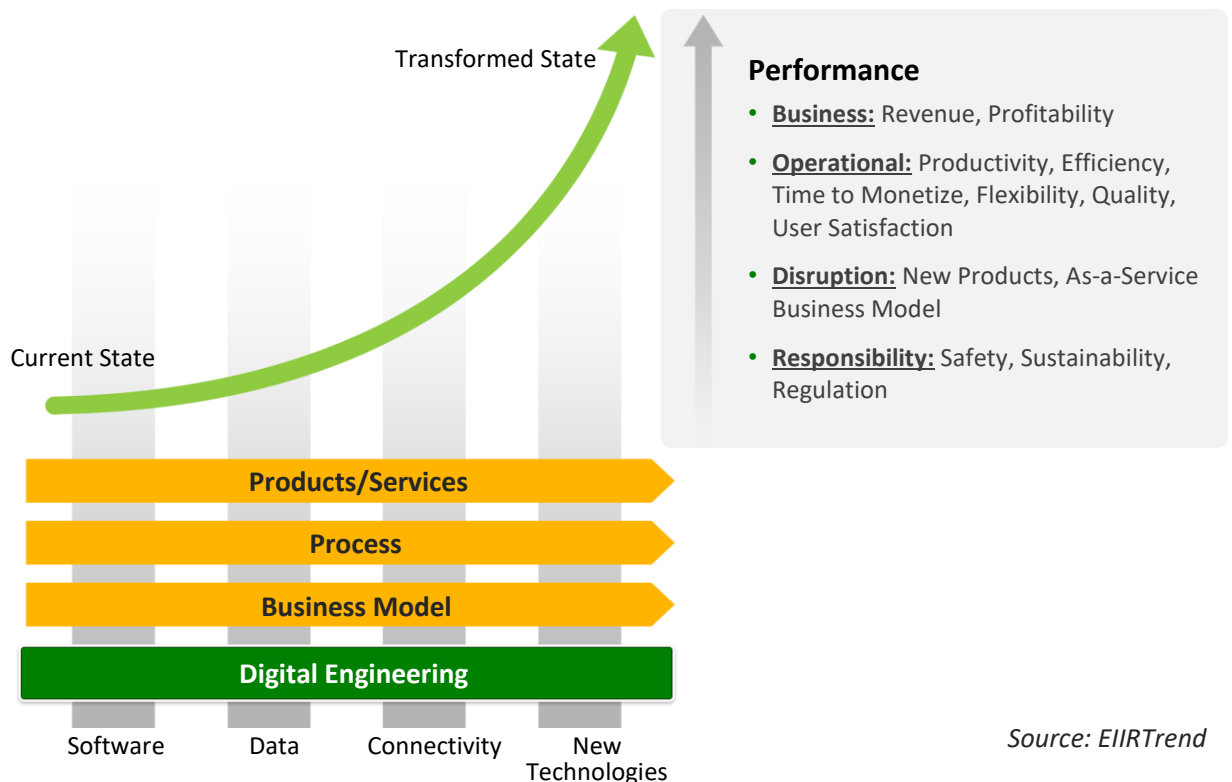# Digital Engineering is Necessary for Exponential Digital Transformation

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Enterprises are striving to make an exponential jump in performance by leveraging digital transformation.

Exhibit 1: Digital Engineering is the Foundation of Exponential Digital Transformation

Transformed State

Performance

- **Business:** Revenue, Profitability
- **Operational:** Productivity, Efficiency, Time to Monetize, Flexibility, Quality, User Satisfaction
- **Disruption:** New Products, As-a-Service Business Model
- **Responsibility:** Safety, Sustainability, Regulation

Current State

Products/Services

Process

Business Model

Digital Engineering

Software   Data   Connectivity   New Technologies

Source: EIIRTrend

But often, enterprises encounter bottlenecks in their transformation programs and an exponential performance rate remains a mirage. A strong digital engineering foundation can solve these bottlenecks. This PoV defines digital engineering and explores how it can help enterprises in their exponential digital transformation journey.
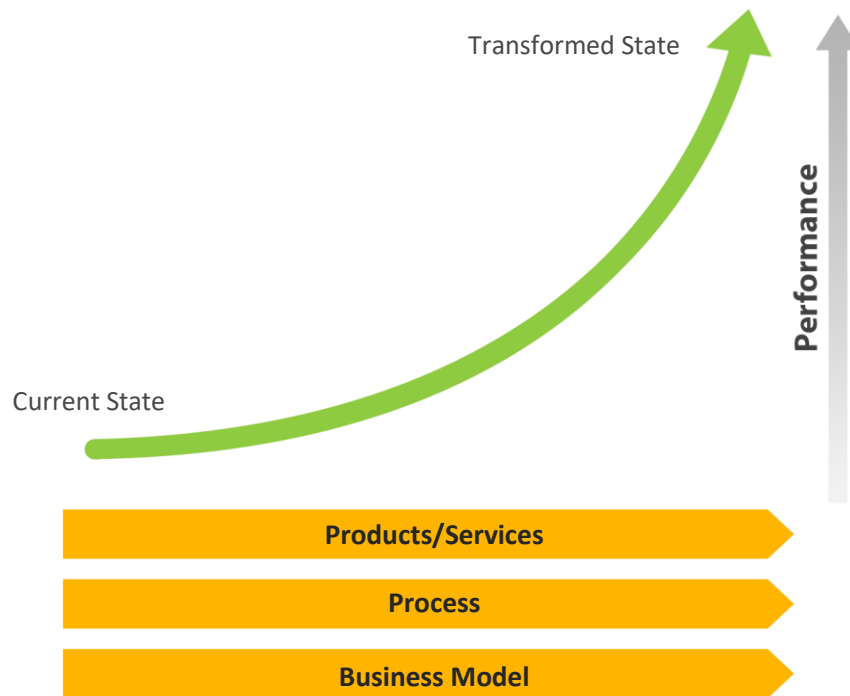
Exponential digital transformation levers

Change is constant in any business environment. However, the rate of change in the last few years has been unprecedented. Enterprises are facing the heat and potentially looking at an existential crisis. They need to exponentially transform or they will fade into oblivion. Their challenges are:

- **Technology:** Technology is changing very quickly both for consumers and enterprises. Although enterprises have traditionally been slow to adopt new technology as compared to the consumer market, the situation is changing now. Users expect the technology of enterprises to match the pace of advancement in consumer technology. Enterprises that fail to adopt and harness the potential of new technologies are likely to be outsmarted by those who are successfully adapting to the changing environment.

- **Disruption:** New firms, including born digital firms, are disrupting incumbents in every industry. The pace of disruption has increased in the last few years. Enterprises need to embrace disruption and behave and act like digital natives if they want to survive.

- **Complexity:** The business environment and industries have become overly complex. Consequently, enterprises and their products and services across the value chain are becoming complex too. What's challenging is that the complexity is increasing every day. An organization cannot manage such a high level of complexity on its own. It needs partners—be it software firms, hardware firms, service providers, or startups—across different business lines and geographies.

To thrive despite these challenges, enterprises need to transform themselves to make an exponential jump in performance. There are three levers of exponential digital transformation, as shown in Exhibit 2.

Exhibit 2: Levers of Exponential Digital Transformation

Source: EIIRTrend

The three levers of digital transformation are:

- **Products/Services:** How can enterprises reimagine their products and services to satisfy the stated and unstated needs of users? Many top companies by market cap have reimagined their products and services—be it electric vehicles, smartphones, video conferencing, OTT media, etc. This has created a change in consumer preferences. How can enterprises leverage technology to improve their product or even completely reimagine it?

- **Processes:** How can enterprises reimagine their processes for productivity, efficiency, flexibility, quality, sustainability, compliance, etc.? Process reengineering was always a transformation lever and organizations have been doing business process reengineering for decades. What has changed now is the usage of technology in reimagining processes. e.g., IoT-enabled machines can predict failures, which allows procurement and inventory processes to be redefined. Similarly, 3D printing or automation can redefine many shop floor or back office processes. How can enterprises leverage technology to create world class processes?

- **Business Models:** Enterprises can reimagine their business models. Product firms can enter as-a-service models where they bill the customer upon usage. In consumer markets, there are many new and interesting business models coming up in different industries and the enterprise market will follow soon. We are becoming an on-demand business economy. How can enterprises leverage the on-demand business model in their businesses? Instead of getting disrupted by the new business models of competitors, it is better to take the lead and change business model proactively.

Digital engineering is the foundation of exponential digital transformation

A strong digital engineering foundation supports the digital transformation levers and creates an environment for them to thrive, as shown in Exhibit 3.

Exhibit 3: Digital Engineering is the Foundation of Digital Transformation Levers
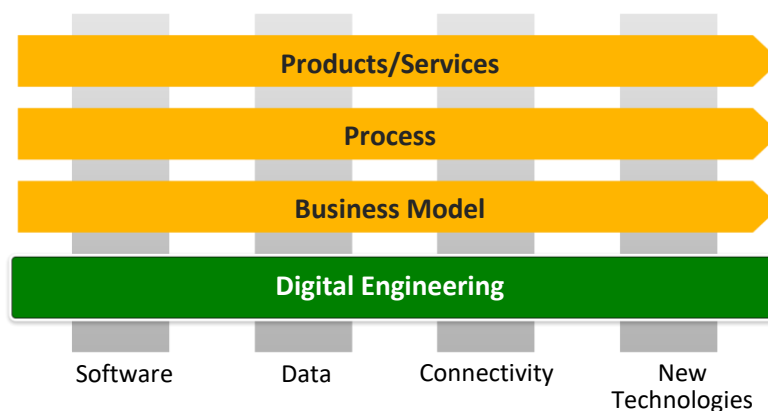
Source: EIIRTrend

"*Digital engineering enables an exponential business transformation of enterprises across products or services, processes, and business models for a step change in business and operational performance by leveraging the power of software, data, connectivity, and new technologies.*"

Four digital engineering pillars that support the digital transformation levers are:

- **Software**: Software is consuming the world and every industry is impacted by it. An entirely new category of products and services are being developed and existing products and services are being transformed. A car is now a piece of software on wheels. All products and services are becoming smart with software. Software is also helping to create better and user-friendly processes across enterprises. In the current wave of virtualization and work-from-anywhere, enterprises are redefining most of their processes by leveraging software.

- **Data:** Data is at the core of all types of transformations—be it product, process, or business model. It provides inputs for software to take decisions. It is all about different ways to capture data and generate value from it. Value can be in the form of information that can be used for immediate control or long-term insights. Many digital native business models on apps are heavily dependent on data.

- **Connectivity:** Many products, processes, and business models are dependent on always-on connectivity now. As the reliability of connectivity is increasing, so are innovations. Shared mobility, entertainment-on-demand, telemedicine, or work-from-anywhere, connectivity with low latency is at its heart.

- **New Technologies:** There have been exponential technology changes in the last few years and it is impacting products, processes, and business models in many industries. e.g., electric and autonomous vehicles, products leveraging augmented and virtual reality, manufacturing processes with 3D printing, and packaging developed with new sustainable materials. Enterprises need to be comfortable reimagining their products, services, and business models to leverage new technologies.

There are three levers of digital transformation and four pillars of digital engineering that support them. All digital transformation is a mix-and-match of building blocks of a four-by-three matrix. Some disruptive successes like Uber are transforming across all four-by-three dimensions. There are many examples across industries that are using two or more blocks across the four-by-three matrix. For example, EV is a combination of product and new technologies, whereas servitization is a combination of business model and software. More such digital transformation examples are shown in Exhibit 4.

Exhibit 4: Digital Transformation Examples across Digital Transformation Levers and Digital Engineering Pillars

	Product/Service	Process	Business Model
Software	• Video Calling	• Procurement	• Servitization
Data	• Fintech apps	• Scheduling	• Data as-a-service
Connectivity	• Connected Cars	• Remote Maintenance	• On-demand model
New Technologies	• EV	• Virtualization Shop floor	• Micro factories

Source: EIIRTrend

The four pillars of digital engineering are software, data, connectivity, and new technologies. Digital engineering offerings and capabilities support these pillars, as shown in Exhibit 5.

**Exhibit 5: Digital Engineering Capabilities**

Pillars of Digital Engineering	Digital Engineering Offerings	Details
Software	• Software Platform Engineering • Silicon Platform Engineering • Digital Commerce	• Building, running, and maintaining enterprise high-performance, secure, and highly scalable platforms • Building customized silicon platforms for enterprises according to their performance requirements • Modernize your B2B/B2C commerce platforms to support business model and process transformation
Data	• Data Engineering	• Data engineering is managing data lifecycle at scale. It is about fetching/acquiring massive amounts of data and storing, processing, and cleaning it to create business impact.
Connectivity	• 5G Engineering	• Ensuring fast, efficient, and ubiquitous connectivity with 5G services by leveraging engineering of core network, RAN, management, and applications
New Technologies	• Industry 4.0	• Intelligent integration of cyber-physical systems by leveraging new technologies like Digital Twins, intelligent sensors, cobots, AI/ML, cybersecurity, AR/VR, 3D printing, and automation

Source: EIIRTrend

Enterprises face challenges in digital transformation that can be solved by digital engineering

Enterprises are often not able to drive value from their digital transformation initiatives because they face the challenges of performance, scalability, lifecycle, and multidisciplinary expertise. The lack of strong digital engineering capabilities becomes a bottleneck in overcoming these challenges, as shown in Exhibit 6.

Exhibit 6: How the Lack of Digital Engineering is a Bottleneck for Enterprises to Realize Value
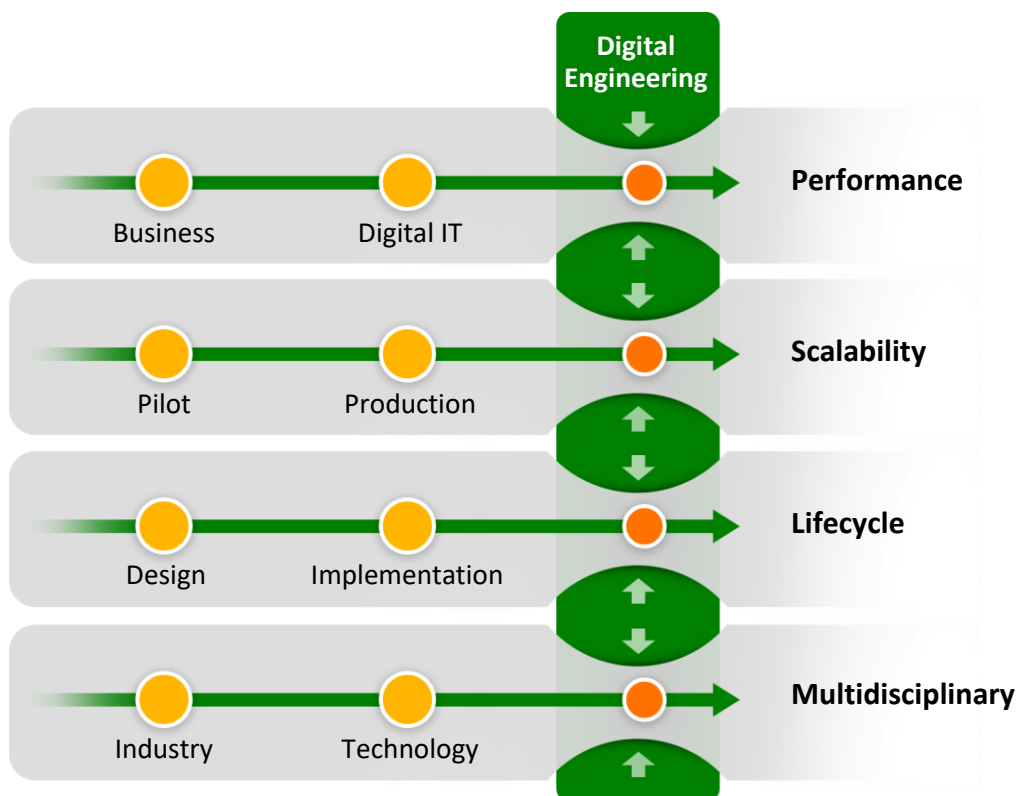
Source: EIIRTrend

- **Performance:** Enterprises often do not get value out of transformation because of performance bottlenecks. Deep digital engineering expertise is needed to overcome it. For example, in an analytics-driven business model, businesses can decide what analytics/algorithms are required. Digital IT can provide all dashboards and data warehousing, but performance bottlenecks will depend on data or digital engineering. In the software world, a shift from monolithic to micro service-based architecture and containerization has brought novel engineering challenges for enterprises. These can become bottlenecks if enterprises do not have strong digital engineering expertise.

- **Scalability:** Transformation sometimes works in limited pilots but is not often scalable across enterprises—different business units, products, plants, locations. For scalability of digital transformation initiatives, digital engineering expertise at scale is essential. Using the public governance analogy, there is a difference between managing a country and managing a city or neighborhood. Similarly, in the construction industry analogy, there is a difference between the engineering effort and expertise required in building a small house and building a large structure. There are engineering tradeoffs in managing a system and local decision that hamper performance and scalability. The scale of engineering, architecture, and processes is different for a large system vs. a local solution. Digital engineering can be ignored for pilot or small projects but it is essential for enterprise digital transformation at scale.

- **Life cycle:** Transformation requires system expertise across the lifecycle of design, implementation, and operation with a closed feedback loop. For digital transformation to be successful, it should be managed both in initial state and steady state with a closed feedback loop. Enterprises can design and implement transformation even without strong digital engineering expertise, but they will face challenges and bottlenecks in the operational phase because all value in transformation is created in this phase. With a strong digital engineering foundation and a feedback loop, operational challenges can be addressed. It is imperative that the same engineering team takes care of design, implementation, and operations to incorporate digital engineering right at the beginning. Also, technologies keep evolving and changing. For future-proofing, enterprise transformation should also able to evolve with changing technologies.

- **Multidisciplinary:** Digital transformation often requires the expertise of different industries and technologies and value creation requires multidisciplinary expertise. Autonomous cars will require automotive knowledge and telecom knowledge. EV charging will require power equipment and automotive knowledge. 3D printing in aerospace will require both 3D printing and aerospace knowledge. This often becomes a bottleneck in transformation. Enterprises tend to solve this problem by working with different partners. But the more partners an enterprise has, the more there are changing hands and potential failure points and local optimization. It is essential for enterprises to choose teams or partners who have multidisciplinary expertise across industries and technologies.

Strong digital engineering becomes a bottleneck and many of these digital engineering skills are hard to find for enterprises. They are available at a premium in the market. Specialist digital engineering service providers can provide these skills on demand.

HCL Digital Engineering capabilities

One such specialist digital engineering service provider is HCL. It is one of the leading global engineering service providers that supports the exponential digital transformation of its customers by leveraging digital engineering. Exhibit 7 and 8.

Exhibit 7: HCL's Digital Engineering Value Proposition

Customer Challenges	Digital Engineering Requirement	HCL's Value Proposition
Performance	• Deep expertise	• Deep engineering capability
Scalability	• Expertise at scale	• Large-scale engagements
Lifecycle	• Breadth of expertise across lifecycle	• Expertise across lifecycle. HCL has experience in partnering with its customers at different stages of the enterprise transformation journey, whether it is related to strategizing, building, migrating, deploying, sustaining, support, or operations.
Multidisciplinary	• Breadth of expertise across technology and verticals	• Expertise across technologies verticals • Expertise of handling convergence of IT/OT • Expertise across both traditional and digital engineering

Source: EIIRTrend, HCL

Exhibit 8: HCL's Digital Engineering Examples

Pillars of Digital Engineering	HCL Offerings	Examples
Software	• Cloud/Platform Engineering • Digital Product Support • Digital Aftermarket • Digital Commerce	• Highly scalable, robust platform to manage millions of concurrent secure transactions to ensure immersive omni-channel customer experience.
Data	• Data Engineering & AI	• Catalyzing data driven experiences and creating new usage based revenue streams

Pillars of Digital Engineering	HCL Offerings	Examples
Connectivity	• 5G Engineering	• Network acceleration solution for 5G data centers
New Technologies	• Industry 4.0	• Digital twin for a dynamic Build-to-Order production environment

Source: EIIRTrend HCL

Bottom Line: Enterprises should have a clear digital engineering strategy to realize the exponential benefits from their digital transformation initiative

Who doesn't want exponential results from their digital transformation initiatives? Enterprises will be judged and rewarded for the results they achieve, not the efforts they put in. Enterprises should think and plan a digital engineering strategy to support their digital transformation initiatives. Specifically, enterprises should:

- Make a strong foundation of digital engineering for exponential success in digital transformation.
- Audit and identify areas where digital engineering can remove bottlenecks and add value.
- Work with engineering partners who have deep expertise, breadth of expertise, and expertise at scale.
- Constantly iterate with new insights and technology changes.

So, what is your digital engineering strategy?

About the Author

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Pareekh Jain is CEO and Lead Analyst of EIIRTrend and Pareekh Consulting.

EIIRTrend is an information platform for discovering engineering, IoT, Industry 4.0 and R&D (EIIR) trends, information, insights, best practices, across 12 industry segments, 24 service segments, 50+ countries and 2500+ providers and buyers. Pareekh Consulting is a focused analyst and advisory firm for EIIR.

A seasoned EIIR professional, Pareekh has seen the EIIR industry from four perspectives: service provider, sourcing advisor, enterprise buyer, and industry analyst.

He is regularly quoted in media on EIIR trends. Some of the media publications he is quoted in include Harvard Business Review (HBR), NDTV, Times of India, Economic Times, Business Standard, Hindu, Business Line, Livemint, Indian Express, Financial Express, Deccan Herald, Bizzbuzz, Rediff, Voice of America, Moneycontrol, Quartz, and Business Insider.

Pareekh is a thought leader, having authored various publications on topics related to EIIR outsourcing. He loves business fiction writing in his free time, and has authored a novel, Who Is That Lady?

Pareekh received his MBA from the Indian Institute of Management (IIM), Bangalore and his Bachelor of Technology degree from the Indian Institute of Technology (IIT) Delhi.

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