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BANGLADESH SEMICONDUCTOR INDUSTRY ASSOCIATION

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SILICON RIVER

BANGLADESH

BANGLADESH'S SEMICONDUCTOR JOURNEY TOWARDS THE GLOBAL ECOSYSTEM

BSIA

SILICON RIVER

B A N G L A D E S H

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SILICON RIVER

A BSIA PUBLICATION, AND A NATIONAL DIRECTION IN MOTION

There are publications that report on industries. There are publications that analyze trends. And then, rarely, there are publications that emerge at the precise moment when a nation begins to redefine itself. Silicon River belongs to the third category.

> Published by the Bangladesh Semiconductor Industry Association (BSIA), Silicon River is not a conventional magazine. It is not intended to observe from a distance or comment after the fact. It is an institutional platform—one that reflects, shapes, and aligns a national effort as it unfolds in real time. This publication is born out of convergence.

For more than sixty years, semiconductor technology has shaped the modern world with remarkable consistency. While technologies have evolved and applications have expanded, the structure of the global ecosystem has remained anchored. The United States continues to lead in innovation. Taiwan defines the frontier of manufacturing. Southeast Asia, particularly Malaysia, anchors packaging and testing. Japan, South Korea, and China have demonstrated that entering this domain is not a matter of intent alone, but of sustained, coordinated national effort. Against this backdrop, Bangladesh has often been seen as an observer. But that perception has always been incomplete.

> Across the global semiconductor ecosystem, more than three thousand non-resident Bangladeshis are actively contributing at the highest levels of industry and research. Their work spans device physics, design, manufacturing, reliability, and system architecture.
>
> Within leading global universities, Bangladeshi-origin faculty have shaped foundational ideas that are now embedded in modern electronics. From transistor behavior to reliability physics to energy-efficient device design, these contributions are not peripheral.
>
> They are structural. The story, therefore, is not one of absence. It is one of dispersion. Silicon River is the effort to resolve that dispersion.

It is not a single initiative. It is not a singular policy. It is a coordinated framework—one that aligns talent, infrastructure, industry, policy, and global engagement into a coherent national system. It reflects a long-term strategy, where each step reinforces the next, and where progress is measured not by isolated success, but by systemic alignment.

This magazine is an extension of that system.

And this issue is intentionally designed as a system of thought. We begin with the institutional voice. The opening interview with the President of BSIA establishes the national context and grounds the journey in legitimacy and direction. It positions BSIA not as a commentator, but as a convener.

From there, the vision expands. The Silicon River essay frames the journey not as a reaction to global shifts, but as a deliberate positioning of Bangladesh within the technological future.

Policy is then reframed. Through the lens of engineering, national strategy is presented not as governance alone, but as design—structured, iterative, and outcome-driven.

The narrative then turns to people. BRAINGAIN demonstrates

that Bangladesh's greatest semiconductor asset is already global, and that reconnecting this distributed strength is central to national acceleration.

We then step outward. The Malaysia Roadshow offers grounded lessons in how ecosystems are built—not through imitation, but through observation, partnership, and disciplined adaptation.

From there, the system turns inward again. BOOST represents a new layer of thinking—where national coordination itself becomes an engineered system, connecting institutions, individuals, and opportunities into a unified digital backbone.

The academic interface follows, offering a structural diagnosis of how universities must evolve—not in isolation, but as part of a national semiconductor system.

An external perspective then provides a necessary mirror. It ensures that ambition remains grounded in global reality, and that strategy is informed by experience beyond our borders. This issue also marks an important evolution.

For the first time, Silicon River is not only written about the next generation. It is meaningfully shaped by them.

Alongside expert perspectives, this issue includes analytical contributions from students, including a detailed examination of semiconductor workforce development and ecosystem strategy. It also features a separate article developed by a group of undergraduate students on the BEAR Summit 2025, reflecting how early-stage thinkers are already engaging with national platforms and global technological questions.

These contributions are not symbolic. They are substantive. They demonstrate that the next generation is not waiting to participate. They are already analyzing, questioning, and building.

Even the visual identity of this issue reflects that spirit. The cover has been designed by a student, Inzamaul Hoque, whose work was selected through a national competition. This is not simply a design choice. It is a statement of intent—that Silicon River is not only about systems and strategy, but about ownership across generations.

This is not incidental. It is intentional.

Because ecosystems are not built by a few. They are built when participation becomes distributed.

The issue then turns to its most important foundation. The CREST Fellows represent the emerging layer of builders—individuals already working across materials, devices, circuits, and systems. They are not future contributors. They are present actors in a system taking shape.

The perspective is then extended further through contributions that explore both the fundamental limits of energy, physics, and computation and the practical realities of building systems within Bangladesh. Together, these perspectives ensure that the narrative remains both forward-looking and grounded in execution.

Taken together, these contributions form more than a collection of articles. They form a living system.

That is the role of Silicon River as a BSIA publication. Not to report what is happening, but to help shape how it is understood. Not to follow momentum, but to create direction. Not to centralize voice, but to distribute it across generations This is only the beginning.

A river does not declare itself at its source. It gathers quietly, aligning streams, building force, and defining its path through persistence.

Silicon River has begun. And this time, it is not flowing alone.

Cover Artwork Credit:

Rafi is a student at BUET's MME department, Dhaka. Fascinated by how physics brings order to the universe, he channels that same precision into his creative work; including a passion for digital art. Outside academics, he finds clarity on two wheels, cycling through the streets of Dhaka.

IN CONVERSATION WITH THE BSIA PRESIDENT

M. A. Jabbar

The Focus

Shaping Bangladesh's Semiconductor Future in the Age of Silicon River

Q1. What inspired the establishment of the Bangladesh Semiconductor Industry Association (BSIA)?

The establishment of BSIA emerged from a fundamental realization that semiconductors are no longer a specialized technology sector, but the invisible infrastructure of modern civilization. Every device, every system, every network that defines today's economy is ultimately powered by silicon.

> For over six decades, semiconductors have shaped the trajectory of global progress. Yet, the global ecosystem has remained concentrated, with innovation largely driven by the United States, manufacturing led by Taiwan, and packaging anchored in Southeast Asia. Bangladesh, despite its remarkable progress in ICT and digital services, remained largely absent from this value chain.

At the same time, a quiet truth existed. Thousands of Bangladeshi-origin engineers, researchers, and leaders were already contributing across the global semiconductor ecosystem. Their impact was real, but dispersed. Their presence was strong, but uncoordinated.

BSIA was created to bring coherence to this reality. It is not just an association. It is a platform to align talent, policy, industry, and global engagement into a unified national direction. It serves as the institutional backbone of what we now describe as the Silicon River vision.

Q2. What were the core objectives of BSIA at its inception?

> From the outset, BSIA was designed not as a conventional industry body, but as a system integrator. Our objective was to create alignment across four critical dimensions: talent, infrastructure, industry, and policy.

We aimed to represent the semiconductor sector with credibility, to support evidence-based policy development, and to ensure that Bangladesh enters the global value chain through strategic and realistic pathways. Human capital development was central to this vision, recognizing that semiconductors are fundamentally a talent-driven industry.

Equally important was global integration. Bangladesh cannot build this ecosystem in isolation. BSIA was therefore tasked with building bridges—connecting local capabilities with global companies, research institutions, and diaspora leaders.

Q3. How do you define success for BSIA in its formative years?

Success, in our view, is not measured by scale alone, but by alignment and credibility.

If BSIA becomes the trusted platform where government, academia, and industry converge, that is success. If policymakers rely on BSIA for strategic direction, if global partners recognize Bangladesh as a serious emerging player, and if young engineers see a clear pathway into this industry, that is success.

Q4. What achievements of BSIA so far make you most proud?

What stands out most is the speed at which alignment has begun to emerge. In a relatively short time, BSIA has positioned itself as a credible and forward-looking institution. We have engaged with multiple ministries, universities, and international partners, creating momentum around policy and ecosystem development.

We have also initiated structured talent development programs, facilitated global collaborations, and brought visibility to Bangladesh's semiconductor ambitions through high-impact engagements. These are early steps, but they demonstrate that coordinated progress is possible.

Q5. What initiatives has BSIA taken to develop the semiconductor ecosystem?

BSIA's initiatives are designed as part of a larger system rather than isolated programs. On the talent side, we are working on structured pipelines through initiatives such as BASICS and SICIP, ensuring that education aligns with industry needs. Global certification pathways are being integrated to ensure international relevance.

> On infrastructure, we are advocating for shared facilities including design environments, testing platforms, and research centers such as CREST, along with the revival of existing capabilities like the BAEC cleanroom.

On industry, we are focusing on realistic entry points such as semiconductor design, verification, embedded systems, and packaging. These are complemented by global partnerships and engagement with leading ecosystem players.

All of these efforts are interconnected and aligned with the broader Silicon River strategy.

Q6. What are the major challenges faced by BSIA and its members?

The challenges are real, but not insurmountable.

Access to advanced tools and infrastructure remains a key barrier. The shortage of experienced professionals reflects the early stage of the ecosystem. Policy frameworks are evolving but require further alignment with industry needs. Global visibility and market access are still developing.

However, these challenges are not unique to Bangladesh. Every semiconductor nation has faced them at some stage. What matters is how systematically and consistently they are addressed.

Q7. Why should the Government of Bangladesh prioritize the semiconductor industry now?

Semiconductors are not just an economic opportunity. They are a strategic necessity.

> Countries that invest in this sector are securing their technological sovereignty and economic competitiveness for decades to come. For Bangladesh, this represents a pathway to diversify beyond traditional industries and move into high-value, knowledge-driven sectors.

The global supply chain is also undergoing realignment, creating a rare window of opportunity. Bangladesh can enter this ecosystem through design, advanced packaging, and specialized services, positioning itself as a meaningful contributor.

Q8. What policy support does the semiconductor industry need?

The semiconductor sector requires a tailored and forward-looking policy framework.

This includes fiscal incentives, R&D support, access to design tools, bonded facilities, and strong intellectual property protection. Equally important is long-term policy consistency and a centralized coordination mechanism to align efforts across ministries.

Semiconductors cannot be developed through fragmented initiatives. They require coordinated, sustained, and strategic policy support.

Q9. How can Bangladesh explore and access global markets?

> Bangladesh must begin with focused and achievable segments. Chip design services, verification, embedded systems, and niche IP development provide immediate entry points. Packaging and testing offer strong medium-term opportunities.

Global engagement is critical. Through structured roadshows, trade missions, and participation in international forums, Bangladesh can build visibility and credibility. Strategic partnerships will open doors that would otherwise remain inaccessible.

Q10. What role does the Bangladeshi diaspora play in this journey?

> The diaspora is one of our most powerful strategic assets.
>
> More than three thousand Bangladeshi-origin professionals are currently working across the global semiconductor ecosystem. They are embedded in leading companies, research institutions, and decision-making roles.

Their contributions are not peripheral. They are foundational. From device physics to system architecture, from manufacturing to packaging, their work is shaping the technologies that power the world.

The Silicon River vision recognizes this reality. Through structured initiatives such as BRAINGAIN, we are transforming this dispersed strength into a coordinated force that accelerates national progress.

Q11. What are the job prospects in the semiconductor sector?

The opportunities are both significant and enduring. Semiconductors offer high-quality, high-value careers across design, verification, testing, manufacturing support, and research. As the ecosystem develops, these opportunities will expand further.

Over the coming decade, we anticipate the creation of thousands of direct and indirect jobs, contributing meaningfully to Bangladesh's transition toward a knowledge-based economy.

Q12. How can students and young professionals prepare themselves?

The foundation remains strong fundamentals. Students should focus on electronics, mathematics, programming, and problem-solving. Equally important is practical exposure through projects, internships, and industry-aligned training.

Semiconductors demand persistence and continuous learning, but they offer the opportunity to work at the frontier of technology.

Q13. What is BSIA's vision for Bangladesh's semiconductor industry by 2030?

> By 2030, we envision Bangladesh as a globally recognized hub for semiconductor design, talent development, and innovation-driven services.

We see Bangladeshi engineers contributing to cutting-edge technologies, Bangladeshi companies engaging with global clients, and Bangladesh positioned as a trusted partner in the global semiconductor ecosystem.

More importantly, we see Bangladesh transitioning into a nation of innovation, where semiconductors serve as the foundation for broader technological advancement across multiple sectors.

Q14. What message would you like to share with policymakers and stakeholders?

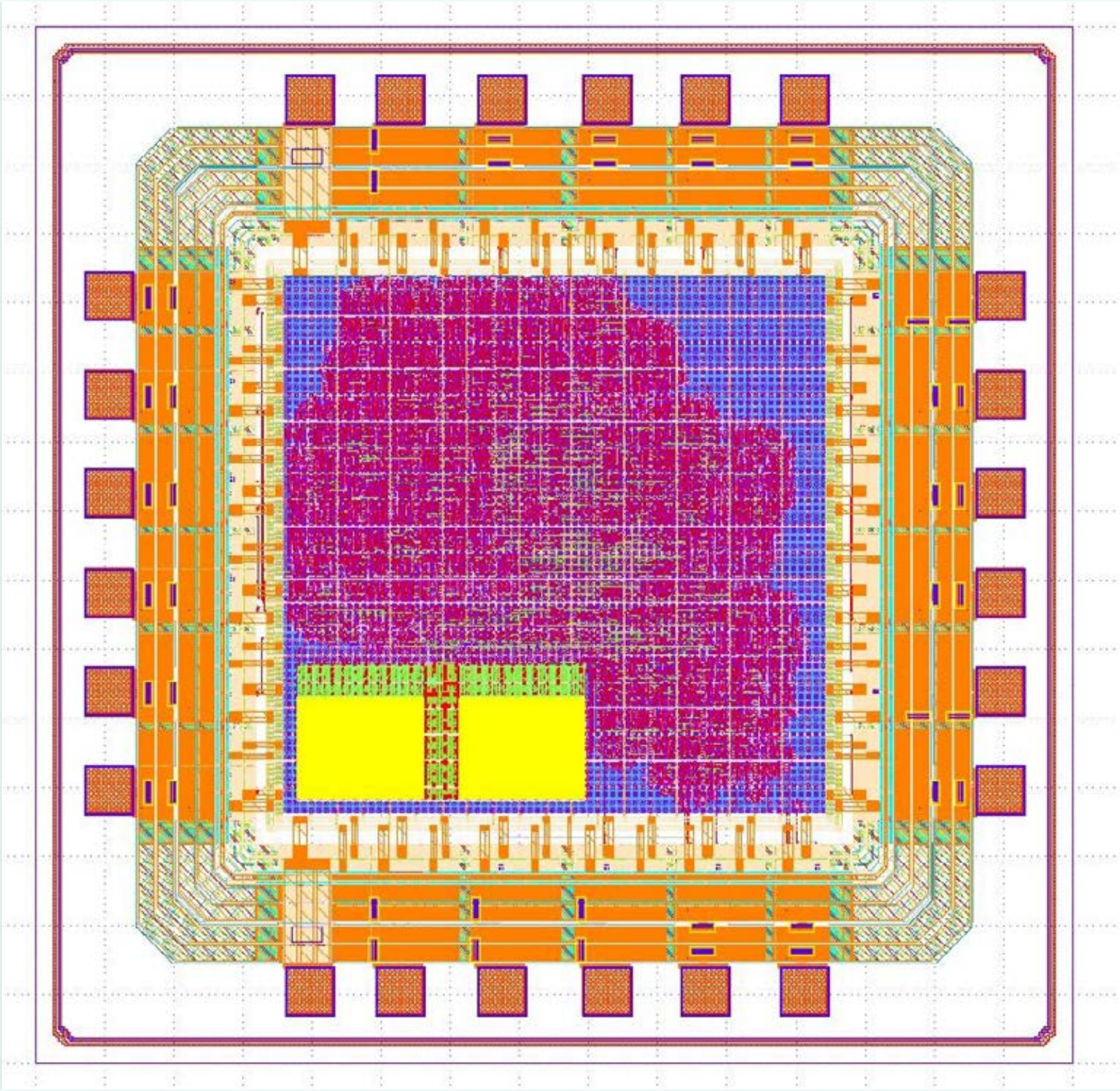
The message is clear. Semiconductors are not an option. They are an imperative.

> This is a long-term journey that requires vision, patience, and alignment. No single institution can achieve this alone. Success depends on coordinated effort across government, industry, academia, and global partners.

If we move together with clarity and purpose, Bangladesh will not merely participate in the future of technology. It will help shape it.

Bio

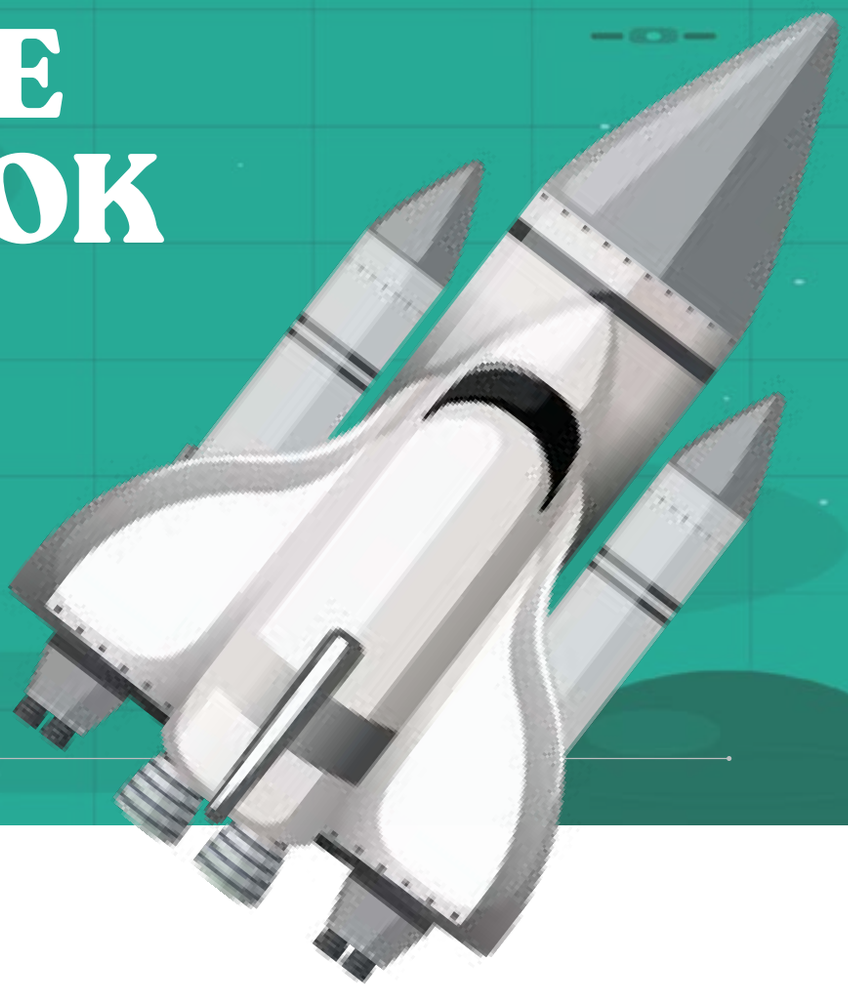
M. A. Jabbar, a Computer Science graduate from the University of Texas at Dallas, is the Managing Director of Neural Semiconductor Limited and DBL Group. With decades of leadership experience at one of the largest conglomerates of Bangladesh, DBL Group having 52,000 team members & a turnover of USD 1 Billion, he has driven growth in diverse sectors including Semiconductor Industry. He is also the current President of Bangladesh Semiconductor Industry Association (BSIA).



Designed on home soil: Bangladesh's first semiconductor chip, born from the partnership of BUET and Neural Semiconductors Ltd., marks a new chapter in the nation's technology story.

WHERE THE DREAM TOOK OFF

FROM NEURAL BEGINNINGS TO BANGLADESH'S SILICON VISION



In 2017, a quiet but consequential shift began in Bangladesh—one that is now emerging as a credible addition to the global semiconductor design landscape.

At the time, the country had minimal presence in semiconductor design. There was no structured ecosystem, no industry representation, and limited institutional support for VLSI development. What existed, however, was a strong base of engineering talent and a small group of forward-looking companies willing to invest ahead of the curve.

> These early VLSI initiatives were not merely operational setups—they were strategic bets. They demonstrated that high-value semiconductor design work could be executed from Bangladesh with quality, reliability, and scalability aligned to global standards.

More importantly, they signaled a long-term vision: positioning Bangladesh as a competitive node within the global semiconductor value chain.

While these companies built capability at the firm level, a broader realization was taking shape—the need for an industry-wide platform to enable coordination, talent development, policy alignment, and global positioning.

For several years, this remained an informal aspiration without institutional backing.

That changed in 2024 with the establishment of the Bangladesh Semiconductor Industry Association (BSIA).

BSIA represents a critical inflection point—transitioning the sector from isolated company-led efforts to a coordinated industry framework. It provides a unified platform for stakeholders across industry, academia, and policy to align on capability building, market access, and ecosystem development.

Through strategic initiatives such as **Silicon River,** BSIA is not only documenting progress but actively shaping the narrative of Bangladesh as an emerging semiconductor destination.

By 2026, the trajectory is clear. **BSIA has grown to include 18 member companies, reflecting early consolidation and signaling increasing confidence in the sector.** This growth is not just numerical—it represents a maturing ecosystem with expanding technical depth, delivery capability, and global engagement.

For global semiconductor and technology leaders, this evolution presents a timely opportunity.

Bangladesh offers a compelling value proposition:

- A **young, scalable engineering workforce**
- **Cost-competitive design capabilities**
- Increasing **institutional alignment and industry coordination**
- Early-stage ecosystem advantages with **high growth potential**

At a time when the global semiconductor industry is actively diversifying supply chains and expanding design footprints, Bangladesh is positioning itself as a viable and strategic partner.

> The journey from a handful of pioneering companies in 2017 to an organized and growing industry platform in 2026 underscores a fundamental reality: this is not a transient initiative—it is a long-term structural shift.

Bangladesh is now at a pivotal stage—moving from capability formation to ecosystem scaling.

For CEOs and industry leaders, the question is no longer whether Bangladesh can participate in the semiconductor value chain, but how early engagement can translate into strategic advantage.

What began as a vision has now evolved into a coordinated movement—one that is steadily shaping the future of semiconductor design from a new and promising geography.

SILICON RIVER

BANGLADESH'S EMERGING IDENTITY

Muhammad Mustafa Hussain, PhD
Professor, ECE, Purdue University, Indiana, USA

There are journeys that begin with ambition, and there are journeys that begin with necessity. Silicon River belongs to the latter.

It was born not from a desire to imitate others, but from a realization that the future of nations is increasingly written in silicon, and that Bangladesh must choose whether it will read that future or help author it.

For more than sixty years, semiconductor technology has quietly shaped the modern world. It powers the devices we hold, the networks we depend on, the systems that govern transportation, healthcare, finance, defense, and communication. It is not an industry at the periphery. It is the foundation upon which nearly every other industry stands. Over time, technologies have evolved, nodes have shrunk, architectures have transformed, and applications have exploded. Yet, despite this evolution, one reality has remained remarkably consistent. The global semiconductor landscape has been anchored by a few dominant regions.

The United States continues to drive the overwhelming majority of innovation, contributing close to eighty-five percent of the foundational ideas, architectures, and design paradigms that define the industry. Taiwan has established itself as the epicenter of advanced manufacturing, mastering the art and science of fabricating chips at scales and precision unmatched globally. Malaysia, along with parts of Southeast Asia, has built a powerful presence in packaging and testing, ensuring that chips transition reliably from fabrication to real-world deployment. Japan laid early foundations through materials and precision engineering. South Korea demonstrated how focused national strategy can create global leaders in memory and manufacturing. China, through sustained investment and policy alignment, is rapidly building capacity across the value chain.

To understand how Bangladesh fits into this picture, it is important to first understand what semiconductors truly are. At their core, semiconductors are materials whose electrical properties can be precisely controlled.

This controllability allows them to act as switches and amplifiers, forming the basis of all modern electronics. But the industry built around them is not singular. It is a chain of deeply interconnected activities.

Design is where ideas take form. Engineers conceptualize circuits, systems, and architectures that determine how a chip will function. Manufacturing is where these designs are physically realized, often through highly complex fabrication processes involving hundreds of steps. Packaging is where individual chips are assembled, connected, and protected so they can function reliably within systems.

OSAT, or Outsourced Semiconductor Assembly and Test, represents the specialized segment that focuses on packaging and testing at scale. Surrounding all of this is a vast supply chain that includes materials, equipment, software, and logistics, each playing a critical role.

The countries that have become semiconductor leaders did not arrive there by accident. They made deliberate choices. They invested in education to build talent pipelines. They created infrastructure to enable research and manufacturing.

They aligned policy with long-term industrial goals. They engaged industry not as an afterthought, but as a central driver. Most importantly, they sustained these efforts over decades, allowing ecosystems to mature and reinforce themselves.

Bangladesh's story, however, carries a quiet distinction. Long before we began speaking about Silicon River, Bangladesh had already been contributing to the global semiconductor ecosystem in ways that were largely invisible but deeply consequential.

Today, more than three thousand non-resident Bangladeshis are working across the global semiconductor industry, embedded within leading companies and research institutions. This is not a peripheral presence. It is a deeply integrated one. Their contributions span design, fabrication, packaging, reliability, and system architecture. They are part of the very fabric of the technologies that power the world.

In academia, the signal is equally strong. Among Bangladeshi professors in the top engineering universities in the United States, a significant majority have roots in semiconductor research and education. This concentration is not coincidental. It reflects both depth of expertise and sustained intellectual contribution.

Some of these contributions have quietly shaped the industry at its core. My own doctoral work on metal gate induced strain engineering became part of the foundation of modern CMOS scaling, and has been present in essentially every processor since 2007. Muhammad Ashraful Alam's work on NBTI established the framework by which reliability is measured across the semiconductor industry, influencing how every major company evaluates device lifetime. Sayeef Salahuddin's pioneering work on negative capacitance has opened pathways to reducing energy consumption at the device level, an idea that continues to shape next-generation transistor design.

Beyond academia, Bangladeshi professionals have held and continue to hold critical leadership roles within industry. Mahbub Rashed has contributed at the highest levels of manufacturing and strategy at GlobalFoundries. Anisul Khan played a key role at Applied Materials, a company central to the global semiconductor equipment supply chain. Zia Karim has driven technological innovation in advanced systems. Shatil Haque is contributing to high-performance connectivity solutions at Credo, an area critical for modern data infrastructure.

These are not isolated achievements. They are signals. Signals that Bangladesh has never been absent from the semiconductor journey. It has simply been dispersed.

Silicon River is, therefore, not an attempt to create something from nothing. It is an effort to reconnect what already exists, to align scattered brilliance into a coherent national force.

This is how we started. Not with a factory, but with a realization. Not with capital, but with capability. Not with infrastructure, but with identity. And this is how far we have come. From conversations to coordination. From dispersed contributions to an emerging ecosystem. From invisibility to intention.

What we are building is not a single initiative, but a system. And like any meaningful system, it must answer three fundamental questions:

- What are we building?
- Why does it matter?
- How will it come to life?

What follows is a detailed view of the components that make up Silicon River. Not as abstract ideas, but as concrete elements of a system designed to transform Bangladesh into a nation of innovation.

FROM OUR ROOTS TO THE FUTURE WE BUILD

Bangladesh's Journey of Resilience, Learning and Leapfrogging

1 JUTE ERA

Our strength was in raw materials.

2 GARMENTS

We found opportunity and scaled with hard work.

3 SOFTWARE & IT

We built talent, served the world, but remained service providers.

UPS & DOWNS

We had resources, but not industrial power.

UPS & DOWNS

Millions of jobs, global reach, but low value addition.

UPS & DOWNS

Global freelancing success, but no ownership of platforms.

SILICON RIVER – OUR PHILOSOPHY

- Think Independently
- Solve Real Problems
- Build Deep Tech
- Create Global Value

WE DON'T WAIT FOR THE FUTURE. WE

BSIA

Bangladesh SemiConductor Industry Association

SILICON RIVER

BEAR SUMMIT 2026

Bangladesh Innovates – BEAR for the World

Biotech • Electronics • AI • Robotics

4 SEMICONDUCTOR

We aim for depth, ownership and technological sovereignty.

5 BEAR

Biotech • Electronics
AI • Robotics
Building solutions for humanity.

NEXT STOP: GLOBAL IMPACT

BEAR Summit is the manifestation of Silicon River – where Bangladesh Innovates and the World Benefits.

UPS & DOWNS

Big leap, big risk, long journey, but highest impact.

UPS & DOWNS

Complex challenges, global competition, but unlimited possibilities.

Empower People

Leave a Legacy

We have come a long way.
Now, we build what the world needs.
From Bangladesh. For the World.

THIS IS OUR TIME.
THIS IS OUR RIVER.

BUILD IT.


AND NATIONAL
SEMICONDUCTOR
SYMPOSIUM
BSIA

FREQUENTLY ASKED QUESTIONS

STAR @ BUET

STAR (Semiconductor Training, Awareness, and Research) Facility, hosted at BUET, serves as Bangladesh's national hub for semiconductor workforce development and hands-on innovation. It integrates three core wings—fabrication, packaging, and testing—providing end-to-end exposure to the semiconductor lifecycle. Designed to bridge theory and practice, STAR enables students, engineers, and researchers to gain real-world skills aligned with global industry standards. The facility supports training, prototyping, and collaborative research, while anchoring partnerships with industry and international institutions. As a cornerstone of the Silicon River initiative, STAR builds the technical foundation required to scale talent, accelerate innovation, and position Bangladesh within the global semiconductor ecosystem.

BASICS

BASICS, the Bangladesh Academy for Semiconductor Innovation and Curriculum Support, provides the foundational structure for semiconductor education across universities. It ensures consistency, quality, and alignment with industry needs. By standardizing curriculum and leveraging digital tools such as virtual fabrication environments, it transforms scattered learning into a cohesive national effort.

SICIP 3500 Talent Program

The SICIP program represents scale. It is designed to train thousands of engineers, bridging the gap between academic knowledge and industry readiness. It is not merely about numbers, but about creating a critical mass of capable individuals who can collectively sustain an ecosystem.

Global Certification through Synopsys SARA

Global certification ensures that talent is not only trained but recognized. Through partnerships with global platforms, engineers gain credentials that are portable, credible, and aligned with industry standards. This connects Bangladesh's talent pipeline directly to the global semiconductor ecosystem.

BRAINGAIN

BRAINGAIN is the effort to reconnect with the Bangladeshi diaspora, many of whom are already contributing to leading semiconductor companies worldwide. It transforms a dispersed resource into an active force, bringing experience, mentorship, and credibility back into the national ecosystem.

CREST

CREST (Center of Research Excellence in Semiconductor Technology) is the innovation engine within the Silicon River ecosystem, bridging academia, industry, and global partners to translate ideas into impact. It focuses on deep-tech research in semiconductors, AI hardware, advanced packaging, and emerging materials, while enabling rapid prototyping and commercialization. CREST aligns university research with real-world industry challenges, creating a pipeline of intellectual property, startups, and deployable technologies. By integrating talent, infrastructure, and collaboration, it transforms Bangladesh from a knowledge consumer into a knowledge creator, positioning the nation as a credible contributor to the global semiconductor and BEAR-driven innovation economy.

BAEC Cleanroom Revival

The revival of the BAEC cleanroom represents a critical step toward hands-on capability. It allows students and researchers to engage directly with fabrication processes, bridging the gap between theory and practice.

BCSIR-CREST Shared Infrastructure

By creating shared access to facilities, resources are utilized efficiently and barriers to entry are reduced. This model ensures that multiple institutions can benefit from limited but critical infrastructure.

BOOST Platform

BOOST acts as the digital backbone of the ecosystem. It connects stakeholders, provides access to resources, and ensures coordination. In a system where multiple components must move together, BOOST enables visibility and alignment.

Assembly, Packaging, and Testing (APT) Center

The APT center focuses on one of the most strategic entry points for Bangladesh. Packaging and testing are increasingly critical in determining system performance, and they offer a more accessible pathway compared to advanced fabrication. This center provides both training and a foundation for industrial activity.

Semiconductor Design and Advanced Design Center

Design is where value begins. Establishing design centers enables Bangladesh to participate in the earliest stages of the value chain, contributing intellectual property and innovation

OSAT and Electronics Manufacturing

These initiatives bring the ecosystem closer to industry. By developing capabilities in assembly, packaging, and manufacturing, Bangladesh positions itself within the global supply chain in a meaningful and economically viable way.

Sovereign Semiconductor Fund

A dedicated fund ensures that strategic initiatives have financial backing. It reduces risk, attracts investment, and enables long-term planning.

BEAR Summit

The BEAR Summit expands the vision beyond semiconductors, integrating Biotech, Electronics, AI, and Robotics. It creates a platform for global engagement, collaboration, and visibility.

Global Roadshows (USA, Malaysia, Korea, Asia)

These engagements connect Bangladesh with global ecosystems. They are designed to build partnerships, attract investment, and position the country as a serious participant in the semiconductor landscape.

National Semiconductor Policy and Government Coordination

Policy provides direction and stability. Through coordinated efforts across ministries and agencies, the government enables alignment, reduces fragmentation, and creates an environment where the ecosystem can thrive.

2026

THE YEAR OF ACCELERATION

The year 2026 marks the transition from intent to action, from architecture to execution. If the preceding phase was about assembling the pieces, 2026 is about setting them into motion in a coordinated and irreversible way. It is the year where Silicon River stops being a concept discussed in rooms and becomes a system experienced on the ground.

The year begins with a deliberate focus on talent, because every lasting ecosystem must be built on human capability before physical infrastructure. National fellowships are expanded to attract and anchor top minds within the country. Semiconductor is formally embedded into national funding priorities, signaling that this is no longer a peripheral interest but a strategic commitment. The SICIP program scales aggressively, training thousands of engineers across multiple institutions, while BASICS ensures that this scale does not compromise quality. At the same time, global certification pathways through Synopsys SARA are activated, allowing Bangladeshi engineers to align with international standards and become immediately relevant to industry needs.

Parallel to this, a narrative begins to take shape. The launch of Silicon River Magazine is not merely a publication milestone. It is a declaration. It defines how Bangladesh tells its story to itself and to the world. It captures the ambition, the structure, and the momentum of a nation repositioning itself within the global technology landscape.

As the first phase stabilizes, the focus expands outward. The middle of 2026 is defined by engagement with the world. Roadshows in the United States, Malaysia, South Korea, and other parts of Asia are conducted with precision and purpose. These are not ceremonial visits. They are strategic dialogues. Meetings are held with semiconductor companies, policymakers, investors, and diaspora leaders. The objective is clear. To establish credibility, to communicate readiness, and to initiate partnerships that translate into real commitments.

The Malaysian engagement provides lessons in building a resilient OSAT ecosystem. The South Korean dialogue opens pathways into advanced packaging and memory-centric architectures. The United States engagement connects Bangladesh to the epicenter of innovation, capital, and design. Across all these interactions, BRAINGAIN plays a central role, transforming diaspora expertise into an active force that reinforces every conversation with credibility and experience.

As the year progresses into its later stages, the emphasis shifts from engagement to establishment. Infrastructure initiatives begin to materialize in tangible ways. The revival of the BAEC cleanroom moves forward, restoring a critical capability for hands-on training and research. Shared infrastructure models through BCSIR and CREST are activated, enabling broader access and collaboration. The Assembly, Packaging, and Testing training centers begin operation, equipping a new generation of engineers with skills directly aligned with industry entry points.

Simultaneously, the BOOST platform comes online as the digital backbone of the ecosystem. It connects students, researchers, institutions, and industry into a unified interface, ensuring that information flows efficiently and that opportunities are visible and accessible. What was once fragmented becomes coordinated. What was once isolated becomes interconnected.

Industry-facing efforts also begin to take shape with greater clarity. Discussions around semiconductor design centers evolve into structured plans. Pathways for OSAT facilities are refined through ongoing global engagements. Investment frameworks, including the sovereign semiconductor fund, are positioned to support early-stage initiatives and attract external participation. The system begins to demonstrate not only readiness, but momentum.

Toward the end of 2026, all these threads begin to converge. The ecosystem, having developed across talent, infrastructure, industry, and policy, prepares to present itself on the global stage. The BEAR Summit serves as a focal point of this convergence, bringing together stakeholders from across disciplines and geographies. It is both a reflection of progress and a catalyst for what comes next.

This progression naturally leads toward global platforms such as CES 2027, where Bangladesh is no longer an observer, but a participant with a story to tell and capabilities to demonstrate. The journey from internal alignment to global presence becomes visible.

Throughout 2026, the most important transformation is not in any single initiative, but in the synchronization of all initiatives.

Talent development feeds infrastructure. Infrastructure enables research. Research informs industry. Industry attracts investment. Policy sustains alignment. Global engagement amplifies everything.

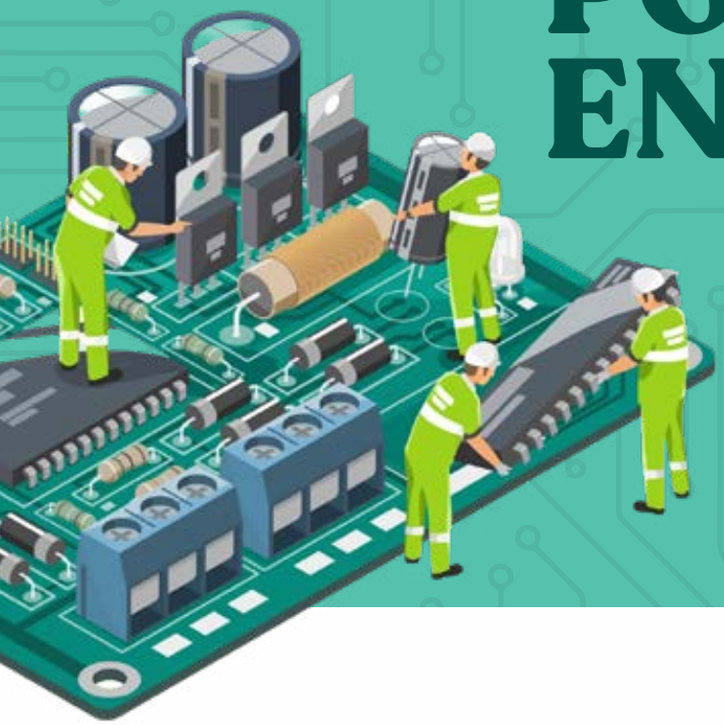
By the end of the year, Silicon River is no longer a vision in formation. It is a system in motion, with direction, velocity, and intent.

And perhaps most importantly, 2026 establishes something that cannot be easily reversed. It establishes belief. Not just among those building the ecosystem, but among those observing it. The belief that Bangladesh is not attempting the improbable, but executing the inevitable.

Bio

Muhammad Mustafa Hussain, PhD
Professor, ECE, Purdue University, Indiana, USA

With experience at TI, SEMATECH, KAUST, and UC Berkeley and 450+ scientific papers and patents, CES 2020 Best Innovation Award winner Prof. Muhammad Mustafa Hussain, PhD (ECE, Purdue University) is architect of Bangladesh's Silicon River and BEAR, global leader in CMOS electronics and the creator of vFabLab and Mobile Fab.



POLICY AS ENGINEERING

DESIGNING FOR THE SEMICONDUCTOR REALITY

Md. Anwar Hossain
Secretary, Ministry of Science and Technology
Government of Bangladesh

> I still remember the atmosphere at the BEAR Summit 2025. The room was full of energy. There was excitement, of course, and plenty of ambition. But what struck me most was something quieter and more meaningful- alignment. Young engineers were asking thoughtful questions, industry leaders were speaking in practical terms, and academics were discussing systems rather than slogans.

Later that year, I attended the inauguration of CREST. The mood there felt different. It was less celebratory and more reflective. CREST did not feel like the launch of another institution; it felt like the laying of a foundation. Standing there, I realized that Bangladesh has reached a point where vision alone is no longer enough. Vision must now be translated into structure.

Now, semiconductors have been formally recognized as a national priority. That recognition carries weight. It signals that Bangladesh understands where technological capability, economic competitiveness, and national resilience intersect.

Yet recognition alone does not create an ecosystem. The real task now is execution.

At the Ministry of Science and Technology (MoST), we approach this responsibility with a simple understanding: semiconductor development does not respond to enthusiasm alone. It demands discipline, long-term planning, and coordinated effort. In many ways, semiconductor policy must be approached the same way engineers approach complex systems- with precision, patience, and respect for constraints.

Science, Technology and Innovation: MoST's Role

MoST plays a central role in Bangladesh's Science, Technology and Innovation (STI) ecosystem. Our mandate extends beyond supporting individual research projects. We are responsible for strengthening national capability across the entire chain- from basic science to technological application and industrial relevance.

In the semiconductor domain, this responsibility becomes particularly important. Semiconductor ecosystems rely on a delicate balance of research capacity, skilled human capital, industry participation, and enabling infrastructure. None of these elements can function effectively in isolation.

> Our role, therefore, is both catalytic and integrative.
>
> We invest in foundational research, support national scientific institutions, enable advanced infrastructure, and work to ensure that scientific knowledge translates into practical technological capability.

If Bangladesh is to participate meaningfully in the semiconductor sector, our STI ecosystem must operate as a coordinated architecture rather than a collection of isolated initiatives.

Semiconductor ecosystems take decades to mature. They require institutional continuity, steady investment, and strategic patience. For Bangladesh, the challenge is not to copy the models of other countries but to design a pathway that reflects our own capabilities and aspirations.

FOUR STRATEGIC PRIORITIES

Semiconductor ecosystems take decades to mature. They require institutional continuity, steady investment, and strategic patience.

For Bangladesh, the challenge is not to copy the models of other countries but to design a pathway that reflects our own capabilities and aspirations.

To guide our efforts, the Ministry of Science and Technology is organizing its semiconductor initiatives around four strategic priorities.

1.

Human Capital and Talent Development

At the heart of any semiconductor ecosystem are people. Engineers, physicists, materials scientists, and process specialists form the backbone of the industry.

Recognizing this, MoST has formally included Semiconductor Science and Engineering within its fellowship framework. This step signals to students and researchers that semiconductor research is not just academically interesting- it is strategically important for the country.

> Beyond advanced research training, workforce scale also matters. Through the SICIP-supported initiative, the Bangladesh Semiconductor Industry Association (BSIA) is training 3,500 young professionals over the next three years. This program helps expand the technical workforce while strengthening the link between training and industry needs.

2.

Research Infrastructure and Scientific Capability

Modern semiconductor research requires specialized infrastructure. Facilities for thin-film deposition, advanced metrology, and controlled cleanroom environments form the technical backbone of semiconductor science.

The establishment of CREST and its collaboration with Bangladesh Council of Scientific and Industrial Research (BCSIR, a research organization of MoST) represent important progress in this direction. When materials science, metrology, and semiconductor research operate in close coordination, their combined impact becomes much greater than the sum of individual efforts.

The revival of the Bangladesh Atomic Energy Commission (BAEC, an organization of MoST) cleanroom also holds strategic significance. Cleanrooms are not simply controlled environments- they are training grounds for process discipline. Engineers working in these environments learn that even microscopic variations can have large-scale consequences.

> Countries that train semiconductor engineers without domestic cleanroom exposure remain dependent on external facilities. Strengthening this capability at home is therefore essential.

3.

Institutional Integration

Bangladesh has never lacked ambition. What we sometimes lack is coordination. Semiconductors intersect multiple domains- science, ICT, finance, education, industry, and national security. Effective policy therefore requires cooperation across institutional boundaries.

> Partnerships among institutions such as CREST, BCSIR, BAEC, universities, and industry bodies must evolve into structured collaboration frameworks rather than informal cooperation. In semiconductor manufacturing, isolated modules rarely produce high yield. Integration does. The same principle applies to national policy.

4.

Building a Practical Roadmap

Looking ahead, Bangladesh's semiconductor roadmap must progress through carefully sequenced stages.

> The first stage focuses on building foundations- talent development, research capacity, and institutional coordination. Fellowship programs, technical training initiatives, and research facilities are critical at this stage.

The second stage involves deeper integration among national institutions. Shared infrastructure, collaborative research programs, and stronger links between academia and industry will help strengthen the ecosystem.

Finally, Bangladesh can gradually expand its participation in higher-value segments of the semiconductor value chain. Areas such as chip design, materials research, testing, and specialized fabrication services offer realistic opportunities for growth.

Platforms that encourage thoughtful discussion play an important role in this process. A mature ecosystem requires spaces where scientists, engineers, policymakers, and industry leaders can exchange ideas and examine challenges openly.

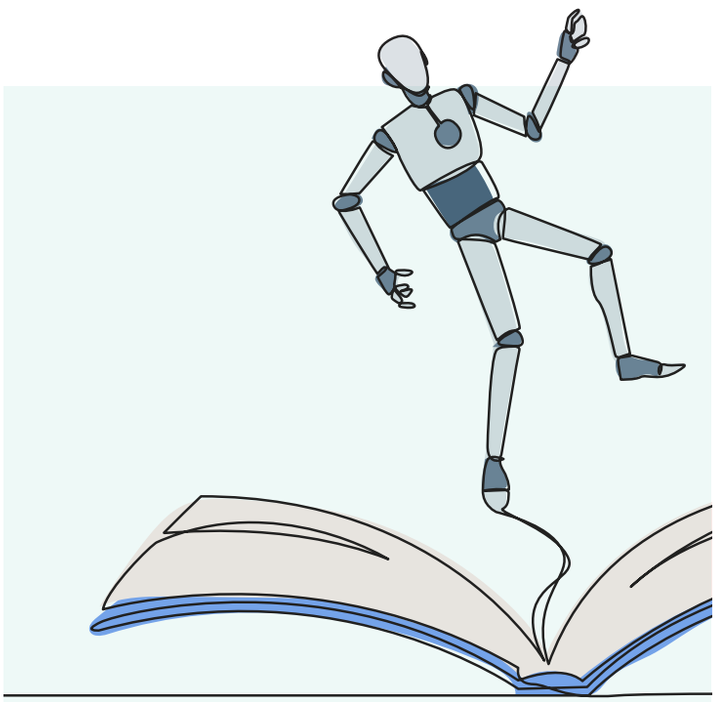
The goal is not to replicate the scale of global semiconductor giants. Rather, it is to build durable competence in areas where Bangladesh can compete effectively.

Execution as the Real Test

Ultimately, the success of semiconductor policy will depend on execution.

Announcements alone are not enough. Progress must be measured, strategies must evolve, and institutions must remain committed over time.

Semiconductor development is slow and demanding. It rewards patience and careful planning while punishing short-term improvisation.



If we treat policy as a form of engineering - designed carefully, implemented methodically, and improved continuously - then Bangladesh can build meaningful capability in this field.

Our ambition is not imitation. It is thoughtful design within our own context: integrating institutions, empowering young talent, and moving forward with discipline.

In engineering, durability defines success. In national policy, disciplined execution does the same.

Bio

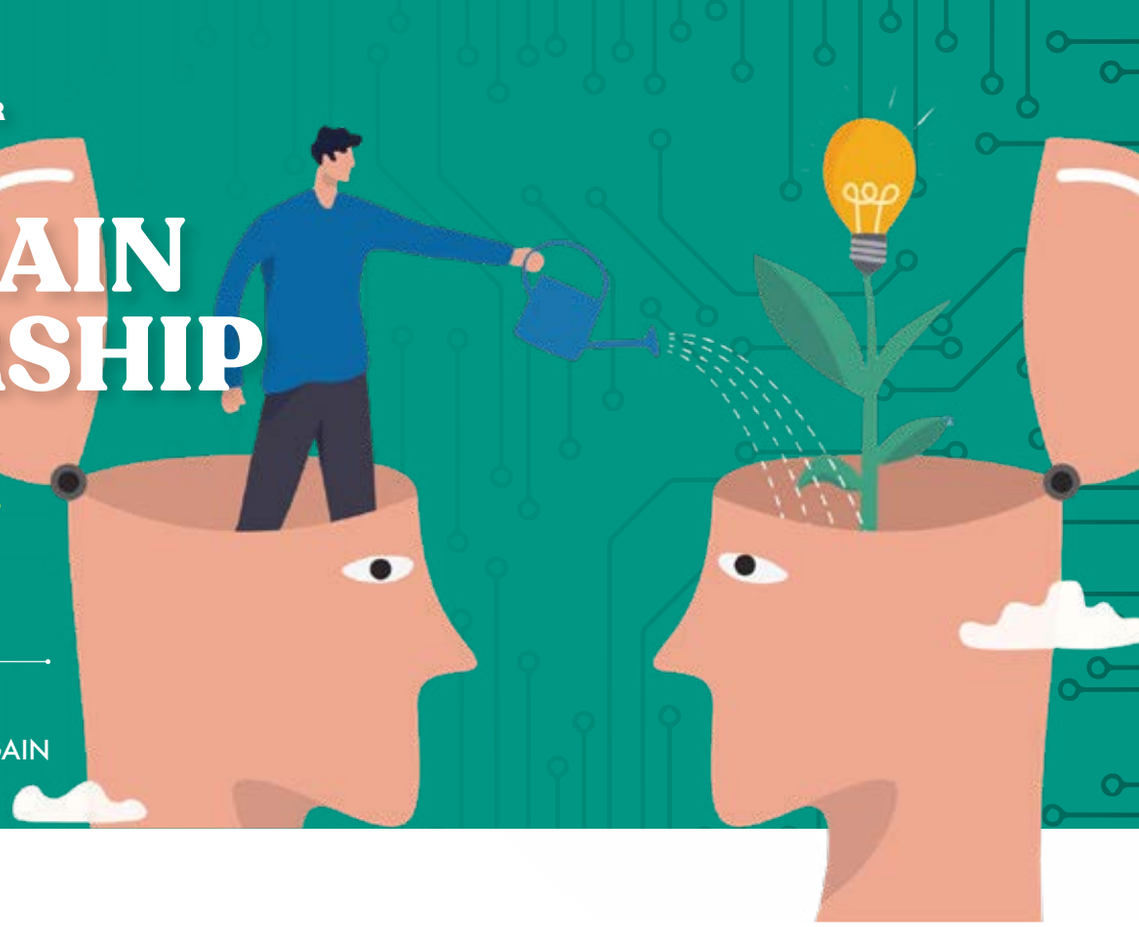
Md. Anwar Hossain
Secretary, Ministry of Science and Technology
Government of Bangladesh

Md. Anwar Hossain is the Secretary of the Ministry of Science and Technology, Government of Bangladesh. A member of the 15th BCS (Administration) cadre, he previously served as Vice-Chairman of the Export Promotion Bureau and Administrator of BGMEA. He is an expert in development economics and international trade relations.

CATALYZING THE SILICON RIVER ECOSYSTEM THROUGH

BRAINGAIN LEADERSHIP

Technical Integration of Global Diaspora Expertise in Bangladesh's Semiconductor Value Chain



Anisul Haque Khan, PhD
Founder, Silicon River and BRAINGAIN

The global semiconductor industry is projected to surpass USD 1 trillion by 2030, driven by exponential demand across artificial intelligence, advanced computing, automotive electronics, biotechnology, and robotics. For emerging economies such as Bangladesh, entry into this capital-intensive and knowledge-dense sector requires more than physical infrastructure or fiscal incentives.

It demands access to tribal knowledge—the tacit, operational, and experiential expertise accumulated over decades by industry practitioners who have built, scaled, and optimized semiconductor ecosystems worldwide.

The BRAINGAIN initiative—a global brain trust of Non-Resident Bangladeshi (NRB) professionals with over 450 cumulative years of experience across industry leaders such as Intel, GlobalFoundries, AMD, NVIDIA, Broadcom, IBM, Motorola, ASE, and Amkor; functions as the technical engine of Bangladesh's Silicon River framework. Rather than operating as a conventional advisory council, BRAINGAIN embeds high-velocity expertise directly into policy formation, talent development, design enablement, and industrial execution.

I. Executive Summary

This article presents a technical and operational blueprint for integrating BRAINGAIN expertise across the six pillars of the Silicon River ecosystem, accelerating Bangladesh's path toward semiconductor capability, competitiveness, and long-term sovereignty.

II. The BRAINGAIN Operating Model

BRAINGAIN is structurally distinct from traditional diaspora engagement programs. It does not operate as a symbolic advisory body or a periodic consultation forum. Instead, it functions as technical oxygen for the Silicon River—continuously circulating knowledge, standards, and execution discipline into the national ecosystem.

Bangladesh historically exhibits a Surplus-to-Scarcity Paradox: an abundance of raw engineering talent but limited exposure to industrial-scale semiconductor design, manufacturing, and testing environments. BRAINGAIN resolves this gap through embedded brain circulation, enabling real-time transfer of best practices, design heuristics, yield strategies, and global compliance standards.

THE SILICON RIVER CIRCULATION FRAMEWORK

Silicon River Pillar	BRAINGAIN Technical Contribution	Strategic Outcome
BASICS	Curriculum co-design aligned with Intel, TSMC, and GlobalFoundries hiring benchmarks	Globally certified, industry-ready workforce
BOOST	Virtual masterclasses, remote lab oversight, and design reviews for 20,000+ students	Scalable and decentralized knowledge dissemination
SARA	Mentorship in RTL-to-GDS flow, AMS design, and physical verification	High-value semiconductor IP creation and export
FOUNDATION	OSAT architecture, high-volume testing (HVM), and yield optimization	Entry into the USD 100B+ global OSAT market
CREST	Research leadership in 3D-IC, silicon photonics, and AI-centric ASICs	"Lab-to-Fab" deep-tech innovation pipeline
BSIA	Global industry matchmaking, technical diligence, and startup coaching	Integration into global semiconductor supply chains

III. Technical Specialization: Circuit Design and Precision Layout

A core mission of BRAINGAIN is to transition Bangladesh from VLSI theory proficiency to tape-out-ready execution. This transformation hinges on deep mastery of physical design, verification rigor, and manufacturability constraints.

Advanced Design Enablement

• **Logic and Memory Architecture:**

Senior architects from IBM and Motorola guide the development of AI-optimized ASICs, domain-specific accelerators, and specialized memory sub-systems tailored for edge intelligence and data-centric workloads.

• **Physical Design Excellence:**

Direct mentorship in Place & Route (P&R), clock-tree synthesis, power integrity, and IR-drop mitigation enables engineers to optimize Power, Performance, and Area (PPA)—the defining metric of competitive silicon.

• **Verification Strategy:**

BRAINGAIN experts institute industry-grade pre-silicon validation frameworks, including constrained random verification, coverage closure, and DFT-aware design, significantly reducing post-tape-out risk and improving global client confidence.

Through this approach, Bangladeshi design houses evolve from service providers into trusted IP contributors within the global semiconductor economy.

IV. The Science of OSAT and High-Volume Testing

As Bangladesh advances toward a projected USD 800 million Phase-I OSAT investment, BRAINGAIN supplies the critical operational and technical blueprints necessary for success in assembly, packaging, and testing.

Operational Intelligence Injection

• **Yield Engineering:**

Drawing on experience from ASE and Amkor, BRAINGAIN deploys advanced yield-learning methodologies, statistical process control, and failure-analysis feedback loops to maximize throughput and profitability.

• **High-Volume Manufacturing (HVM) Protocols:**

Implementation of stringent test standards—thermal cycling, power integrity validation, signal integrity, and burn-in testing—positions Bangladesh to serve automotive, medical, and industrial-grade semiconductor markets.

• **Advanced Packaging Leadership:**

At the STAR Facility (BUET), BRAINGAIN directs research and pilot programs in 3D-IC integration, wafer-level packaging, and heterogeneous integration, enabling Bangladesh to compete in high-margin OSAT segments rather than commoditized assembly alone.

V. Policy Acceleration and Ecosystem Governance

While Silicon River functions as the national policy interface and investment platform, BRAINGAIN acts as the policy catalyst, grounding decisions in technical realism and global benchmarking.

Evidence-Driven Policy Enablement

- **National Semiconductor Policy 2025:**

BRAINGAIN ensures continuous alignment with global process nodes, export controls, supply-chain resilience strategies, and workforce certification standards.

- **Sovereign Financing Models:**

Advocacy for transparent citizen-investor and diaspora-backed financing mechanisms reduces dependency on foreign capital while strengthening national ownership of strategic infrastructure.

- **STEM Diplomacy:**

BRAINGAIN facilitates technical MOUs and joint research pathways between BUET, BRAC University, University of Dhaka, and global centers of excellence such as UC Berkeley and Purdue University.

- **The BEAR Vision:**

Semiconductors are positioned as the connective tissue enabling advances across Biotech, Electronics, AI, and Robotics, ensuring cross-sectoral compounding of innovation.

Bio

Anisul Haque Khan, PhD
Founder, Silicon River and BRAINGAIN

Anisul Haque Khan, PhD, is a semiconductor leader with 30+ years of experience. A former Applied Materials VP, he drove DRAM and CMOS innovation and holds 32 U.S. patents. As founder of Silicon River and BRAINGAIN, he now advances Bangladesh's semiconductor ecosystem through global collaboration and advanced manufacturing expertise.

VI. Conclusion

The historical era of Brain Drain has definitively ended. In its place emerges a durable, scalable model of Brain Circulation, where global expertise continuously reinforces national capability.

> By anchoring the Silicon River ecosystem in the lived experience of its global diaspora, Bangladesh is no longer an observer in the semiconductor race—it is an emerging contender. Through BRAINGAIN, the nation is systematically building the institutional capacity to design, test, package, and innovate at international standards.

The future of Bangladesh is Silicon.

The path is the River.

The power is BRAINGAIN

THE 2025

MALAYSIA ROADSHOW

Shatil Haque, PhD
AVP, CREDO, Santa Clara, California, USA

If someone does a Google search on "BSIA's Malaysia Roadshow in 2025", he/she/they will find an executive summary as the following:

"The Bangladesh Semiconductor Industry Association (BSIA) successfully executed its inaugural international roadshow in Penang, Malaysia, from November 11 to 13, 2025. Themed "Introducing Bangladesh as Silicon River," the three-day mission aimed to position Bangladesh as a strategic partner in the global semiconductor value chain. The roadshow combined high-level networking receptions with intensive industrial site visits across Penang and Kulim.

By engaging with key Malaysian government agencies—including MIDA (Malaysian Investment Development Authority) and Invest Penang—and visiting seven leading semiconductor and electronics companies, the BSIA delegation established crucial bilateral ties. The event highlighted the natural synergy between Bangladesh's growing chip design talent pool and Malaysia's world-class manufacturing, assembly, and test infrastructure."

While the executive summary above is absolutely correct, I am here to take you through the incredible journey from planning stage to the final execution stage, recognizing the enormous efforts by a small band of people who made this possible.

"So, what do we do next?" This is exactly how my conversation started with Dr. Mustafa, Mr. Jabbar, and the other organizers at the wrap up session of the superbly successful BEAR summit in Dhaka last July. I will not go into the details of the summit (which I am sure you have either attended or have read about it online and through various publications), but I must point out a key conclusion that stood out - Bangladesh is undoubtedly ready for semiconductor revolution!

Bangladesh's semiconductor ecosystem has rapidly grown, supported by the strong government initiatives, global academic and industry collaborations, and a fast-developing talent pipeline and now is the time to let others know that we are open for business and what we can offer. We agreed that one of the best ways to achieve that would be to arrange a number of road shows in key semiconductor hubs in Asia and then in the USA. The objective is simple – "Introducing Bangladesh as Silicon River".

Malaysia, particularly the island of Penang, was chosen as the inaugural destination due to its reputation as Asia's most mature semiconductor packaging and testing hub, hosting all global giants. For BSIA, which represents Bangladesh's emerging fabless semiconductor industry, Penang represents the ideal partner: a hub with mature OSAT (Outsourced Semiconductor Assembly and Test) capabilities and advanced manufacturing that complements Bangladesh's strengths in chip design.

The key challenge in this road show was that we wanted to get this done before the end of 2025. December is typically busy with year-end activities and company holidays and so, we decided that we must schedule it within November, which meant we needed to get to work right away – from planning to organizing and then to executing.

Given my past 25 years of extensive work-stay experience with Penang, Malaysia (whom I consider my 2nd home), I took the responsibility of organizing the Malaysia part of the roadshow. Of course, when one works with an A-Team (comprising Dr Mustafa, Mr. Jabbar, Mr. Hashim and the executive leaders of the Bangladeshi Semiconductor companies), the whole thing started to take shape in no time. BSIA team in Bangladesh started recruiting team members that would be a part of the visit. Collaborating with like-minded people, alignments on key decision points became easy. Here are some of the key decisions we made at the onset.

We agreed that we will focus on visiting companies that are primarily Malaysia-based, so that our team can connect with their top executives and senior management directly rather than going through their HQ/team somewhere else.

We also wanted to bring a diverse segment of semiconductor eco-system for our visiting team so that they could have diverse 1st-hand experience visiting design houses, contract manufacturing, and front/back-end manufacturing.

We also knew very well that to make this roadshow successful, we must invite the relevant Malaysian government agencies (e.g., MIDA, Invest Penang) and industry organizations (e.g., MSIA) and the best way to gather such an audience would be to host an information session/workshop along with a dinner reception. The workshop and dinner reception will provide an excellent platform to:

a. Learn about Bangladesh's emerging semiconductor ecosystem and its value proposition in design, advanced packaging, and manufacturing.

b. Engage in one-on-one discussions with BSIA member companies and government representatives, and

c. Explore possibilities for partnerships in R&D, supply chain integration, and talent development.

Bottomline, once we set the stage and have introduced Bangladesh's Semiconductor sector and our roadshow objectives clearly, then the rest of our visits and meetings at the local companies would be seamless.

Selecting the companies to visit was no small feat given there are so many and we only had two days to cris-cross between Mainland and Island of Penang.

We wanted to provide the BSIA delegation direct exposure to the breadth of Malaysia's semiconductor ecosystem, from design services to high-volume manufacturing. At the same time, we ensured that there is strong relevance to BSIA based on the core competencies of the companies we will visit. So, after a lot of consideration, we selected the following companies/organizations to visit.

1. Rapid Manufacturing:

One of the leading companies providing wire-harness solutions for Semiconductor Process and Test equipment to the top-tier equipment makers. Relevance to BSIA: demonstrate high-skilled yet low-cost manufacturing offering customized solutions for equipment eco-system.

2. Infinecs:

System-on-Chip (SoC) and ASIC design house offering end-to-end ASIC design services, embedded software development, silicon-proven IP cores. They specialize in bridging design concepts to tape-out. Relevance to BSIA: Direct counterpart to Bangladeshi design firms; potential for joint design projects or sharing of design resources.

3. TF-AMD (Tongfu Microelectronics & AMD Joint Venture):

High-volume semiconductor assembly and test (OSAT) offering advanced packaging solutions, final testing for processors and integrated circuits. They are a major player in the global backend supply chain. Relevance to BSIA: Represents the "missing link" for Bangladeshi fabless companies. Visiting TF-AMD would display the manufacturing scale needed to take a locally designed chip to mass production.

4. MMS (Micro Modular Systems):

Technology solutions for fully customized backend equipment (process, test, and visual inspections). Relevance to BSIA: Provides insights into equipment and vision system manufacturing and the digital infrastructure required to operate a modern semiconductor facility.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Supporting Partner
MSIA


BANGLADESH × MALAYSIA–
FROM VISION TO VELOCITY
A SEMICONDUCTOR TSUNAMI FOR ASIA

5. Aemulus Corporation:

Automated Test Equipment (ATE) for RF and mixed-signal semiconductors serving 5G, Wi-Fi, and automotive chips. They are a publicly listed company (Bursa Malaysia) with strong R&D capabilities. Relevance to BSIA: Their ATE solutions could serve the testing needs of Bangladeshi chip designers, potentially leading to joint R&D in test engineering.

6. YBS International Berhad (Oriental Fastech Manufacturing Sdn Bhd):

Core Business includes Integrated manufacturing solutions including precision plastic injection molding, tooling, and high-precision electronics manufacturing services (EMS). They serve the semiconductor, automotive, and medical device industries. Relevance to BSIA: While not a pure-play semiconductor firm, YBS represents the broader electronics ecosystem. Their expertise in precision manufacturing is critical for the packaging and housing of semiconductor components.

7. PSDC (Penang Skills Development Center):

Talent development and industry training. PSDC is a unique industry-led initiative that provides upskilling programs for engineers in the semiconductor and electronics sectors. It is a model for public-private partnership in human capital development.

Relevance to BSIA?

It offers a potential blueprint for Bangladesh's proposed Centers of Excellence and training frameworks to build a skilled semiconductor workforce.

So, this enabled us to finalize the agenda – we will start with an introductory session and reception dinner on the 11th November followed by the local company visits on the 12th and the 13th.

The roadshow would be inaugurated by Jagdeep Singh Deo, Deputy Chief Minister II of Penang, with Manjurul Karim Khan Chowdhury, Bangladesh's High Commissioner to Malaysia, attending as a special guest. Senior representatives from Malaysian agencies such as MIDA, MSIA, and Invest Penang also participated. A 15-member delegation led by BSIA President Mohammed Abdul Jabbar would represent Bangladesh.

The delegation would include six leading Bangladeshi semiconductor companies - Neural Semiconductor Limited, ULKASEMI Private Limited, Prime Silicon, SILICONOVA Limited, iTest Bangladesh Limited and Cactus Materials Ltd. Venue was set, all our flights, hotel bookings…all set; companies that we will visit were ready with our schedules, van arrangement was completed to take the delegates between companies…each and every element was planned meticulously.

So far so good, right? WRONG!!! Murphy's Law never takes a break, and it completely (almost) threw us off-guard at the last moment.

Half of our delegation including BSIA secretary Mr. Hashim were ready to board the red-eye flight on Malaysian Airlines on 10th Nov night at Dhaka airport when they were told that their flight would be cancelled due to mechanical issues with the aircraft! Their flight got rescheduled for the next day, which meant there would be nearly zero chance that they would be in before the Day 1 event, which we have been preparing for so long. And then we also got a message that Dr. Mustafa's flight from Chicago was delayed due to inclement weather and he was rerouted in a way that in the best-case scenario, he would land in Penang just an hour before our gala reception. So many logistics now would be jeopardized…who will present on their behalf? Where will we get the posters and the gifts that team was carrying from Bangladesh…bottom line, it was a dire situation to say the least.

Well, as the saying goes, when the going gets tough, the tough gets going and that is exactly what we did. Half of our BSIA delegates, including Mr. Jabbar had already arrived in Penang on the 10th and so, we decided that we must carry on with our scheduled event as planned even if we don't have the full quorum because we had confirmed attendance from all our VIPs and it would be impossible to reschedule at the last moment. But we needed extra hands to fill the gaps and sure enough, the local young Bangladeshi engineers rose to the occasion.

We sent Aousafur to ensure he picks up Dr. Mustafa from Penang airport as he lands and drives like a local and brings him to the G hotel without wasting a single second. Musanna and team (Ashikur, Mahade, Prince, Saad, Nazim, Mehedi and Kamrul) were tasked to make all the printouts, banners, load all the presentations on laptop, be the AV specialists during the event, greet the VIPs, manage the crowd…the list of tasks was long and we had so little time!

Everyone literally rolled up their sleeves and got to work without wasting any time and without any question – it was a matter of pride…representing Bangladesh and we were NOT going let anything slip. And by God's grace, we did pull things through, and we were ready to host the 1st ever roadshow!

And from that moment onward, everything went like clockwork…all the VIPs and attendees came on time, and we started our event on the dot. It was my great privilege to be the emcee of the show and so I started the event by welcoming everyone and going through the agenda and the objectives of our road show.

Mr. Jabbar delivered a precise overview of Bangladesh's Semiconductor journey and as he is wrapping up, Dr. Mustafa reached the venue and delivered the keynote speech highlighting the collaboration opportunities between Bangladesh and Malaysia. Next, we presented detailed overviews of the six companies and highlighted their key competencies spanning digital/analog/RF design, AI-driven automation, SiC power devices, and testing services. Judging from the reactions of the audience, it was clear that they now understood the complementary value chains that existed between the two nations – mission accomplished! Bangladesh's semiconductor industry, currently focuses on the "front-end" of the value chain: chip design, intellectual property (IP) creation, and fabless operations while Malaysia's strength lies in the "back-end": assembly, testing, packaging, and manufacturing, which creates a natural symbiotic relationship where a chip designed in Dhaka can be manufactured, assembled, and tested in Penang.

Our special guest, Mr. Manjurul Karim Khan Chowdhury, Bangladesh's High Commissioner to Malaysia reiterated the message of this collaboration. Our chief guest of the evening, Jagdeep Singh Deo, Deputy Chief Minister II of Penang took the stage as the final speaker of the event. He went off-script and spoke from his heart by welcoming BSIA not only as visitors, but as partners in building the next chapter of Asian semiconductor collaboration. He assured his full support by committing to a long-term relationship rooted in trust, knowledge exchange, investment, and shared success.

With that, we wrapped up our day 1 at G hotel and went to the dinner reception where our delegates were surrounded by so many inquisitive Malaysian counterparts who were soaking in every bit of information. So, in summary, what felt like an impossible task a few hours ago as we started the day, became one of the most successful events in the history of Silicon River's journey.

Next morning, on the 12th November, our remaining colleagues/ partners (who got stuck at the Dhaka the day before) finally joined us in Penang and we visited all the listed companies as a team, as a full quorum throughout 12th and 13th November. We ended the roadshow with an appreciation dinner hosted by BSIA for the local Bangladeshi engineers, who truly rose to the occasion and made this event ever so successful.

Looking back, when I think of the ambitious agenda we had set forth for the road show:

I. To highlight Bangladesh's growing capabilities in chip design, testing, and innovation;

II. To connect Bangladeshi design expertise with Malaysian manufacturing excellence; and

III. To establish business-to-business (B2B) and business-to-government (B2G) partnerships for joint design and OSAT (Outsourced Semiconductor Assembly and Test) projects.

We checked all the boxes!

Bio

Shatil Haque, PhD

AVP, CREDO, Santa Clara, California, USA

Born in Rajshahi, Bangladesh, Dr. Haque earned BS in Electrical Engineering from ASU and MS and PhD (Materials Engineering and Science) from Virginia Tech. 25 years of experience (spanning Ford, Philips, Lumileds, Enovix and Credo Semiconductor) in product & process development through NPI & industrialization into HVM. Super power – Execution.

SYSTEMS THAT *MOVE PEOPLE*

INFRASTRUCTURE BEFORE INTERFACE

How BOOST Was Designed to Serve a Nation, Not Just Its Users

1. Introduction

> When people build digital platforms for education and research, they often start with what the user will see like the screens, menus, and dashboards. When the Military Institute of Science and Technology (MIST) began designing the Bangladesh Online One-stop Semiconductor Technology platform under the BASICS–CREST Program, the first question was not about appearance, but about strength: what challenges must the system be able to handle?

This way of thinking, putting infrastructure before interface is what makes BOOST stand out. It was built to be more than a website or app. BOOST is a backbone, a system designed to survive and adapt to the real conditions of Bangladesh's universities, industries, and research community. That is why BOOST is worth studying. It is not just a national project, but an example of how digital systems can be designed to last, to serve diverse people and institutions, and to remain reliable even when resources are limited.

2. A System That Must Hold Together Across Institutions

Bangladesh's semiconductor effort is spread across many groups. It includes public and private universities, engineering colleges, experts from the Bangladeshi diaspora working abroad, and local industries that are still growing. For a digital platform to serve all these groups at once, it cannot be built like a simple single user app. It has to act like connective tissue that links them together.

BOOST was designed with this diversity in mind. Its role based structure gives each type of user a different entry point into the same system:

- Students follow training paths and track fellowships.
- Faculty use research tools and share publications.
- Industry partners post opportunities and connect with talent.
- NRB experts join through the BRAINGAIN channel to mentor and share expertise remotely.
- Administrators oversee approvals, monitor activity, and generate national reports.

This design is not just about convenience; it is about governance. A Joint Steering Committee made up of MIST, BSIA, CREST, and Neural Semiconductor ensures that BOOST is accountable to all institutions, not controlled by any single one. That accountability is built into how funds are used, milestones are tracked, and reports are delivered.

3. Designing Under Constraint: Security, Scale, and Institutional Reality

Building a national platform is not just about making it big. It's about making it strong enough to handle different kinds of users and institutions at the same time.

For example, BOOST has to let a student from a private university in Sylhet and a Bangladeshi researcher working abroad log in through the same system. It must do this without making the process too difficult for either user, and without creating security risks. To solve this, BOOST uses a layered access system.

> People identify themselves by role like student, faculty, industry partner, or researcher but their access is confirmed through approval steps managed by administrators.
>
> This approach may be slower than open registration, but it builds trust. In a system where companies share job opportunities and researchers share sensitive insights, protecting identity is not optional but it's essential.

BOOST was also built under a strict timeline, divided into five phases. The team had to make tough decisions early, such as finalizing the system's architecture and data structure before writing any code. This careful planning was necessary because with so many stakeholders involved, it's not easy to change direction later. One of BOOST's key lessons is that when building a national platform, you must get the foundation right before you start building.

User Role	System Access	Intended Outcome
Student	Training, certification, fellowship tracking, industry listings	Skill verification, career pathways
Faculty	Research repository, collaboration tools, mentorship network	Publications, funded fellowships
Industry	Talent discovery, internship posting, R&D connect	Qualified hire pipeline, co-research
NRB Expert	Mentorship channels, BRAINGAIN diaspora program	Diaspora engagement, knowledge transfer
Admin	Analytics dashboard, approval workflows, governance tools	National metrics, system health reporting

Table 1: BOOST User Roles, System Access, and Intended Outcomes

4. The Trade-offs No One Talks About

Every big system has hidden trade-offs that don't usually appear in the official plans. BOOST had to face several of them directly:

Open access vs. secure control:

The platform needed to be open to all universities and industries under BASICS and CREST.

But if anyone could register without identity checks, the system would not be trusted. BOOST solved this by allowing wide access but requiring each user's identity to be verified through their institution. This way, the system stays inclusive but also reliable.

Reliability vs. fast growth:

If a platform tries to do too many things before its core is stable, it risks failing at all of them. BOOST chose a careful rollout, starting small with real users before opening fully. This ensured the system was strong first, and growth came later as a result of proven reliability.

Inclusivity vs. performance:

Serving people across Bangladesh means dealing with different internet speeds, devices, and levels of digital skills. BOOST designs lighter pages, simpler interfaces, and offline tolerance and was shaped to reach users everywhere, not just those in Dhaka with fast connections. This balance is ongoing and requires constant adjustment.

These trade-offs show that building a national platform is not just about technology, it's about making choices that keep the system trustworthy, stable, and accessible to everyone.

5. Outcomes as System Requirements, Not Aspirations

One of the most important design choices in BOOST is that results are built into the system from the start. Features like fellowship tracking, analytics dashboards, and national reporting are not add ons placed on top of a training platform. They are part of the core structure. BOOST was designed from the ground up to show clear evidence of its impact.

This matters because it changes what the platform is. A normal learning system might only record how many people log in or complete a course. BOOST goes further: it produces data on how many fellowships are awarded, how research output is growing, and how industries are connecting with universities. This outcome data is not just useful, it is essential. It supports continued funding, proves the system's value to its governing bodies, and helps align national policy. By planning for outcomes from the beginning, rather than adding analytics later, BOOST ensures that accountability and evidence are part of its foundation. This is not just a technical choice; it is an institutional necessity.

6. Bangladesh as a Reference Case: What Generalizes

The challenges that shaped BOOST are not unique to Bangladesh. Many countries trying to build national digital systems face similar issues: limited resources, many different institutions to connect, the need to involve experts living abroad, uneven internet access, and complex governance with multiple stakeholders. What can be learned from BOOST is not the exact technical design, but the principles behind it:

1. Build the infrastructure first, then design the user interface.

2. Make role-based governance part of the foundation, not just a feature.

3. Treat outcome measurement as a built-in requirement, not something added later.

4. Recognize that the hardest trade-offs are often the ones no one writes down in the official plan.

Countries working on platforms in areas like semiconductors, health systems, agriculture, or vocational training face the same dilemmas. The Bangladesh experience shows how these challenges can be managed in a systematic way, under real institutional constraints, with a development team that is part of the same environment as the people they are serving.

7. Conclusion:

If BOOST succeeds, people will know it by the students it trains, the fellowships it manages, the industry partnerships it supports, and the role it plays in strengthening Bangladesh's semiconductor ecosystem. The technology that makes all of this possible will mostly remain invisible and that invisibility will actually be a sign of success.

> But we should not forget the careful design work that went into building it. Large systems that serve many people, across different institutions and under varied conditions, are not created by simply focusing on what users want to see on a screen. They are built by asking a harder question: **what must the system be able to handle and withstand?** Its journey shows that the real strength of a platform lies not in its interface, but in the resilience of the system behind it. The full answer to that question is still unfolding.

About The Authors

This article is contributed by the Military Institute of Science and Technology (MIST), Mirpur Cantonment, Dhaka-1216, Bangladesh. BOOST is developed by MIST in collaboration with the Bangladesh Semiconductor Industry Association (BSIA) under the BASICS–CREST Program, funded by Neural Semiconductor Ltd.

BOOST USER JOURNEY

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What - Who & Why

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NATIONAL METRICS

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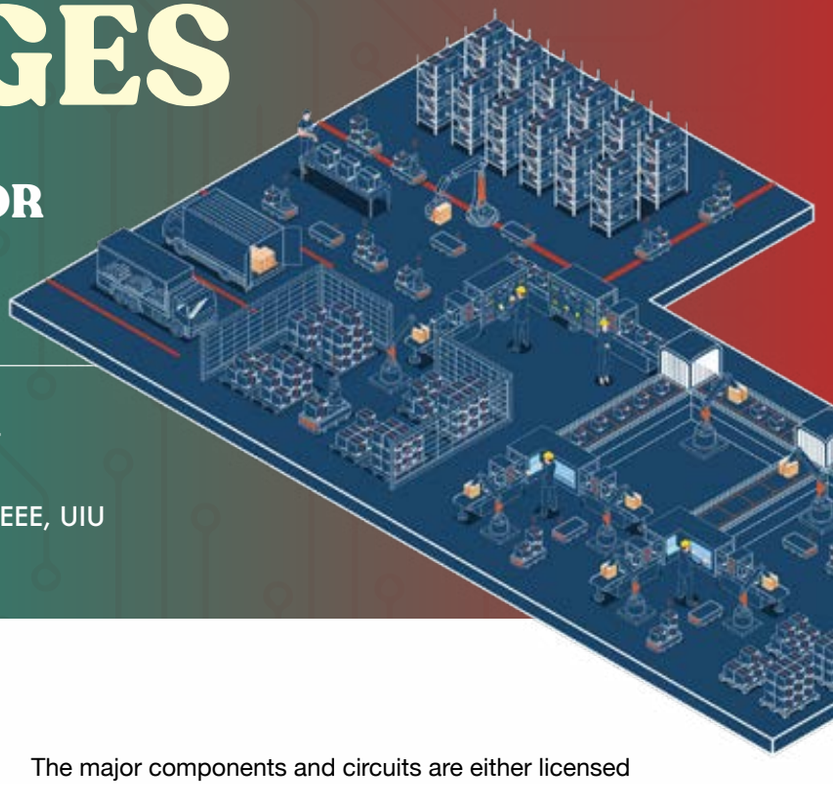
PROSPECTS AND CHALLENGES

TO DEVELOP A SEMICONDUCTOR ECOSYSTEM IN BANGLADESH



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1. Introduction:

The global semiconductor industry is one of the largest and fastest-growing technology sectors with an annual revenue of USD 790 billion in 2025 and a compound annual growth rate (CAGR) of 6.25% per year. It is projected to reach USD 1 trillion by 2030, fuelled by the growth of AI, smart phones, data centers, automotive electronics, and Internet of Things (IoT). Currently, the semiconductor market size of China and India is estimated approximately $200bn and $45bn, respectively. In contrast, Bangladesh remains a late entrant, a slow starter and is still in the early stages of ecosystem development, with an estimated annual revenue of around USD 15 million.

> With cheaper trained manpower, there is ample scope for growth in this sector and our initial research shows that it is possible to increase the earning to $1bn within the next 5 years. To understand the origins of these market shares—and to identify pathways for increasing Bangladesh's participation—a comprehensive understanding of the semiconductor ecosystem is essential.

2. The Semiconductor Ecosystem:

The semiconductor ecosystem spans from chip design to fabrication, testing and packaging, and integration of the chip into end products. Fig. 1 illustrates the major stakeholders and core components of the semiconductor ecosystem in a simplified manner. Everything of chip design begins from applications requirements which lead to chip specification such as: architecture, functionality, and performance. The chip designers translate those requirements into a physically realizable system often consisting of central processing unit (CPU), memory, modem, and other custom blocks.

The major components and circuits are either licensed Intellectual Properties (IPs) (e.g., ARM is the largest IP provider of CPU) or are developed by the designers themselves. Next is the verification and physical design of the chips using Electronic Design Automation (EDA) tools—which constitute the outsourced VLSI design jobs, such as: verification, synthesis, place and route (PnR), signoff checks like design rule check (DRC) and layout versus schematic (LVS) to final design file in graphic design system II (GDS-II) format—that the Bangladeshi design houses/startups are primarily pursuing. After sign off by the design team, the chips proceed to fabrication, a highly capital-intensive process that demands atomic scale precision, ultra clean environment, and multidisciplinary technological expertise. Fabrication is followed by chip assembly, testing and packaging which is moderately complex compared to fabrication and much less capital incentive.

The semiconductor value pyramid shown in Fig. 2 delineates the deep, fragile, and highly fragmented stack of specialized industries required to produce a functional chip. It maps the entire ecosystem from raw materials to final electronic products, illustrating how value is added at each stage and highlighting the interdependencies between design, manufacturing, and assembly. It is the fabless companies in the middle of the pyramid from where most of the outsourced design service is channeled to the Bangladeshi design houses. The following section will describe the prospects and challenges for Bangladesh in the various segments of the ecosystem.

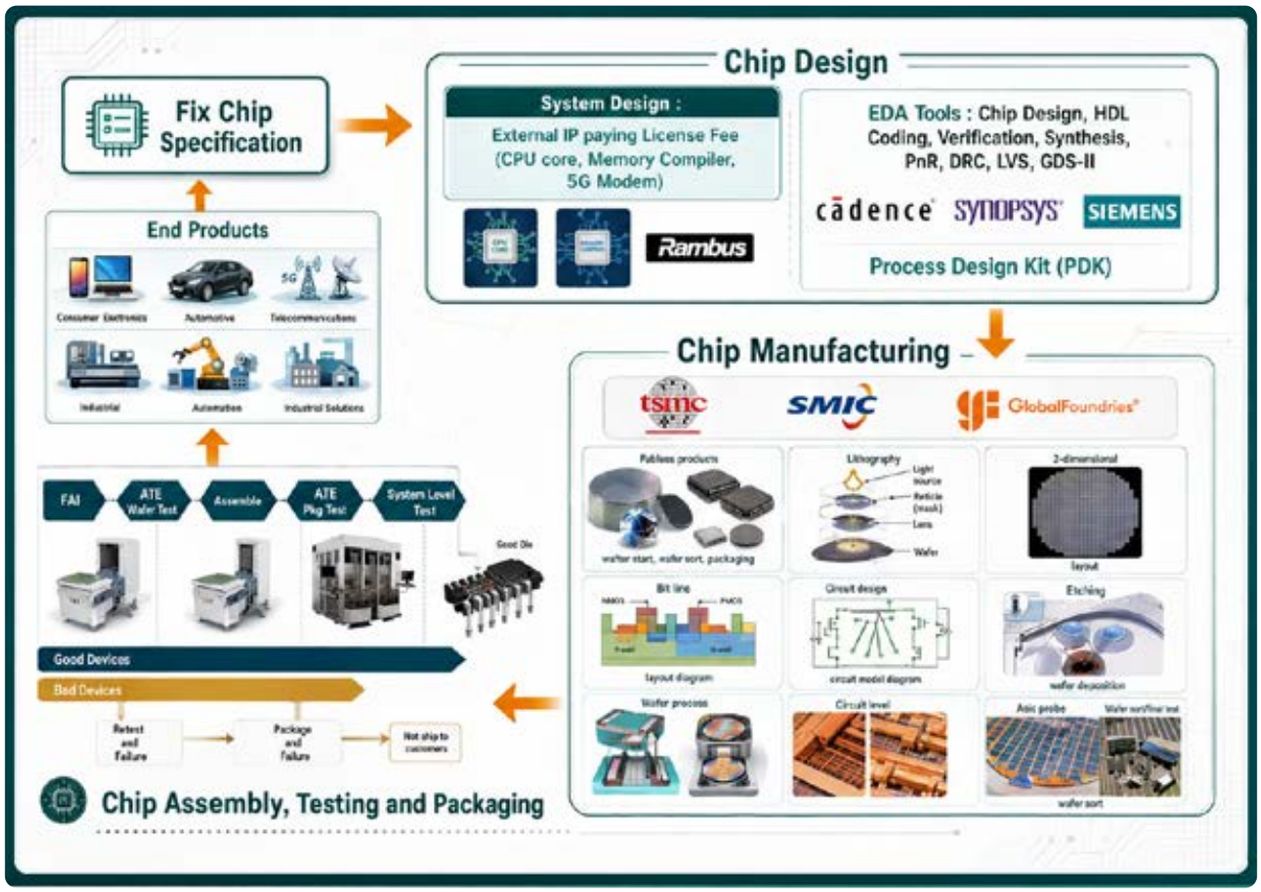

Figure 1: Semiconductor ecosystem © H. Rashid

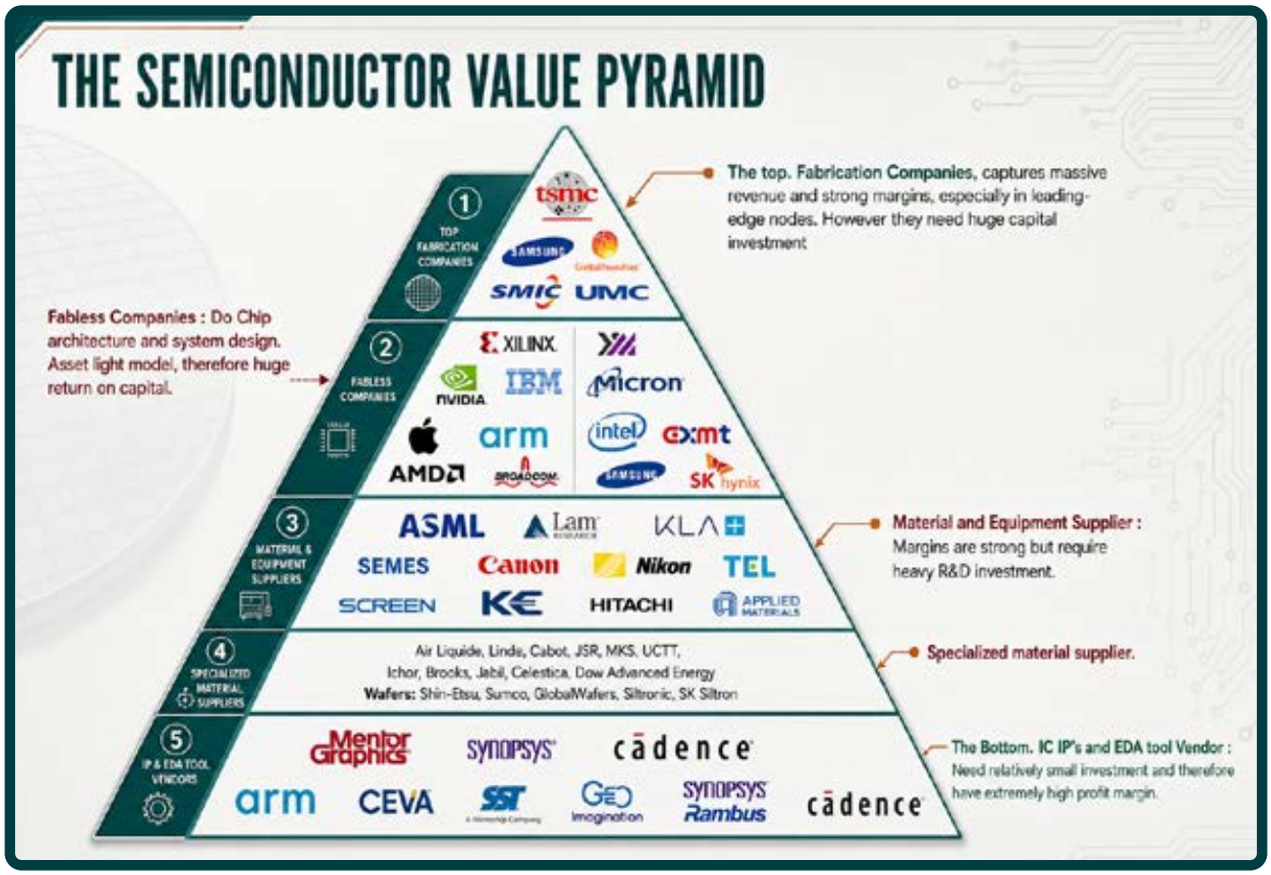

Figure 2: Semiconductor value pyramid (modified figure from "The Semiconductor Ecosystem Explained" by Steve Blank, SemiWiki 02-06-2022)

3. Prospects and Challenges for Bangladesh in Various Segments of the Semiconductor Ecosystem:

i. Semiconductor Design Services

The global semiconductor design services market is roughly $7bn–$8bn today and expected to grow to about $16bn–$17bn by 2030. There is often a misconception that India has a market share of $40bn in semiconductor design, but in reality, out of the $45bn market share of India, the majority (about $30bn) is import driven consumption of semiconductor-based products for its domestic market. Out of the remaining $15bn, pure design services by outsourcing firms are likely ~30–40% of $7bn–$8bn i.e., ~$2bn–$3bn, captive design work for the multinational corporations (MNCs) is about $8bn-$10bn, embedded systems including embedded software/firmware is about $3bn-$5bn, and a small portion is from prototyping and validation.

Bangladesh semiconductor initiative has so far been concentrated on a small number of pure-play third-party design service firms i.e., companies that primarily undertake outsourced chip design work with an estimated combined annual revenue of around $15mn. However, with well-structured government policies and targeted incentives—particularly in human resource development, access to EDA tools, and fiscal measures such as tax and VAT relief—the country has the potential to significantly expand its footprint and scale this segment toward a $1bn market in the near future.

The opportunities and challenges in design services outsourcing are as follows:

THE OPPORTUNITIES:

(1) Lower cost of design engineers:

The yearly engineering costs in North America, Japan, Europe, India, China, and Bangladesh are 115, 75, 70, 18, 15, and 6 thousand USD respectively. Bangladesh has a huge advantage in terms of engineering labor cost.

(2) Availability of talented young engineers with English fluency:

In Bangladesh, approximately 13,000 students graduate annually in Electrical and Electronic Engineering (EEE) and around 26,000 in Computer Science and Engineering (CSE) across both public and private universities. In total, nearly 50,000 graduates enter the workforce each year. These individuals represent a pool of bright, young talent with strong technical foundations and good proficiency in English.

(3) Demographic dividend:

Bangladesh has a redundant educated manpower which, with proper policy adaptation, can be transformed into an invaluable asset for this sector. We, at the policy level, must realize that our underutilized workforce can be guided and trained for prospective sectors to get them employed and contribute to our economy. While many developed nations are experiencing population decline, our young generation can be an asset if we can utilize them properly.

(4) Favorable geopolitical shifts:

It is foreseen that the evolving geopolitical scenario will eventually focus on a geographically diverse population for the manufacturing and service sector industries, and smaller countries like Bangladesh can gain an advantage if there is ready manpower with the right professional training. For example, the western world is taking more interest in countries like Bangladesh, compared to large economies like China or India due to their high-tech industries. This can be an opportunity for countries like Bangladesh and we must act quickly to capitalize on this world trend.|

THE CHALLENGES:

(1) Lack of skilled engineers: Although fresh graduates with good English proficiency are readily available, they are not industry-ready. Even when selecting candidates who have completed relevant coursework and passed targeted assessments, it typically requires around one year of rigorous training before they can be effectively deployed in customer projects.

(2) Shortage of experienced project managers: The biggest challenge is finding engineers with 10+ years of experience in relevant field who can lead a customer project and engage with the customers. This often becomes a bottleneck to get outsourced jobs.

(3) Use of AI in VLSI design: With the emergence of artificial intelligence (AI), the whole modality of VLSI design industry is going to experience a rapid transformation making the older design concepts obsolete. In a sense, it is an opportunity for us, as all the established VLSI design industries are entering this new phase from a similar starting point, allowing Bangladesh to catch up. However, a prompt and appropriate policy adoption is a necessary precondition for an early success.

Although AI-based applications are increasing, it is perceived that human contribution to IC design will retain its share for quite some time and Bangladesh must pick up this sector before it is too late. The future of IC design will be a combination of AI and human input, and the basic requirements for employment in this sector will evolve rapidly. So, entering this sector early will ensure that our manpower can avail themselves of the transformation opportunity as and when needed.

(4) Policy Level Support: As Bangladesh is a late starter, policy and fiscal support from the government is essential to 'leapfrog' to a level within a short period of time so that our engineers/ designers can have a reasonable presence in this field when the thrust of change comes to accommodate AI and other forms of automation. The 'National Semiconductor Task Force' report (June 30, 2025) can be a starting point for this, accepting the fact that finalization of any policy requires more detailing and impact analysis before it can be implemented. The policy support may include:

- a. Training of the skilled manpower for this sector needs very special policy support as the number of educational institutions/training centers that have proper training facilities (software and the laboratories) and the qualified trainers is very limited. Software like Cadence, Synopsis or Mentor Graphics are quite expensive (even the educational licenses) in comparison to the cost of living in Bangladesh and support of the government in this area can make a significant difference. The actual number of trained manpower to provide training in this sector is also very limited. So, 'Training of the Trainers (ToT)' programs at the initial stage will be helpful in getting an early boost in this sector.

- b. Policy level support like funding for VLSI design software purchase, initiatives for the 'train the trainers' and tax holiday for the companies are important. Besides, a number of other policy decisions will help boost this sector in Bangladesh. These are – i) identifying VLSI as a priority sector that will provide seed fund for the new companies; ii) funding some centers of excellence (CoE) that will house the VLSI design software and provide the small VLSI design companies with time slots on a reasonable payment basis so that the initial investment on the software can be avoided; iii) organize road shows and policy meetings for promoting VLSI capability of Bangladesh, having participation from the VLSI design companies worldwide; iv) organize training programs for the trainers on the emerging design sectors with trainers from internationally reputed VLSI companies; v) forming a think tank consisting of diaspora Bangladeshi professionals and academicians working in this field to provide continuous guidance and support regarding the future development of this sector; vi) adopting education policy that will make semiconductor technology as a priority sector for high school and tertiary level education by adopting course curricula to disseminate knowledge and understanding of semiconductor technology even before the students go for higher education and training. It is also important to overcome the present level of weakness in STEM (Science, Technology, Engineering, and Mathematics) education at the secondary and high school level; vii) With the development in AI and its possible future impact, it is high time to incorporate AI in the STEM education to make our graduates well conversant with the use and development of AI tools and its possible future applications.

ii. Semiconductor IP Vendor (IP Core Provider)

Current market size of IP core provider is $7bn-$8bn and it is expected to reach $20bn by 2030. However, Bangladesh has no footprint in this area yet. Leveraging specialized post graduate degrees (MSc/PhD) and building centers of excellence in semiconductor discipline, we can gradually develop innovative IPs to expand our global footprint.

iii. Fabless Semiconductor Company

Fabless semiconductor companies account for roughly 35% of total semiconductor market revenue. The global fabless semiconductor market is roughly $180bn–$200bn today and it is expected to grow to $270bn–$530bn billion by around 2030, depending on AI-driven growth scenarios. However, it must be recognized that developing globally competitive fabless semiconductor companies in Bangladesh—whose chips are widely adopted in international consumer markets—is not a realistic prospect in the near term.

A more pragmatic strategy is to attract multinational semiconductor companies (such as AMD, Qualcomm, NVIDIA, Texas Instruments, Intel etc.) to establish design centers in Bangladesh. This would create a significant opportunity to build local capabilities and accelerate the country's engagement in the semiconductor ecosystem. Achieving this, however, will require strong commitment at the highest levels of the government, supported by enabling policies, improved infrastructure, and the removal of bureaucratic barriers.

iv. Chip Assembly, Testing and Packaging

The market of chip assembly, testing and packaging formally known as Outsourced Semiconductor Assembly and Testing (OSAT) is anticipated to expand at an 11.0% CAGR, increasing from $10bn in 2025 to ~$18bn by 2034. This is an area where we should step in immediately, doing so will position Bangladesh in relatively high-tech manufacturing

with significantly less capital investment than semiconductor manufacturing or chip fabrication. However, this will require partnerships with semiconductor giants such as Intel, Samsung, and TSMC, as well as fabless semiconductor companies. This will also necessitate a strong commitment at the highest levels of the government, supported by enabling policies, improved infrastructure, bonded warehouse facilities, and the removal of bureaucratic barriers.

v. Specialized and Higher Node Chip Manufacturing

If Bangladesh ultimately decides to enter semiconductor manufacturing, it should focus on specialized segments such as GaN- and SiC-based high-voltage, high-power devices, particularly for the rapidly growing electric vehicle (EV) market. The combined market is approximately $4bn in 2025, with projections to exceed $16bn. These technologies do not require state-of-the-art single-digit nanometer photolithography; therefore, the capital investment is significantly lower compared to leading-edge semiconductor fabrication. Another option might be implementing the higher (legacy) node digital and analog chip manufacturing which is needed in ordinary electronic gadgets.

However, we have to acknowledge that a fab cannot operate in isolation. It needs a complete supply chain, including ultra-pure chemicals and gases, silicon wafers, photomasks, and precision equipment maintenance. These have to be supplemented by 24/7 high quality uninterrupted electricity and millions of liters of ultra-pure water on a daily basis. Unfortunately, the harsh reality is that Bangladesh currently has no semiconductor-grade supply chain and no supporting industries. Without the ecosystem, fabs become unsustainable and very costly.

Overall, being a late starter, Bangladesh should enter this sector with greater thrust and vigor to make it a change maker for country's economy. As other competitors are ahead of us, our policy makers must consider that we need to move much faster at the initial stage to reach a competitiveness so that we do not lag behind other countries when the new AI-driven changes are introduced in this sector.

As Bangladesh can be a source of low-cost manpower, it is our utmost responsibility to provide the right training and adopt the right policies, before it is too late, to convert our manpower into an intellectual asset for this sector.

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A. B. M. Harun-ur Rashid has received his B.Sc. in EEE from BUET in 1984, and his Ph.D. in Electronic Engineering from the University of Tokyo, Japan in 1996. Since then he has been serving as faculty member in the Department of Electrical & Electronic Engineering at BUET where he became a Professor in 2006 and is currently serving as the Head of the Department.

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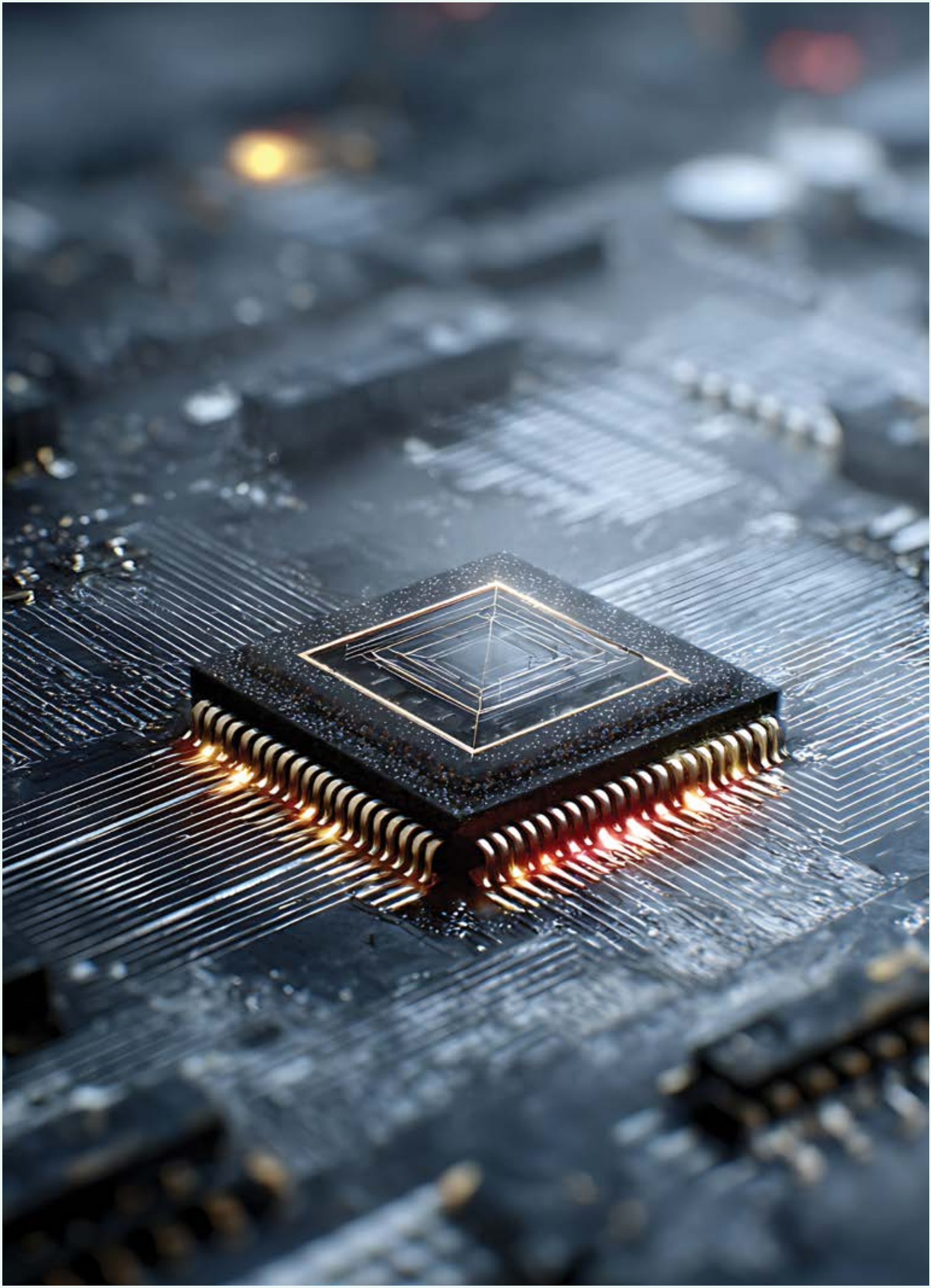
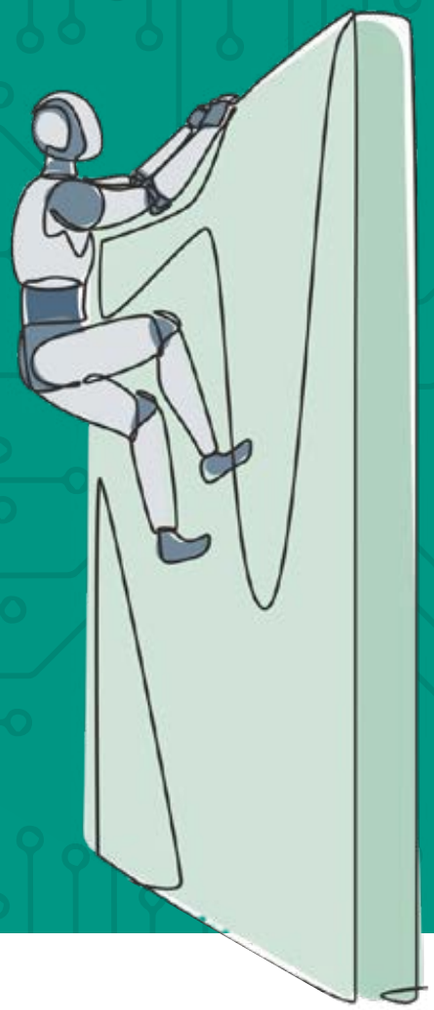




WHAT NO ONE TELLS EMERGING NATIONS

ABOUT ENTERING THE SEMICONDUCTOR SECTOR

Robert Quinn
Semiconductor Industry Ambassador

I have had some version of the same conversation many times now. A government official, usually someone sharp and genuinely motivated, leans across the table and tells me their country is going to build a semiconductor industry. They have a plan. They have political will. They have funding commitments. They want to know what I think.

What I think, and what I have learned to say carefully, is this: before we talk about the plan, we need to talk about which industry you are actually trying to enter. Because there are many of them, and they are not even close to the same thing.

The Number That Changes Everything

On one end you have EUV advanced node manufacturing. This is the technology behind the chips in your iPhone, the processors running AI data centers, the cutting edge of what the semiconductor world produces. Building a fab at this level costs somewhere between $20 billion and $40 billion before you hire a single engineer or produce a single chip. The machines alone, made by one company in the Netherlands called ASML, now cost over $200 million each for standard models, and the latest generation runs closer to $400 million. Taiwan, South Korea, Ireland, and now the United States with massive federal backing are the places operating here. That door is not open to most nations, and I think it does real harm when advisors let governments believe otherwise.

On the other end you have legacy chip technology. Mature process nodes. And here is something I want to say plainly: legacy chips run the world. The chips in your car, your power grid, your medical equipment, your industrial controls, your water treatment facility, your aircraft, your factory floor. None of that runs on cutting-edge silicon. It runs on mature nodes that most people in policy circles barely talk about. Entry-level investment here can start around $5 million for packaging and test operations.

A mature-node foundry might cost a few billion, which is still serious money, but it is a completely different conversation from the EUV world. And the demand is enormous. The industry is chronically short on legacy chip supply because all the major players have been chasing the leading edge while the rest of the market quietly kept growing.

That gap between $5 million and $40 billion is the single most important thing a policymaker can understand before writing a single line of semiconductor strategy. I have had to explain this distinction to many governments. It never gets easier to say, but it always matters.

The Infrastructure Nobody Talks About

There is a second conversation I have had to have just as often, and it almost never appears in government semiconductor roadmaps.

> Chips do not get made with just machines and engineers. The semiconductor industry runs on an enormous infrastructure ecosystem that takes years to build and must be in place before a single wafer moves through a fab. We are talking about ultra-pure process gases, specialty chemicals, vast quantities of ultrapure water, and reliable high-capacity electrical power. A single fab can consume as much electricity as a small city and as much ultrapure water as a mid-sized municipality. The power question alone is why renewable energy infrastructure has become a critical factor in site selection decisions, because the industry's largest customers are demanding clean energy commitments throughout the supply chain.

Beyond utilities, there is a whole world of consumable components that most people outside the industry never think about. Process kits, chamber parts, quartz hardware, ceramic components. These are parts that wear out and need regular replacement inside the manufacturing equipment. They are not optional. They are not something you source locally when you are starting out. Building the supply chain for these materials and consumables is part of building a semiconductor ecosystem, not a detail to figure out later.

For emerging nations, this infrastructure reality is often the first hard wall they hit. The question is not just whether you can attract a company to build a facility. It is whether the power grid is stable enough, whether the water treatment capacity exists, whether the specialty chemical supply chain can reach you, and whether the ongoing consumable needs of the equipment can be met reliably. Countries that get serious about semiconductors address this in parallel with the investment strategy, not after the ribbon is cut.

Look at Brazil Before You Look at Taiwan

Every emerging nation I have worked with wants to benchmark against the successes. They study Taiwan, South Korea, Malaysia. Those are the right case studies, but they are incomplete without also studying the failures.

Brazil is required reading.

Brazil made serious attempts over several decades to build a domestic semiconductor industry. They had government commitment, investment, and genuine strategic intent. What they could not overcome was a combination of institutional dysfunction, inconsistent policy, and political instability that reversed progress every time a new administration came in. A government-backed chip manufacturer called CEITEC was launched, then put into liquidation when the political winds shifted, then revived again. A promising fab venture with IBM collapsed. Companies that came in during favorable policy windows left when the rules changed. The ecosystem never had the stability to compound.

The lesson is not that Brazil lacked ambition. The lesson is that ambition without institutional consistency is expensive and ultimately pointless in this industry.

> Here is why that matters practically. The global companies that would partner with, invest in, or source from an emerging ecosystem are making decade-long commitments worth hundreds of millions of dollars. They do deep due diligence. They are not just evaluating technical capability. They are asking whether the rules of the game will still be the same rules in ten years. They are watching how public funds move, whether contracts mean what they say, and whether a change in government will undo everything the previous one built.
>
> Institutional instability does not just create uncertainty. It drives capital to the next country on the list.

For Bangladesh, this means transparency and policy continuity have to be built into the foundation of the semiconductor strategy from day one. Not added later. Not assumed. Independent oversight, clear published criteria for how incentives are awarded, and a genuine commitment to protecting the program across administrations. These are not soft requirements. They are competitive requirements.

You Cannot Build This Alone

No emerging nation develops a semiconductor ecosystem in isolation. That is not a weakness, it is just how this industry works. The technology, the process knowledge, the manufacturing IP that makes modern chips possible took

decades and hundreds of billions of dollars to develop. It lives inside companies. And those companies are not going to share it out of goodwill.

What they will do is partner, under the right conditions.

Micron's investment in India is the clearest current example of how this works, and it is no longer just a promise. The facility in Sanand, Gujarat, is open and already shipping made-in-India memory products to companies like Dell. The total investment is $2.75 billion. Micron contributed roughly 30 percent of that. The Indian central government covered 50 percent and the state of Gujarat provided the remaining 20 percent through incentives. Micron gets a regional foothold that serves its global supply chain diversification goals. India gets technology transfer, thousands of jobs, and a credible anchor tenant that signals to every other company considering the country that the ecosystem is real.

That exchange is the model. IP owners are not looking for charity cases. They are looking for partners who make their own business case easier to justify to shareholders.

> For Bangladesh, this means the incentive structure has to be designed before the partnership conversations begin, not during them. What is on the table? What does the government bring beyond enthusiasm? Land policy, tax frameworks, import duty structures on equipment, visa and work permit processes for foreign engineers who will need to be on the ground during technology transfer. These are the questions a company like Micron, Infineon, or any serious player asks before the second meeting.

Countries that have done this well thought like a business development team, not like a ministry writing policy. They figured out what the other side of the table needed and built the offer around that. Bangladesh has the opportunity to do exactly the same, but the offer has to be concrete, competitive, and credible before anyone sits down.

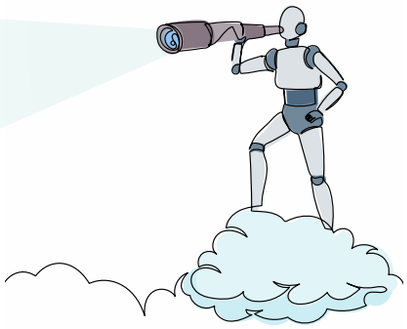
Where the Real Opportunity Lives

Once you understand what you are not going to build, you can get serious about what you can.

The semiconductor industry is far larger than the fabs that make headlines. Design houses, advanced packaging, test and assembly, materials supply, equipment servicing, process consumables, specialty chemicals. The foundries everyone talks about could not function without a long supply chain of companies most people have never heard of. The countries that made durable entries into this industry did not do it by announcing a cutting-edge fab. They found a specific place in the supply chain where their existing strengths fit, and they committed to it for decades.

Vietnam went deep on assembly and test. Malaysia built a packaging hub over thirty years. Neither one tried to out-Taiwan Taiwan. They found the gaps and filled them.

Bangladesh has something that rarely gets mentioned in these conversations: a manufacturing culture that has already proven it can scale under pressure and meet demanding global quality standards. The garment industry is not semiconductors, but the discipline required to run high-volume production for international customers with zero tolerance for defects is real, and it is transferable. That foundation is not nothing. The question is how to channel it toward the right entry points, packaging, test, assembly, and over time, mature-node design support.



What I Actually Watch For

When I am trying to assess whether an emerging ecosystem has real traction, I stop looking at the announcements and start looking at a few specific things.

- **Private capital.** Government funding can start a program, but when private investors start chasing returns alongside the public money, something real is happening. When they are not showing up, the program is usually drifting.

- **Talent that stays.** Countries can produce strong semiconductor engineers who then move to the US, Germany, or South Korea within five years. The question is never just how many engineers are being trained. It is how many are still home a decade later.

- **Infrastructure readiness.** Power, water, chemicals, gases. These are not secondary concerns. They are gating factors. An ecosystem cannot grow faster than its infrastructure allows.

- **Adjacent industry strength.** Countries with existing precision manufacturing, electronics assembly, or advanced materials operations have a head start that does not show up in policy documents but absolutely shows up in outcomes. The muscle memory matters more than people realize.

The One Thing Most Governments Underestimate

Time.

Semiconductor ecosystems do not mature inside political cycles. The countries succeeding today started building the foundations fifteen to thirty years ago. A government that frames this as a four-year initiative will be disappointed. A government that commits to a generational program and protects that commitment across administrations has a real shot.

> The global industry is under more pressure to diversify right now than at any point in the last forty years. That is a genuine opening for nations that have historically been on the outside looking in.
>
> But the ones that capture it will not be the loudest. They will be the ones that picked a realistic entry point, invested in the infrastructure that actually makes manufacturing possible, designed incentive structures attractive enough to bring real partners to the table, studied honestly what failed in Brazil and what succeeded in Malaysia and Vietnam, and had the patience this industry demands.

Bio

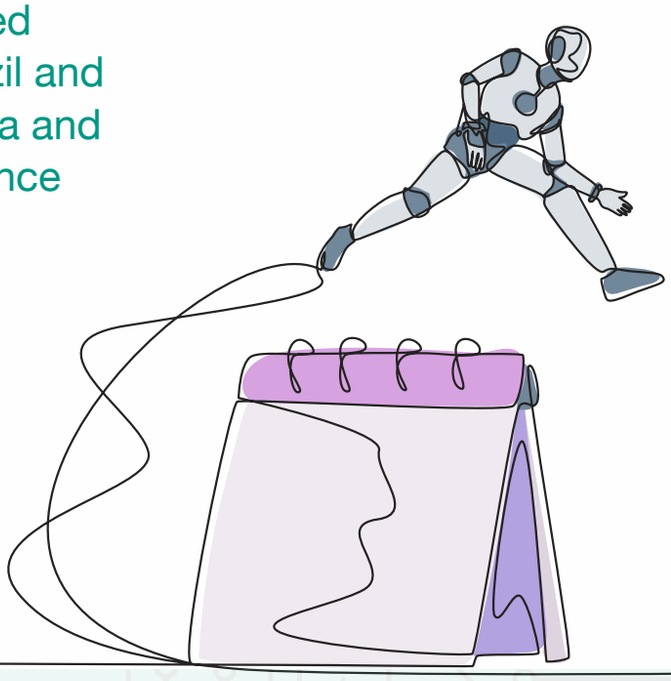
Robert Quinn

Semiconductor Industry Ambassador

Robert Quinn is a Semiconductor Industry Ambassador with experience across Applied Materials, Samsung, Intel, Texas Instruments, and GlobalFoundries. He advises governments and industry organizations on semiconductor strategy and workforce development. He is also a Professor of Texas A&M and Temple College.

> The goal is not to become the next Taiwan. The goal is to become indispensable at something specific, and to build the kind of foundation that makes that indispensability last.

That is achievable. But only with clear eyes, a realistic map of where you are starting from, and the institutional stability to stay the course when the results take longer than the politics would prefer.



BRIDGING THE SEMICONDUCTOR SKILLS GAP

LESSONS FROM GERMANY'S APPLIED RESEARCH ECOSYSTEM FOR BANGLADESH

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Abstract

The Shortage of skilled workers in the semiconductor industry is predicted from 750,000 to 1 million globally by 2030. This shortage is in areas like chip design, fabrication, packaging, testing, and equipment engineering. Bangladesh could convert this challenge into an opportunity. In Bangladesh, it would be recommendable to focus on design and packaging sectors with- out going into spending fabrication costs of around $10-20B.

One of the best models in this regard is Germany's Fraunhofer-Gesellschaft, which is funded 30% public, 30% public contract research, 40% industry, and works very closely with universities. The Center for Research Excellence in Semi-conductor Technology (CREST) had started its journey in Bangladesh from January 2025. Instead of simple production line factory establishment, the center plans to have training for over 5 years with its investment target of the semiconductors related exports is to hit $1 billion by 2030. It is pro- jected that around 60% of the total of 10, 000 engineers to be produced in Bangladesh by 2030 will be engaged in design and verification works, 25% in packaging and testing, and the other 15% in analogue and power sectors. The five diagrams illustrate a skill gap (Figure 1), Germany's collaborative work structure (Figures 2), different points of value chain entries (Figure 3), and the expenses involved in different types of investments (Figure 4), stages of growth (Figure 5). The University Grants Commission (UGC) states that Bangladesh, having a firm base and more than 50, 000 engineers graduating annually, is excellently positioned to take advantage of global talent pool discrepancies and develop strong tech skills.

Keywords: Semiconductors, Technology Policy, Workforce Development, Innovation Ecosystems, Bangladesh, Fraunhofer Model

1. Introduction

The semiconductor industry is a backbone of today's digital economy, and due to factors such as data centers, electric vehicles, and a transition to cleaner energy, the industry worldwide can nearly reach $1 trillion by 2030 [1, 2]. Yet, the lack of skilled workers is the biggest hurdle in the industry. Figure 1 shows the number of workers the global semiconductor industry demands compared to available workers. It shows a looming worker shortage, which can slow down the growth of the industry.

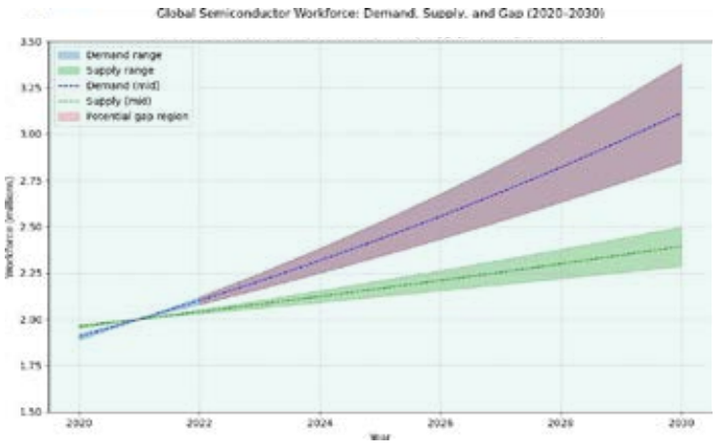


Figure 1: Expected global semiconductor workforce need vs. supply (2020-2030). The need will jump from about 2 million in 2020 to over 3.3 million by 2030, while the available workforce will grow from about 2 million to 2.4 million, leaving a gap of 900,000 workers. These numbers are based on Deloitte's 2 million global baseline from 2021, U.S. forecasts from the SIA (2024), SEMI global predictions, and Oxford Economics' job models.

In the USA, semiconductor jobs will increase by 33% by 2030 according to the SIA reports in 2024. However, 67,000 new positions where 58% of technical roles will remain empty because degree programs can't produce enough graduates. A McKinsey study of 2023 forecasts that the U.S. will lack between 59,000 and 146,000 engineers and technicians by 2029, even with CHIPS Act money for training. Germany will be short of 209, 000 STEM workers in the near future. Meanwhile, verification engineers can receive hiring bonuses of 20% to 30% [20].

Primary factors driving things forward: more reliance on data cen- ters (generating at least 20% of the revenue by 2026), Electrified Vehicles SiC/GaN, and up to 500 billion IoT/5G sensors by 2030 [3, 21]. The sector will demand 120,000 to 150,000 new workers each year, with a 6 to 8% global CAGR [1, 20]. Also, around 33% of U.S. Semiconductor workers are already over 55 years old, and the STEM enrollment in developed countries stays flat [2]. This labor shortage is a strategic opportunity for emerging economies. Nations having an increased supply of engineers could prove worthy partners in the international semiconductor supply system provided they can find jobs that fail to demand colossal capital investments. The January 2025 National Semiconductor Taskforce of Bangladesh aspires to make above 1 billion in semiconductor related export within 2030.

> Today, it employs 700 design engineers and exports approximately 8 million, demonstrating the effectiveness of the strategy when combined with access to electronic design automation tools and mentorship [4, 5].
>
> The taskforce is concerned with increasing this talent pool to 10,000 engineers in the design and verification (60%), packag- ing and test (25%), and analogue power (15%) application, which comprises a lot to the non-fab part of the value chain.

The development gap between the rise of global markets and the supply of highly skilled labor, therefore the opportunity for Bangladesh to strengthen its position in the semiconductor industry while other emerging hubs like India, Vietnam, and Malaysia are busy consolidating their roles. Whether or not the country can perform this general engineering to specialized semiconductor capabilities conversion will largely decide the success of this plan.

2. Global Supply Chain for Semiconductor Talent

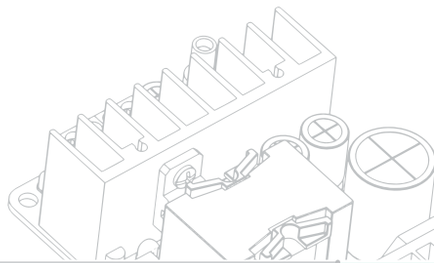
Figure 1 shows a labor shortage which is due to the recent technological changes in the global environment. Semiconductors have not only stayed as core components of computers but are actually present in a majority of the products people use these days, driving a rapid demand increase for sophisticated microelectronic devices.

Among other things, AI processors, EV power electronics, and 5G/IoT sensors are a key source of demand in the semiconductor value chain [3].

3. Germany's Applied Research Ecosystem

Germany is also a key competitor in the microelectronics market, and it exports EUR2.5 billion without having a direct analog of a state-of-the- art foundry like the Taiwanese TSMC or Korean Samsung.

It has been successful because of its institutional structure and not huge, solitary capital investments. The best example of such an architecture is the one developed by the Fraunhofer-Gesellschaft, and this design can teach new economies a lot [14, 15].



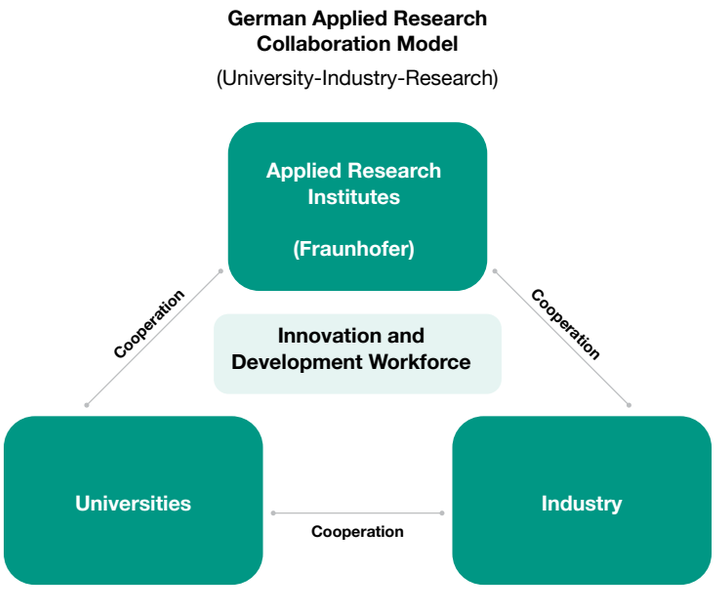


Figure 2: The university-Fraunhofer-industry cooperation model in Germany. The two- way arrows reflect mobility of students (around 30 percent of the doctoral students at Fraunhofer are contracted by industries), contract research (it brings in about 1.2 billion annually in revenue), and common infrastructure (it has 150 partner labs with universities). It was based on the analysis conducted by the National Academies of the organizational structure of Fraunhofer-Gesellschaft (2020) and the Fraunhofer 2024 annual report.

Fraunhofer-Gesellschaft employs 76 institutes and has a budget of EUR3.4 billion (2024). Out of this, 30 percent is through 10,000 industry contracts (70 percent of this by the SMEs), a third of this through federal and state funding, and again another third through competitive programs that enable the institutes to remain market relevant in addition to making it easier to conduct pre-competitive research. It has 200/300 mm pilot lines in its mi- croelectronics institutes (IIS, IAF, IPMS, and EMFT) that are available to 2,000 SME clients annually, photonics testbeds, and MEMS platforms [14].

University cooperation is also incorporated in 1,200 joint professorship and 40 percent of the Fraunhofer publications include academic co-authors [15]. To give an example, the Technical University of Munich mandates students to have a six-month industry internship (including with Infineon and GlobalFoundries), resulting in an 85% success rate into the 70K-90K segments [15]. The dual vocational training in Germany yields 500,000 tech- nicians a year, of which 15 percent of this number find themselves in the microelectronics industry because of three-year apprenticeship training that meets the demands of equipment maintenance, a high technology area where most other regions are experiencing shortages of 20 to 40 percent [8, 15].

Main mechanisms are: funding tied to performance; making pilot-line access available to SMEs; and annually placing 5,000 students in the indus- try. Having a rather well-developed research infrastructure, Germany is also struggling: in 2024 there were 209,000 the number of vacant STEM jobs, ver- ification engineers have been asking 20-30 percent hiring fees as due to the competition to acquire EUV and 3 nm [8]. Fraunhofer IPMS and EMFT are currently prioritizing resilient supply chains and Green ICT that can meet the needs of Bangladesh in solar power and flood sensors.

In the case of Bangladesh, CREST would be based on the applied re- search orientation of Fraunhofer by establishing joint research posts with academic institutions like BUET and DUET, building common laboratories, and establishing performance indicators based on industry partnership and employment success. The university's cleanroom proposed Phase 1 (invest- ment of 30 million USD) is a scaled-down version of the Fraunhofer pilot line model, which is around 1/100th of the cost of constructing a full-scale fabrication plant.

4. The Semiconductor Situation in Bangladesh

At present, Bangladesh has around 700 semiconductor design engineers. They are mostly located in Dhaka-based companies, including Ulkasemi, a partner in TSMC Design Alliance, and other companies that belong to the Bangladesh Semiconductor Industry Association (BSIA). They practically verify the design and implementation of engineering features, intellectual property integration, and physical designing in support of international cus- tomers. It is the activities that generate the equivalent of eight million dollars annually from exports [5].

> The collaboration of Ulkasemi with TSMC confirms the design talents of Bangladesh, the access to tools, and the availability of mentors [4]. According to the roadmap, the government is making serious strides to ensure the semi- conductor industry is committed to, and this is the reason why the National Semiconductor Taskforce was set up in January 2025 under the Bangladesh Investment Development Authority, and includes representatives of numer- ous ministries. The target established by the taskforce is also ambitious, expecting the increase of semiconductor-related exports up to $1 billion by 2030, which is over 125 times higher than the current industry levels [5].

The nation has about 50,000 engineers every year in its government and non-governmental universities. The most popular engineering schools in the country are the Bangladesh University of Engineering and Technology (BUET), Dhaka University of Engineering and Technology (DUET), and Chittagong University of Engineering and Technology (CUET), which offer good course offerings in the electrical engineering, electronics engineering, and computer science disciplines [6]. The number of engineers that young engineers deliver annually is greater than in many countries that have devel- oped semiconductor design sectors, such as Vietnam and Malaysia.

However, a huge gap still exists between general engineering education and the deep knowledge required in the areas of semiconductor design and verification. In fact, such roles typically require 6 to 18 months of further training beyond a normal electrical engineering degree, including the learning of hardware design languages (Verilog, SystemVerilog), verification (UVM) methodologies, as well as the entire electronic design automation tool cycle. This level of expertise cannot yet be found on a large scale in any of the universities in Bangladesh [7].

5. Semiconductor Value Chain Entry Points

Although the semiconductor industry is dominated by fabrication plants, the ecosystem consists of a lot of interlinked processes. This value chain can be understood so that the entry points identified can be an entry that can be developed without the need of huge capital investments. Figure 2 shows the semiconductor value chain with its focus on the segments that are characterized by lower investment intensity and that are more dependent on engineering talent.

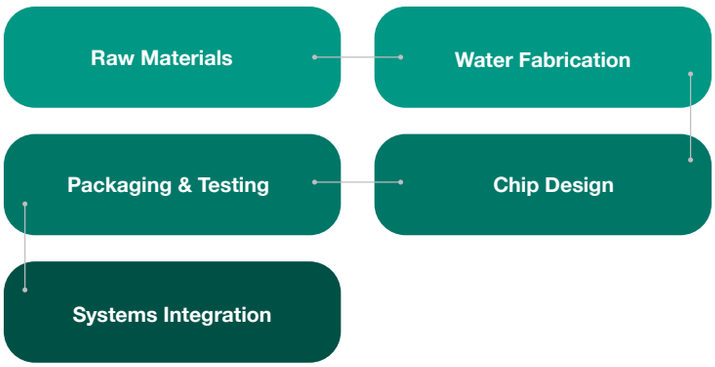


Figure 3: Value chain Semiconductor: Raw Materials, Wafer Fabrication, Chip Design, Packaging, and Testing Systems Integration. The possible entry points in Bangladesh are the segments of Chip Design and Packaging and Testing, which are more engineering- intensive rather than capital-intensive. Further development: Author adaptation of SIA- BCG value chain framework and BIDA Semiconductor Roadmap (2024).

The process that follows is Wafer Fabrication, in which integrated circuits are manufactured using elaborate sequential processes. It is the most capital- intensive phase of the semiconductor industry and needs investments of 10-20 billion dollars of leading-edge plant and 2-5 billion dollars of mature-node plant [20]. The capital demands are higher than the national budget of Bangladesh (about 15 billion a year of the development expenditure), and the necessity of qualified specialists would put additional pressure on the talent pool [5].

Chip design doesn't mean only fabricating the chips physically; it also includes planning, creating the architecture and features in the design phase. Such complicated systems are designed and verified with the help of electronic design automation tools, which are the main resources of the engineers. Due to the possibility of outsourcing design work worldwide, semiconductor firms are starting to outsource work to nations where there is a high engineering labor force. The design industry represents approximately 30-35 percent of the total workforce in the worldwide semiconductor industry, and the capital investment needs are in the millions and not billions of dollars [10].

Yearly, India churns out around 150,000 engineering graduates, and the exports of its semiconductor design industry are estimated to be near $20 billion [11].

When fabrication is done, Packaging and Testing are done. During this step, protective packages containing chips are assembled, they are connected to external interfaces, and properly tested to determine performance and re- liability. These processes are highly equipment-intensive and use cleanroom conditions, but their capital expenditures are much lower than those of fab- rication plants. An advanced outsourced semiconductor assembly and test (OSAT) system can be constructed at 100-500 million dollars and will have 500-1500 employees [12].

Malaysia has developed a strong OSAT sector, which employs 50,000 peo- ple and assembles and tests a significant share of semiconductor components worldwide [13]. The value chain structure shows that the future direction of Bangladesh will be focused on the Chip Design, Packaging, and Testing, which operate based on engineering talent and not huge capital.

6. Bangladesh Strategic Segmentation

Even the National Semiconductor Taskforce has an ambitious target of training 10,000 semiconductor professionals by 2030, which requires special- ization in various segments of the value chain [5]. The derived three segments are based on the international industry pattern and the prevailing capabilities in Bangladesh.

The most actionable segment is design and verification services (target: 60, or about 6,000 engineers), and it will capitalise on the performance and infrastructure that is already in place regarding engineering education in Bangladesh. It also states that electrical engineering graduates must undergo a 6-12-month specification program.

The design engineering capacity is created by the trend of semiconductor corporations outsourcing 40-70 percent of non-core design work to cheaper service providers in geographically proximate regions [20].

The next logical step will be packaging and testing (target: 25 or about 2,500 engineers) because the maturation of the design capabilities in Bangladesh will provide an opportunity to invest in the facilities of packaging and testing that will be required to enter the operations related to manufac- turing. This segment needs materials science expertise, thermal management expertise, mechanical reliability expertise, and automation test equipment programming expertise.

Within the Sheikh Hasina Software Technology Park, a pilot packaging and testing line, approximated to cost US$100-150 million, could be put up. This kind of facility would act as a training ground, enable the prototyping of the domestically developed chips, and create the earnings of foreign exchange [5].

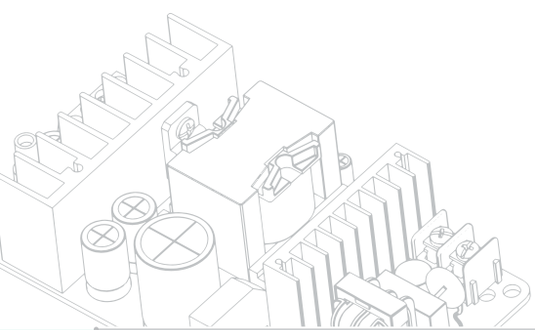
> Specialised semiconductor expertise will also be needed to serve the domestic demand of analog, power, and sensor electronics (target: 15, or about 1,500 engineers). The solar energy generation (4 GW installed) in Bangladesh would generate the demand of power electronics like inverters and charge con- trollers. Moreover, the high susceptibility of the country to natural disasters and the high level of agricultural production will stimulate the demand in the environmental sensors and IoT monitoring devices [12].

7. As a Reality and Staged Roadmap of Investment

The difference between the investment needs among the semiconductor infrastructures is quite high, as shown in Figure 5, which shows the strategic priorities of Bangladesh.

Risks of the fab-first strategy: Malaysia's US$6B mature-node effort ended up with a 30% capacity utilization because of the shortage of technicians. In fact, human capital always comes ahead of hardware. A five-year development plan that would take advantage of the US$1 billion would give a total investment of about US$500 million, which would only constitute 0.7 percent of the total development spending in Bangladesh [5]. This amount is economically sustainable, and it is like investments in high-tech parks in the past, which have reached a 95 percent occupancy [16].

The National Semiconductor Taskforce targets can be actualised under three consecutive phases of investment that have been depicted in Figure 5:



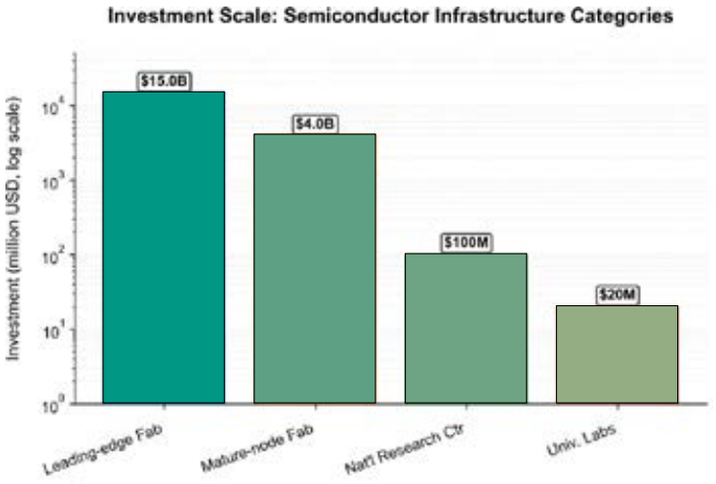


Figure 4: Comparison of investor requirements in semiconductor infrastructure on a log basis. The fabrication plants are state-of-the-art at a cost of 10 billion to 20 billion US Dollars (e.g., TSMC Arizona plant: US$12 billion, 2024) [17, 20]. Mature node fabrication plants cost between US$2 and 5 billion (e.g., Global Foundries expansions: US$2-3 billion). National research centers require funding investments ranging between US$50-200 million (e.g., IMEC cleanroom: US$80 million, 2023), and university laboratories need between US$5-20 million [18, 19].

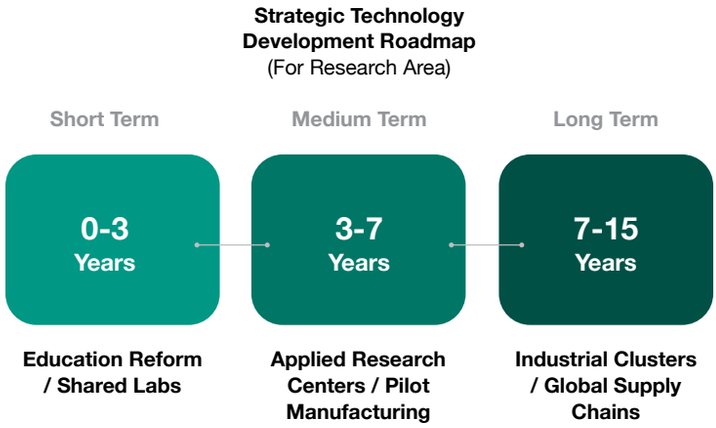


Figure 5: The semiconductor industry roadmap of Bangladesh is staged. Phase 1 (2025– 2026, US$100 million) is based on basic skills. Phase 2 (2027–2029, US$250 million) develops capacities. Phase 3 (2030, US$150 million) focuses on the export union. Statis- tics: BIDA National Semiconductor Taskforce (2024).

> A total investment of US$500M over five years represents just 0.7% of Bangladesh's development expenditure—economically sustainable and comparable to past high-tech parks [16].

8. Policy Implementation Recommendations

Four key mechanisms are essential: 1. Performance-based funding for CREST, 2. Diaspora mentoring programmes, 3. International joint venture, 4. BIDA incentives under taskforce oversight [5].

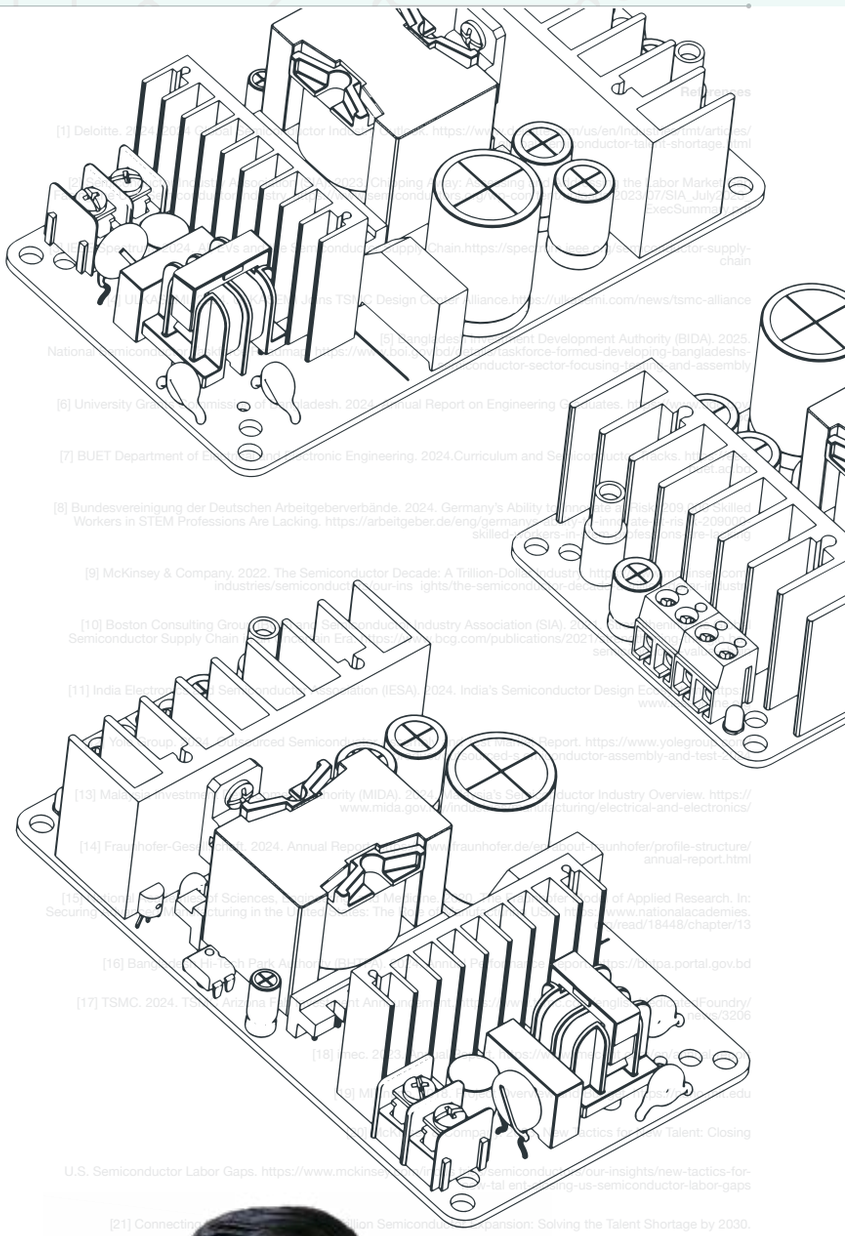
Cross-ministerial Oversight: Education, industry, and finance ministries are going to supervise the Taskforce, a practice that has been successful in Germany.

9. Conclusion

> By 2030, the world will need semiconductor revenue of US$1 trillion, which will be fueled by AI, EVs, and the IoT [1, 20]. To meet this demand, 750,000 to 1,000,000 skilled personnel will be needed in design, packaging, and testing areas [2, 22, 21].
>
> Bangladesh has 50,000 engineering graduates every year, and with a talent arbitrage, can capture market share by reskilling engineers to jobs where vacancies cause a deviation of estimated lifetime revenue of 1–2 million given up per designer [6].

The Fraunhofer model of Germany, which integrates both public and private capital with university alliances, has already facilitated the export of microelectronics to the value of EUR2.5 billion with no state-of-the-art production capability [14].

CREST and the National Semiconductor Taskforce in Bangladesh, with a phased investment of US$500 million [5], can consider this blueprint by prioritizing the creation of a workforce of 10,000 engineers within realistic segments of the value chain to reach a target of US$1 billion in exports by 2030.



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Bio

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BSIA

CREST FELLOWS

Md. Rakibul Islam Rafi
Level 3, Term 2, ECE, BUET

THE BUILDERS BENEATH THE SURFACE

Before a river becomes visible, it gathers quietly, beneath the ground, shaping its path long before anyone sees its flow. The CREST Fellows are that movement.

They are not waiting for a semiconductor ecosystem to emerge. They are already building it, layer by layer, across materials, devices, circuits, and systems. What makes them remarkable is not only their academic excellence, but their alignment with real, global technological challenges.

Each of them is working on a piece of the future, and together they form something far more powerful than a collection of individuals. They form a system.

Akif Hamid graduated in Electrical and Electronic Engineering from Bangladesh University of Engineering and Technology and currently performing as a lecturer at United International University. Akif has quickly distinguished himself through his work on next-generation memory systems. His most notable recognition is his advanced research contribution in electro-thermal modeling of resistive memory devices, where he collaborates closely with leading researchers in the field.

He is currently engaged in research and development work focused on emerging memory technologies, and within CREST he is guided by Dr. Sadid Muneer working on RRAM device physics and modeling. His research explores how memory devices behave under real electrical and thermal conditions, revealing that memory is not static storage but a dynamic system shaped by heat, electric fields, and atomic motion. In simple terms, he is uncovering how memory truly works under stress, which is essential for reliable AI hardware and future computing systems.

Junaid Jalal graduated from Bangladesh University of Engineering and Technology with a strong academic record and is currently serving as a lecturer at BRAC University while pursuing his graduate studies. His recognition includes leadership roles in national VLSI competitions and advanced research contributions in spintronic devices. Within CREST, he is mentored by Dr. A.B.M. Harun-ur Rashid in low-power device design and emerging memory systems.

His research focuses on voltage-controlled magnetic tunnel junctions and the development of true random number generators. These devices use physical phenomena to produce genuine randomness, which is essential for secure communication and trustworthy computing. In simple terms, he is building hardware that ensures systems remain secure at their most fundamental level.

Ishmam Hossain completed his undergraduate studies at North South University with distinction and continues his graduate work in electrical and electronic engineering. His academic excellence is reflected in his full merit scholarship and top-tier performance. He is currently working as a lab instructor and researcher, actively contributing to computational materials science. Within CREST, he is advised by Dr. Nafisa Noor focusing on quantum modeling and next-generation semiconductor materials.

His work uses quantum mechanical simulations to predict how new materials behave before they are ever fabricated. He studies materials such as graphene and other two-dimensional systems to determine whether they can replace silicon. In simple terms, he is helping decide what the future of electronics will be made of.

Md. Shajol Al Mamun completed his studies at Bangladesh University of Engineering and Technology and is currently pursuing advanced research in silicon photonics. His work has gained recognition for addressing one of the most critical challenges in modern computing, which is data movement at scale. Within CREST, he is guided by Dr. Zabir Ahmed working on photonic integration and high-speed interconnects.

His research focuses on wavelength-division multiplexing transmitters using micro-ring modulators and advanced filtering techniques. These systems allow massive amounts of data to be transmitted using light instead of electricity. In simple terms, he is building ultra-fast communication pathways that future AI systems will depend on.

K. M. Mehedi Hassan graduated from Khulna University of Engineering and Technology and has established himself through his research publication in a high-impact journal in computational materials science. His current work involves advanced simulation of materials for energy applications, and within CREST he is guided by Dr. Khairul Alam working on device physics and materials modeling.

His research uses first-principles methods to understand how materials behave under strain and how that affects their ability to support energy-related processes such as hydrogen generation. In simple terms, he is designing materials that can improve how we generate and use energy, connecting electronics with sustainability.

Afsana Anjum Akhi graduated from the University of Dhaka with outstanding academic performance, ranking at the very top of her class, and is currently pursuing her master's degree while working as a graduate research assistant. Her highest recognition includes the IEEE Electron Devices Society Masters Fellowship and national-level research awards. Within CREST, she is guided by Dr. Mainul Hossain in nanoelectronics and sensing technologies.

Her research focuses on advanced transistor-based sensors using two-dimensional materials, negative capacitance devices, and GaN-based architectures. Her work demonstrates how transistors can be transformed into highly sensitive detectors capable of identifying extremely small environmental and biological signals. In simple terms, she is redefining the role of a transistor from a switch into a sensing platform.

Priyanka Das graduated from Rajshahi University of Engineering and Technology with distinction and is currently pursuing her graduate studies while serving as a teaching assistant at BRAC University. Her recognition includes published research in photonic biosensors and strong contributions to applied sensing technologies. Within CREST, she is advised by Dr. Touhidur Rahman working on photonics and biomedical sensing.

Her research focuses on photonic crystal fiber sensors that use light to detect biological markers such as glucose levels and disease indicators. In simple terms, she is building systems that can detect health conditions early and non-invasively, using light as a precise sensing tool.

Sheikh Tariful Islam is currently a student of Bangladesh University of Engineering and Technology with strong interdisciplinary exposure and working on integrated system design involving sensing, computation, and communication. His recognition comes from his diverse project portfolio spanning RF systems, embedded platforms, and intelligent sensing applications. Within CREST, he is guided by Dr. A.B.M. Harun-ur Rashid focusing on system-level integration and applied electronics.

His work connects different components into cohesive systems that interact with the real world. In simple terms, he builds systems that sense, process, and respond, bringing intelligence closer to everyday applications.

Md. Khalid Hossain is also an undergraduate level student from Bangladesh University of Engineering and Technology and has built a strong foundation in VLSI design through hands-on experience. His most significant achievement is contributing to a RISC-V based integrated circuit that has been submitted for fabrication. He is currently continuing his work in chip design and development, and within CREST he is advised by Dr. A.B.M. Harun-ur Rashid in VLSI design and semiconductor manufacturing.

His work spans the full design flow from hardware description to physical layout, ensuring that ideas can be translated into real chips. In simple terms, he takes designs from concept to something that can actually be built.

Md. Sharif Uddin graduated from Bangladesh University of Engineering and Technology with excellent academic standing and has demonstrated strong capability in circuit design and system modeling. His recognition includes academic scholarships and high-performance project work. Within CREST, he is guided by Dr. Md. Shofiqul Islam working on neuromorphic computing and emerging architectures.

His research focuses on memristor-based crossbar arrays and systems where computation occurs directly within memory. In simple terms, he is working on computers that behave more like the human brain, where memory and processing are intertwined.

What makes the CREST Fellows extraordinary is not simply their individual achievements, but how they collectively span the entire semiconductor landscape.

From materials discovery to device physics, from circuit implementation to system integration, and from sensing to communication, they form a complete and coherent structure.

This is not a pipeline waiting to be built. It is already flowing. And this is how ecosystems begin.

Bio

Md. Rakibul Islam Rafi

Bangladesh University of Engineering and Technology (BUET)

Md. Rakibul Islam Rafi, a current undergraduate level student at Bangladesh University of Engineering and Technology. I am passionate about research in semiconductor device physics for the application of advanced communication systems. I love to explore innovative solutions integrating advanced electronics, signal processing, and energy-efficient technologies for next-generation applications.


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PRIYANKA DAS
BRACU
Fun Fact:
Easy works don't thrill Priyanka. E... in her leisure, she ... doing challenging ... which requires ... like - knitting.


Inauguration of


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BUILDING TECHNOLOGY

WHERE IT MATTERS MOST

Ashiqur Tanim
CEO, THiNK

Every technology ecosystem begins with a few people who believe that their country should be capable of building its own solutions.

Long before large investments or national strategies emerge, progress often starts quietly inside small laboratories where engineers are trying to turn ideas into real devices.

When we started THiNK in 2019, the ambition was not simply to build products. It was to test a belief that Bangladeshi engineers could design and develop advanced electronics and embedded systems for the problems we face every day. At the time, most of the technology used in the country was imported or assembled from foreign designs. Original engineering was rare, even though the need for local solutions was everywhere.

Our early attempts in consumer electronics taught us an important lesson very quickly. Competing directly with imported products while depending on imported components is extremely difficult for a young company investing in original engineering. The takeaway was not that local innovation could not work, but that it required a different approach to survive.

That realization led us toward research driven engineering.

Over time, THiNK has evolved into a truly multidisciplinary engineering and research environment, bringing together electrical and electronics engineers, ECE and ETE specialists, mechanical engineers, computer scientists, as well as domain experts from fields such as entomology and agriculture. This diversity allows us to approach problems not just from a technical standpoint, but with a deep understanding of the environments and systems we are designing for. Our work spans far beyond conventional embedded development. We have created a wide range of original technologies and intellectual property, including battery and power management systems, memory and communication architectures, inverter and motor control systems, sensor development platforms, acoustic and signal based technologies, and complex mechanical and electro mechanical systems. Each solution is developed from the ground up, often in response to challenges that have no existing off the shelf answer. This approach has enabled us to build a portfolio of unique, locally engineered products and technologies that reflect both technical depth and real world relevance.

When this capability is applied to real world problems, its value becomes more tangible.

One such example is Moshar Machine, a mosquito control system developed entirely in Bangladesh. Mosquito borne diseases remain a recurring public health challenge, affecting millions of people every year. Families live with the constant concern of outbreaks, particularly during the monsoon season.

> Instead of adapting foreign solutions designed for different environments, we built a system specifically for Bangladesh's conditions. The machine uses a photocatalytic process to generate trace carbon dioxide, attracting mosquitoes without relying on harmful chemicals.

Independent studies conducted by entomologists have produced striking results. In one comparative field test in Dhaka, a single Moshar Machine captured more than twenty two thousand mosquitoes in one week. In the same study, internationally sourced traps deployed nearby captured only a handful.

For the team that built it, this was more than a performance metric. It was proof that local engineering, when applied with context and care, can outperform imported solutions. But it also leads to an important question. If a locally developed technology can demonstrate this level of effectiveness against a major public health challenge, why are we not seeing it deployed at scale?

This is not a question of criticism, but of reflection. In emerging ecosystems, innovation often moves faster than the frameworks required to adopt it. Yet the benefits of supporting domestic technology are clear and far reaching.

> Locally engineered solutions come with immediate serviceability. They can be maintained, improved, and adapted without dependence on distant suppliers. They reduce the need for foreign currency outflow and create opportunities for export in markets facing similar challenges. Most importantly, they build confidence. Confidence that solutions can be designed and built within the country.
>
> Bangladesh today has a generation of engineers who are capable, motivated, and ready to build. What they need is an ecosystem that allows their ideas to move beyond prototypes into real world deployment.

Companies like THiNK operate in a critical layer of this ecosystem. Embedded systems and hardware platforms translate semiconductor enabled technologies into tools that industries, governments, and communities can use. This is where technology becomes real.

The story of Bangladesh's deep technology sector is still being written. It is not defined by limitations, but by potential waiting to be realized. With the right alignment between industry, policy, and talent, the country has the opportunity to build not just products, but a sustainable innovation ecosystem.

Because in the end, a nation's technological strength is not defined by what it imports. It is ultimately defined by what it learns to create.

Bio

Ashiqur Tanim
CEO, THiNK

Ashiqur Tanim is Founder and CEO of THiNK and a Director of BSIA. He leads multidisciplinary R&D across embedded systems, industrial IoT, semiconductor design services, and climate technologies, while contributing to Bangladesh's technology ecosystem through innovation, capability development, and indigenous engineering solutions.

THE EXPLOSIVE PURSUIT FOR ENERGY EFFICIENCY IN ELECTRONICS

Sayeef Salahuddin
tSMC Distinguished Professor, EECS, University of California, Berkeley, USA

Modern computing is approaching a critical inflection point driven by the explosive growth of artificial intelligence workloads. In 2023, Google's data centers alone consumed approximately 24 TWh of electricity.

Globally, data centers consumed around 415 TWh in 2024, and projections suggest this figure could reach 945 TWh by 2030, representing nearly 3% of all global electricity consumption.

At the rate of ~30.29 cents/kW-h, this translates to roughly 286 billion dollars. While data centers pay a much cheaper rate, this still projects to a staggering number.

Assuming the traditional rate of increase of power consumption in AI accelerators, this means that, indeed, just the electricity bill of running the data centers could reach a few hundred billions of dollars per year over the next decade.

The energy burden falls into two compounding categories:

First, the compute block: transistors have historically shrunk under Moore's Law, but the ability to reduce supply voltage has stalled.

Second, the memory transaction: accessing DRAM today costs approximately 50 picojoules per bit, while a single arithmetic operation costs only ~50 femtojoules — a 1000x asymmetry. Much of this energy is lost in communication paths outside the chip, and access times remain stuck at ~30 ns with limited bandwidth.

Breaking through the energy wall requires simultaneously solving three interconnected challenges:

(i) running logic devices at fundamentally lower energy and voltage;

(ii) shrinking devices further while maintaining performance; and

(iii) enabling access to more memory with dramatically lower power and latency.

These are not incremental engineering problems — they require new physics. Dennard scaling, which once promised simultaneous shrinking and power reduction, broke down around 2007.

Among various research trajectories that are being explored to address these challenges, Two technologies rooted in new physics of ferroelectric materials offer a credible path forward. The first is negative capacitance (NC) transistors.

Proposed by Salahuddin and Datta in 2008, NC-FETs integrate a ferroelectric layer into the transistor gate stack that — through internal voltage amplification — effectively allows the transistor to sense more gate voltage than is externally applied. Critically, ferroelectricity has now been demonstrated in ultra-thin binary oxides (HfO2-ZrO2 superlattices at sub-nm scales), and these materials are fully CMOS-compatible — meaning NC-FETs can be manufactured on existing semiconductor processes without new infrastructure.

The second technology is embedded ferroelectric memory (FeFET/eFRAM). Ferroelectric field-effect transistors store data as polarization state in a ferroelectric gate layer, requiring no static current for retention.

Unlike DRAM, which consumes continuous refresh energy, FeFETs maintain their state with zero DC power draw and can. Embedded directly in logic chips, ferroelectric memory dramatically shortens the data path and eliminates most of the off-chip communication energy that dominates today's 50 pJ/bit memory access cost. FeFET arrays are also being explored for in-memory and neuromorphic computing, where computation happens at the storage site — further collapsing the memory-compute energy gap.

Together, negative capacitance transistors and embedded ferroelectric memory address both sides of the energy wall: reducing the cost of each logic operation below thermodynamic limits previously thought inviolable, and slashing the energy penalty of memory access through tighter integration and non-volatile storage.

Continued materials research — particularly on HfO2 dopant engineering, ferroelectric reliability, and device-level integration — will determine how quickly these technologies can move from laboratory demonstrations to at-scale deployment.

Bio

Sayeef Salahuddin
tSMC Distinguished Professor, EECS
University of California, Berkeley, USA

Dr. Sayeef Salahuddin is the TSMC Distinguished Professor of Electrical Engineering and Computer Sciences at UC Berkeley. A pioneer of negative capacitance devices, his research redefines energy-efficient electronics. A BUET graduate and Purdue PhD, he leads innovations in next-generation logic, memory, and low-power computing systems.

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BEAR SUMMIT 2025

When Bangladesh Declared Its DeepTech Future

Mohammed Towhiduzzaman,
MD. Tasfique Noor
M K Fahim Shahariar
Zahid Hasan

In mid-July 2025, within the National Science and Technology Complex in Agargaon, Dhaka, Bangladesh did something rare in the modern technological era.

It did not simply gather to discuss the future. It paused, reflected, and then chose to define it.

The Biotech, Electronics, AI, and Robotics (BEAR) Summit 2025, alongside the National Semiconductor Symposium, became a moment where vision converged with realism, and aspiration encountered structure.

Over two days, Bangladesh brought together students, professors, policymakers, entrepreneurs, global semiconductor executives, and diaspora experts into a shared space—not merely to speak, but to align.

What emerged was not an event. It was a transition.

The Dhaka Declaration: Technology as Sovereignty

At the center of this transition stood a defining articulation—the Bangladesh Declaration: A New Chapter in Deep Tech Sovereignty.

This was not drafted in abstraction. It was read aloud, sequentially, by leaders representing academia, industry, and government—a symbolic act of shared ownership.

The declaration established a philosophical and operational foundation:

- Bangladesh will engage in BEAR—Biotech, Electronics, AI, and Robotics—not as a follower, but as a sovereign participant in global innovation
- The semiconductor and deep-tech ecosystem will be people-centric, ensuring national benefit through employment, dignity, and economic growth
- A structured national mission will build 20,000 BEAR professionals by 2030, integrating global expertise with local accessibility
- All innovation systems will operate under transparent governance, measurable outcomes, and environmental responsibility
- Global partnerships will be welcomed—but governed by fairness, reciprocity, and shared risk
- Intellectual freedom will be preserved as a core enabler of innovation
- The movement is anchored in Bangladesh's historical trajectory—from language to liberation to reform—linking technology with national identity

This declaration did something profound. It repositioned technology not as an industry, but as an instrument of sovereignty.

A Nation Assembles Itself

The scale of participation reflected a country not observing change, but preparing to lead within it.

- Over 2,500 participants across students, faculty, industry, and government
- More than 300 project demonstrations spanning AI, robotics, health technologies, and IoT
- Representation from over 30 universities
- Engagement from global semiconductor leaders and diaspora experts
- Participation from all major local semiconductor entities

But beyond numbers, what stood out was composition. The ecosystem was not fragmented. It was present—fully.

Artificial Intelligence: Between Disruption and Design

The AI panel discussions were among the most urgent.

They began with a stark acknowledgment: Bangladesh's economic model—built on labor-intensive industries—is highly exposed to automation and generative AI disruption.

Key structural challenges identified:

- A significant proportion of manual and semi-skilled jobs at risk
- Nearly one-third of youth disconnected from education, employment, or training
- Over half of employed youth working in roles misaligned with their academic preparation

However, the panel did not remain in diagnosis. It moved toward structured response. Strategic Recommendations from the AI Policy and Governance Panel

- Develop a comprehensive national AI policy incorporating ethics, governance, and legal safeguards
- Establish regulatory bodies and oversight mechanisms to manage misuse, including deepfakes and misinformation
- Build national AI infrastructure, including data centers and cloud platforms
- Integrate AI into public services such as healthcare, agriculture, and governance

Launch nationwide awareness and literacy programs to prepare citizens for AI interaction.

Education Reform Recommendations

- Introduce AI concepts progressively, beginning with logic, mathematics, and reasoning rather than technical jargon
- Strengthen STEAM education across all levels
- Implement AI-driven personalized learning systems
- Promote lifelong learning and continuous reskilling

The overarching realization was clear: AI is not a sectoral upgrade—it is a system-wide transformation.

AI Talent Development: Building the Pipeline

The talent panel revealed a paradox. Bangladesh possesses strong academic foundations, yet lacks alignment between education and industry needs.

Core Challenges Identified

- Limited access to high-performance computing infrastructure
- Insufficient teacher training for AI-integrated education
- Overly theoretical curricula lacking problem-solving emphasis
- Fragmentation between academia, industry, and policy

Actionable Recommendations

- Build a coordinated national AI talent pipeline from school to industry
- Invest in GPU infrastructure and high-performance computing labs
- Develop teacher training programs with incentives and flexibility
- Encourage industry-funded research labs and co-supervised student projects
- Leverage diaspora for mentorship, curriculum design, and global exposure

The emphasis shifted from producing graduates to producing capable contributors.

AI Investment and Startups: Unlocking the Economic Layer

The startup discussions reflected both optimism and structural gaps.

Key Barriers

- Limited availability of deep-tech-aware investors
- Weak venture capital ecosystem
- Lack of startup exits, reducing investor confidence
- Regulatory inefficiencies
- Insufficient risk-tolerant capital

Recommendations from the Panel

- Develop AI-savvy investor networks and training programs
- Establish government-backed funding pools, potentially exceeding $1 billion in scale
- Transition toward a fund-of-funds model to catalyze venture capital ecosystems
- Promote sector-specific AI innovation, particularly in agriculture, logistics, and finance
- Enable voice-based and inclusive AI interfaces to expand adoption

The panel emphasized that AI reduces the cost of entrepreneurship—but scaling requires capital intelligence.

Cybersecurity: Building a Defensive Architecture

Cybersecurity discussions revealed a system in evolution.

Identified Challenges

- Shortage of trained cyber professionals
- Fragmented incident response systems
- Lack of coordination between law enforcement and technical experts
- Limited public awareness
- Absence of streamlined reporting mechanisms


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ICT


EDGE
BEAR SUMMIT
AND NATIONAL
SEMICONDUCTOR


EDGE


58%
21%
18%
Digital & AI


ICT


EDGE

Strategic Recommendations

- Establish a one-stop national cyber response system integrating technical and legal capabilities
- Expand cybersecurity education programs, including undergraduate and postgraduate degrees
- Develop regional cybersecurity centers across the country
- Introduce online FIR systems for cybercrime reporting
- Promote nationwide cyber hygiene awareness program

The panel also emphasized the need to develop offensive cyber capabilities, recognizing that modern cyber defense requires proactive strategies.

Biotechnology: Aligning Science with Systems

The biotechnology discussions were among the most technically rich and structurally revealing.

Core Barriers

- Lack of fabrication facilities for biosensors and lab-on-chip systems
- Fragmented biological and health data
- Absence of national research coordination
- Regulatory barriers in medical device development
- Limited industry-academia collaboration

Panel Recommendations

- Establish a National Biotech Innovation Institute with global and diaspora participation
- Create an inter-ministerial coordination body to align health, agriculture, and industry
- Build small-scale fabrication facilities for bioelectronics and diagnostics
- Develop national electronic health record systems and data platforms
- Introduce AI governance frameworks for healthcare technologies
- Enable contract manufacturing pathways for medical device startups

Biotechnology was positioned not as a niche field, but as a pillar of national resilience and sustainability.

Robotics: Completing the Innovation Cycle

Robotics discussions revealed a clear gap between research and deployment.

Key Challenges

- Lack of local manufacturing for sensors, actuators, and controllers
- Dependence on imported hardware
- Limited industrial integration expertise
- Insufficient research funding and PhD-level programs

Recommendations

- Develop local manufacturing capabilities for robotics components
- Establish national robotics research cells and funding programs
- Create integration teams to reduce deployment costs
- Promote multi-robot systems for disaster response and agriculture
- Enable industry partnerships for commercialization

The panel emphasized that robotics must be viewed as a system-level capability, not just a technological artifact.

Semiconductors: From Possibility to Pathway

The semiconductor discussions brought strategic clarity.

Challenges Identified

- Limited fabrication infrastructure
- Gaps in advanced curriculum and training
- Shortage of experienced faculty
- Weak industry-academia linkage


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Strategic Recommendations

- Establish centralized facilities for design, testing, and MPW access
- Launch nationwide training programs with global tool providers
- Promote inter-university collaboration
- Encourage startup and IP ecosystem development
- Develop secure labs for defense and dual-use technologies

The message was clear: Bangladesh must build a coordinated, scalable semiconductor ecosystem.

Global Semiconductor Leaders: A Moment of Alignment

As the summit transitioned into its global reflection session, the atmosphere shifted. The room, filled with students, policymakers, and researchers, grew quieter—not out of formality, but attention.

This was no longer about aspiration. It was about alignment with reality.

Dr. Anisul Khan, former Vice President of Applied Materials, opened with a tone that was both measured and firm. "We already have the roadmap," he stated. "Now the question is—can we execute? Not in theory, but with discipline. Every initiative must be evaluated with clear go or no-go metrics." Coming from a company that sits at the heart of global semiconductor manufacturing, his words carried institutional weight. This was not encouragement—it was expectation.

That perspective was reinforced by Patrick Wilson, Corporate Vice President of MediaTek. "You must understand your competitive positioning," he noted. "Not just what you have—but what others have that could pull investment away from you."

He pointed to something deeper than infrastructure or policy—leadership alignment. Referencing global semiconductor success stories, he emphasized that transformation requires commitment from the highest levels of national leadership. He also highlighted the importance of expanding participation across demographics, noting that diversity strengthens innovation capacity.

The discussion sharpened further with Jin Lim, Corporate Vice President of SK hynix. "You already have three of the four pillars—talent, R&D, and incentives," he said. "The missing one is infrastructure." He spoke in precise, industrial terms:

- Continuous, high-capacity power
- High-speed digital connectivity
- Logistics capable of supporting manufacturing scale

Without these, he made clear, semiconductor ambition cannot translate into production reality.

As the conversation evolved, Dr. Asim Shatil Haque, Chief Technology Officer of Enovix, shifted the focus toward talent depth. "The world does not need more generic programmers," he said. "It needs system architects—people who understand how everything connects." He emphasized the need to cultivate individuals who can operate across layers of abstraction—from materials to systems—transforming Bangladesh's workforce from task-oriented to design-driven.

Then, Fumitoshi Ito, Vice President of Technology Development at SanDisk, expanded the conversation to value creation across the semiconductor chain. "If you participate across the full cycle—from design to packaging to delivery—you create feedback loops," he explained. "That is how you build ownership and accelerate innovation." He proposed a model where universities and industry form integrated "product squads," enabling ideas to move from concept to deployment within a unified system.

Strategic sequencing came into focus with Vaidya Bharadwaj, Vice President at Tokyo Electron.

"You do not start at the most advanced nodes," he said. "You begin where you can compete—mature, high-volume technologies. Build credibility there. Then expand." It was a reminder that success in semiconductors is not about ambition alone, but about entry strategy and timing.

Finally, Dr. Mahbub Rashed, Vice President at GlobalFoundries, brought the discussion back to talent—this time with technical specificity. "We need semiconductor-trained engineers," he emphasized. "Not just graduates, but individuals who understand design, memory, RF, packaging, and system integration together." He outlined critical domains for Bangladesh's future capabilities:

- Memory systems and edge-AI architectures
- RF and millimeter-wave technologies
- Silicon photonics and heterogeneous integration
- Ultra-low-power and near-threshold design


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University of Liberal Arts
Bangladesh


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BSIA


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But his most important point was structural. “This cannot happen in silos,” he concluded. “Government, academia, and industry must move together. That is how talent becomes capability.”

From Guidance to Expectation

What emerged from this session was not a collection of opinions, but a convergence of experienced judgment.

Across different companies, geographies, and roles, the message aligned:

- Execution must be disciplined and measurable
- Infrastructure must match industrial standards
- Early success requires focused specialization
- Talent must evolve from volume to depth
- Value lies in full-chain participation
- Intellectual property must be treated as a national asset
- Speed of decision-making must increase

These were not theoretical recommendations. They were distilled from decades of building, scaling, and competing at the highest levels of the semiconductor industry.

In that moment, the summit reached a turning point. The vision had been articulated. The gaps had been identified. The expectations had been set. What remained was execution.

Conclusion: From Declaration to Discipline

The BEAR Summit 2025 did not end with applause. It ended with clarity. Bangladesh now understands:

- Where it stands
- What it lacks
- What it must build

> The summit transformed ambition into structure, and structure into expectation. The declaration has been made. The roadmap has been reinforced.
>
> The recommendations are explicit. What remains is execution—disciplined, sustained, and aligned. Because in deep tech, momentum is fragile. But when sustained, it becomes transformation.

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BSIA SIGNS CONTRACT WITH SICIP

TO TRAIN 3,500 SKILLED PROFESSIONALS FOR BANGLADESH'S SEMICONDUCTOR SECTOR

Dhaka, Bangladesh | 17 February 2026

The Bangladesh Semiconductor Industry Association (BSIA) has signed a contract today with the Skills for Industry Competitiveness and Innovation Program (SICIP) at the SICIP office in Dhaka to implement a large-scale, industry-oriented semiconductor workforce development program. Mr. Mohammed Walid Hossain, Executive Project Director of SICIP, and Mr. M A Jabbar, President of BSIA, signed the contract on behalf of their respective organizations.

> Under this contract, BSIA will train 3,500 graduates from EEE, ECE, CSE, Applied Physics and other relevant disciplines, through six specialized courses.

The courses are: IC Design & Layout Engineering, Advanced Physical Design Program: RTL to GDSII, DFT and Verification Engineering Program for ASIC Designers, Applied Semiconductor Systems: Power Devices and Industrial Integration, Smart Systems Engineering: Embedded Design and Semiconductor Application Interfaces, and Packaging and Testing. Each course will be conducted for three months (240 hours). According to the contract, the total cost of the program is BDT 35.14 crore, and the implementation period is from February 2026 to December 2028.

Speaking on the occasion, SICIP Executive Project Director Mr. Mohammed Walid Hossain emphasized the importance of ensuring high-quality training delivery, strong monitoring throughout implementation, and achieving at least 65% job placement of certified trainees in line with the program's objectives. He expressed confidence that the partnership with BSIA, supported by robust oversight and industry linkage, will produce competent professionals who can contribute meaningfully to Bangladesh's growing semiconductor ecosystem and also will be ready for global market.

BSIA President Mr. M A Jabbar expressed his gratitude to SICIP and thanked all concerned officers from both organizations who contributed to making the initiative a reality. He noted that the agreement marks a significant milestone for Bangladesh's semiconductor ecosystem and will help create a critical mass of skilled manpower to support the growth of advanced electronics and semiconductor services, strengthen industry readiness, and enhance Bangladesh's competitiveness in the global semiconductor value chain.

Among others, Mr. Mahfuzul Alam Khan-Additional Secretary DEPD (Program Management), Mr. Manjur Alam Prodhan, Joint Secretary DEPD (Program Management), Ms. Amina Fahmeen, Joint Secretary DEPD (Program Management), Mr. Myenul Hasan, DEPD (Fund Management), Mr. Mohammad Afzal Hossain, AEPD (Program Management), Deputy Secretary and focal point of SICIP for BSIA, along with other senior officials, were present at the signing ceremony. Alongside, Sr. Vice President of BSIA Mr. M E Chowdhury Shameem, Director of BSIA Mr. Munir Ahmed, and Mr. Hashim Ahmed, Secretary, BSIA were present from BSIA.

It may be mentioned here that SICIP is being implemented under the Finance Division of the Ministry of Finance, with financial support from the Government of Bangladesh and the Asian Development Bank (ADB).

SILICON RIVER

BSIA
BANGLADESH SEMICONDUCTOR INDUSTRY ASSOCIATION

SILICON RIVER: 15 CRITICAL FACTS

BANGLADESH'S JOURNEY TOWARD A SEMICONDUCTOR FUTURE

1 

SEMICONDUCTOR

A semiconductor enables precise control of electrical conductivity, forming the foundation of modern electronics.

2 

TRANSISTORS

Transistors, built from semiconductors, act as the fundamental switches of digital systems.

3 

BINARY LOGIC

1 represents ON and 0 represents OFF. This binary logic powers all computing.

4 

65+ YEARS

Semiconductor technology has evolved over more than six decades.

5 

$650B INDUSTRY

The global semiconductor industry is valued at approximately 650 billion dollars.

6 

EVERY DEVICE

Every modern electronic system depends on semiconductor technology.

7 

4 KEY PILLARS

The ecosystem spans design, manufacturing, packaging, and supply chain integration.

8 

3,000+ NRBs

Over three thousand Non-Resident Bangladeshis contribute across the global semiconductor ecosystem.

9 

GLOBAL LEADERSHIP

Bangladeshi-origin professionals hold leadership roles in major semiconductor companies worldwide.

10 

BSIA ECOSYSTEM

BSIA includes fifteen companies generating over 10 million dollars in revenue and employing more than 1,200 engineers.

11 

4 NATIONAL INITIATIVES

BASICS, STAR, CREST, and BOOST were established within a year to build foundational capability.

12 

UNIVERSITIES DRIVE INNOVATION

Universities are central to semiconductor advancement through research, talent development, and technology transfer.

13 

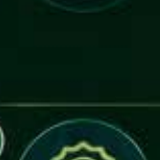
NRB PROFESSORS

More than 30 Bangladeshi-origin professors are contributing to semiconductor research across leading U.S. universities, including seven at the top five graduate engineering institutions, according to the U.S. News 2026 rankings.

14 

FOUNDATIONAL RESEARCH

Research contributions by BUET alumni Professors Muhammad Ashraful Alam, Muhammad Mustafa Hussain, and Sayeef Salahuddin have advanced reliability, high-performance, and energy-efficient computing, respectively, with global impact over the past 25 years.

15 

GLOBAL RECOGNITION

Students from the University of Dhaka, including recipients of the prestigious IEEE Electron Devices Society fellowships, reflect a growing global semiconductor talent pipeline.

Silicon River, together with initiatives such as the BEAR Summit, Silicon River Magazine, and BSIA global engagements, reflects Bangladesh's emergence as a coordinated, innovation-driven semiconductor ecosystem.

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JULY 25–26, 2026

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BEAR 2026 Bangladesh

The Bangladesh Semiconductor Industry Association (BSIA), in partnership with the Export Promotion Bureau (EPB) of Bangladesh, participated for the first time in history as an exhibitor at the **SEMICON SEA 2026**, which was held at the Malaysia International Trade and Exhibition Centre (MITEC) from **May 5–7, 2026.**

BANGLADESH PARTICIPATED FOR THE 1ST TIME AT SEMICON SEA 2026 IN MALAYSIA

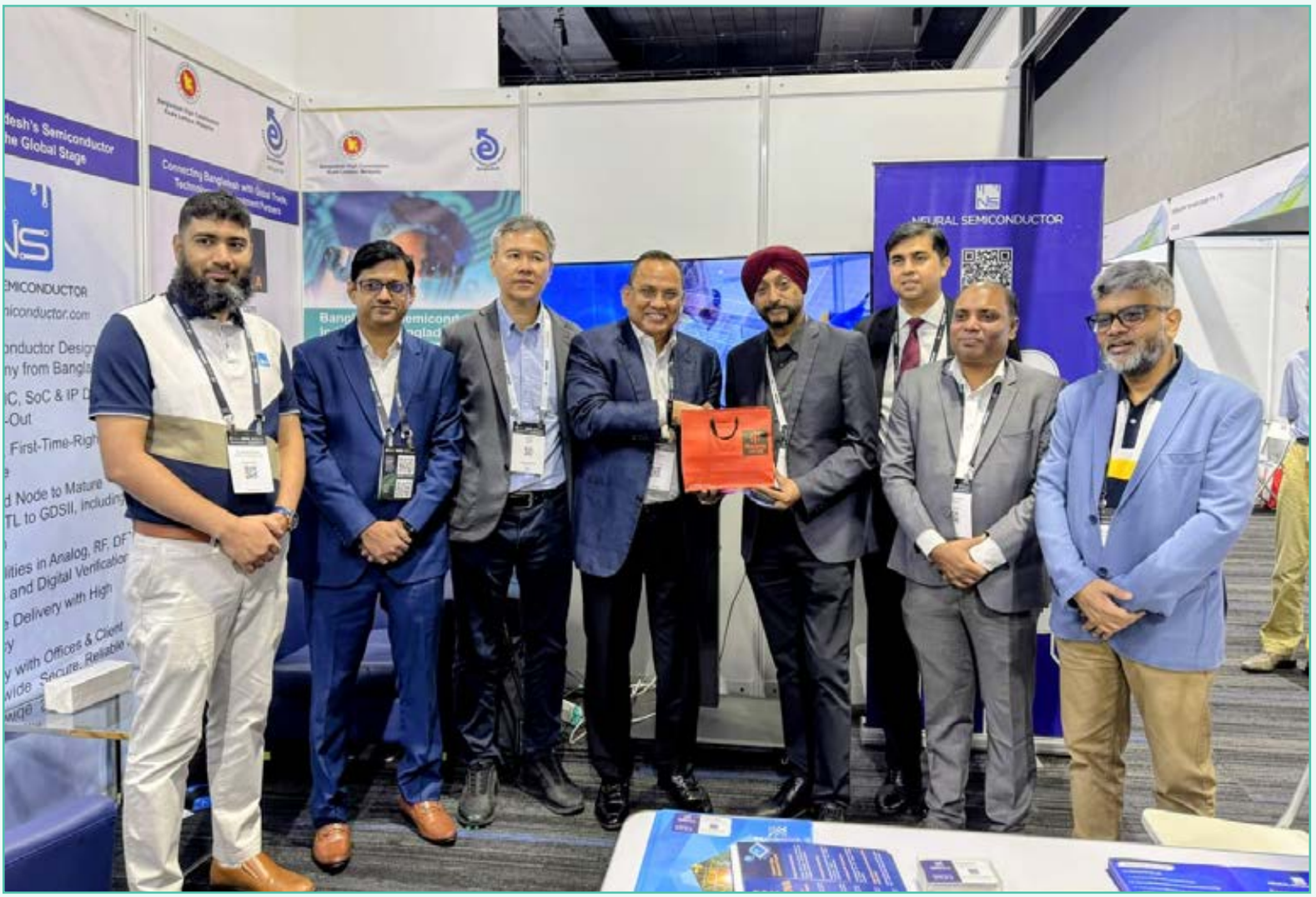
Three BSIA member companies—Prime Silicon Technology Limited, Neural Semiconductor Limited, and Siliconova Limited—showcased their products, technologies, and services at the international exhibition, representing Bangladesh's growing capabilities in the semiconductor and advanced technology sectors.

H.E. the High Commissioner of Bangladesh to Malaysia, Mr. Manjurul Karim Khan Chowdhury, visited the BSIA booth along with officials of the Bangladesh High Commission. During the visit, he expressed high satisfaction over Bangladesh's participation in SEMICON SEA 2026 and appreciated the initiative taken by BSIA and the participating companies to showcase Bangladesh's semiconductor potential on a global platform.

He also thanked the exhibitors and BSIA for taking this important initiative to promote Bangladesh's emerging semiconductor industry internationally.

Welcoming the High Commissioner, Mr. M. A. Jabbar, President of Bangladesh Semiconductor Industry Association, expressed gratitude for the continuous support extended by the Bangladesh High Commission in Malaysia. He stated that although BSIA representatives had previously attended SEMICON SEA as visitors, this marked the first-ever participation of Bangladesh as an exhibitor at the prestigious global semiconductor event.

> "We believed this was the beginning of a new journey for Bangladesh's semiconductor industry. Through this platform, we hoped to attract global semiconductor companies to explore investment opportunities in Bangladesh and build meaningful international partnerships," he added.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Where Innovation Meets Precision
BSIA

A GLIMPSE INTO THE FUTURE OF SILICON RIVER

SOUTH KOREA ROADSHOW

By Munir Ahmed

For decades, the semiconductor industry has been shaped by nations that combined long-term vision, disciplined execution, industrial coordination, and relentless investment in talent. South Korea stands as one of the clearest examples of such transformation. Visiting this ecosystem therefore carried significance beyond technical discussions. It offered an opportunity to observe, learn, and begin building relationships with institutions and companies that helped shape one of the world's most advanced semiconductor economies.

> Throughout the roadshow, one theme became increasingly clear. The global semiconductor industry is evolving rapidly under the pressure of artificial intelligence, advanced packaging, heterogeneous integration, memory-centric architectures, and increasingly complex supply chains.

As this transformation accelerates, opportunities are emerging not only for established players, but also for new ecosystems capable of developing talent, enabling innovation, and supporting future infrastructure.

> The Bangladesh Semiconductor Industry Association (BSIA)'s South Korea Roadshow was not simply a series of meetings, presentations, or ceremonial engagements. It represented something deeper: an early glimpse into how Bangladesh may gradually position itself within the evolving global semiconductor ecosystem.

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The delegation's engagements reflected this broader context.

One of the most memorable moments of the roadshow was the opportunity to visit SK hynix's advanced packaging facilities. Such access is rarely provided to foreign visitors and is often restricted even internally. The visit offered direct exposure to the realities of AI-era semiconductor infrastructure: packaging density, thermal challenges, heterogeneous integration, manufacturing precision, and the extraordinary scale required to support modern computing systems.


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BSIA
SK hynix
Welcome to SK Hynix
13 May 2026

Discussions with SK hynix leadership, including President Charles Ahn and senior packaging executives, centered not only on technology, but also on the future direction of semiconductor ecosystems. Bangladesh's evolving "Silicon River" vision was presented as a long-term, innovation-driven effort focused on advanced packaging, scalable workforce development, AI-centric systems, and ecosystem-oriented value creation.

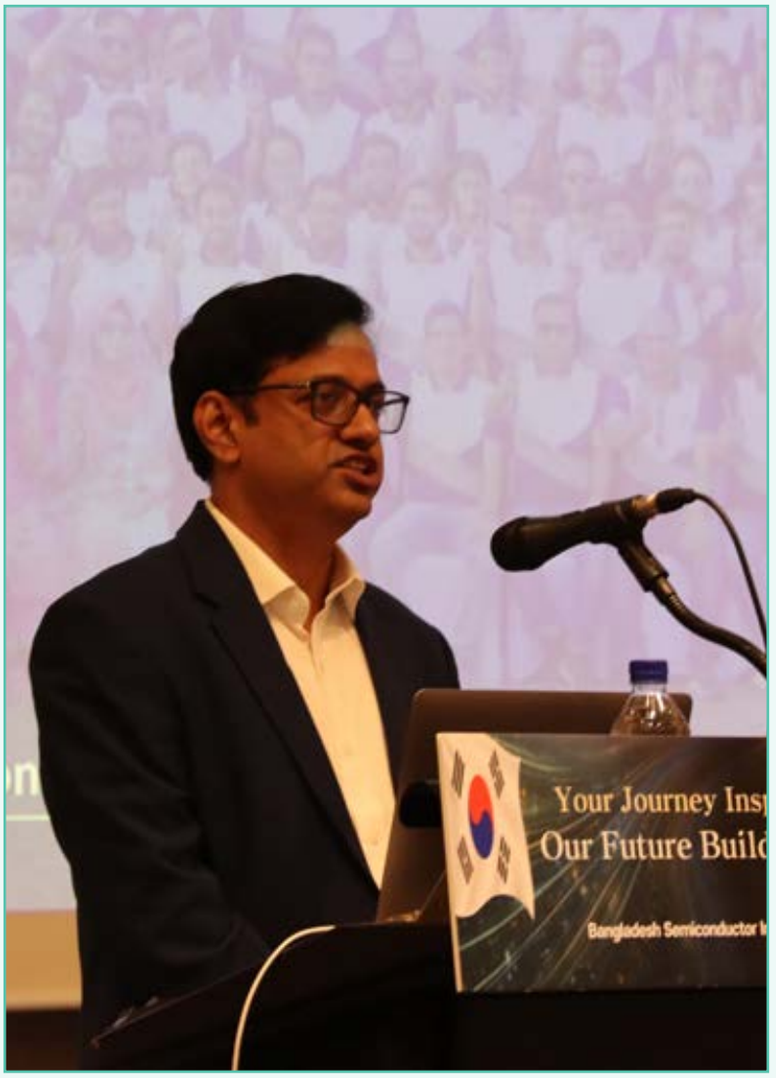
An important message repeatedly emphasized during the engagements was that Bangladesh's strategy is not simply to participate in manufacturing for its own sake. Rather, the long-term objective is to create an environment where innovation through applications, products, systems, and emerging technologies can flourish. History shows that once meaningful innovation ecosystems emerge, supply chains and industrial capabilities gradually organize themselves around those centers of value creation.

The roadshow also highlighted the growing maturity of Bangladesh's semiconductor ecosystem at the institutional level.

A major milestone was achieved through the signing of a Letter of Intent (LOI) between KAIST Global Commercialization Center (GCC), CREST, and BSIA. The agreement established a framework for collaboration in semiconductor research, commercialization, startup ecosystems, advanced packaging, AI semiconductor systems, and talent development.

The significance of this engagement extended beyond symbolism. KAIST GCC represents a sophisticated ecosystem model where research, startups, commercialization, and global engagement operate in coordination. The discussions reinforced an important realization: successful semiconductor ecosystems are not built solely through research or manufacturing. They emerge through alignment between talent, academia, industry, commercialization, and long-term institutional continuity.

> During the signing ceremony, BSIA President Mr. M A Jabbar described the collaboration as "a carefully designed alignment between research, commercialization, and ecosystem integration." That statement captured the spirit of the roadshow itself.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LETTER OF INTENT(LOI) SIGNING CEREMONY


Your Journey Inspires Ours.
Our Future Builds Forward.
Date: May 13, 2026
Venue: Double Tree by Hilton Seoul Pangyo
Bangladesh Semiconductor Industry Association
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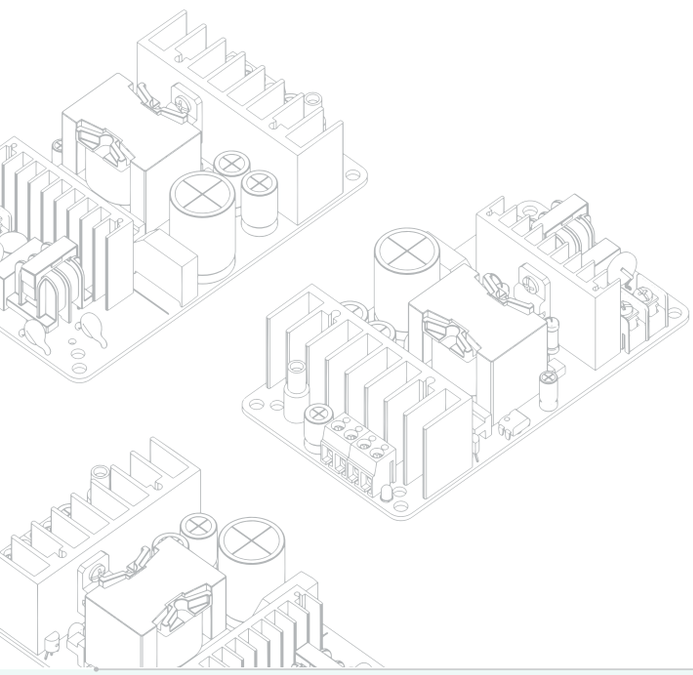
Your Journey Inspires Ours, We Build What Comes Next.
LETTER OF INTENT(LOI) SIGNING CEREMONY
Advancing Semiconductor Research, Innovation, and Talent Development
BSIA
KAIST
Date : May 13, 2026 Time : 3:00 PM Venue : Double Tree by Hilton Seoul Pangyo

In parallel, Bangladeshi semiconductor design houses held technical and business discussions with Korean companies including PineS and Synic Solution, exploring collaboration opportunities in semiconductor design services, foundry support, MEMS technologies, sensor systems, and engineering workflows.

One company that particularly stood out during the roadshow was iTest Bangladesh Limited, notably as the only participating Bangladeshi company with a strong and specialized focus on semiconductor testing and characterization. Their capabilities span ATE test development, memory interface validation, wafer sort, final test engineering, PCB/loadboard design, and yield analytics using platforms such as Advantest V93K. The company demonstrated experience in DDR4/DDR5 controller validation, NAND flash characterization, MRAM/ReRAM-related testing, and production-grade semiconductor test flows. In many ways, iTest represented an important signal that Bangladesh's emerging semiconductor ecosystem is beginning to develop technically sophisticated backend and test engineering competencies beyond conventional design services.

Another important visit took place at Hana Micron, one of South Korea's leading OSAT companies, where discussions focused on advanced packaging, industrial participation, workforce development, and manufacturing collaboration opportunities.

Perhaps the most encouraging aspect of the roadshow, however, was not any single meeting. It was the growing recognition that Bangladesh is beginning to be viewed not merely as a low-cost market or outsourcing destination, but as an ecosystem attempting to think strategically about the future of semiconductors.



In less than six months, CREST has already established collaborative engagement with institutions including NUS, Taiwan Institute of Semiconductor Research, KAUST, and now KAIST. This momentum reflects increasing international interest in Bangladesh's emerging deep-tech trajectory.

> The roadshow also reinforced a broader lesson. Semiconductor ecosystems are not built overnight. They are built gradually through trust, consistency, learning, collaboration, and long-term alignment between institutions and people.

Silicon River remains an evolving journey. But the South Korea Roadshow demonstrated that Bangladesh is beginning to enter meaningful conversations within the global semiconductor community — not only about participation, but about future possibilities.

Bio

Munir Ahmed

Managing Director, iTest

Munir Ahmed is a prominent Bangladeshi business leader and electrical engineering graduate from the State University of New York at Buffalo. He serves as the Managing Director of iTest Bangladesh Limited, a company founded in 2021 that provides test development, DFT, and test hardware design services to multiple semiconductor companies around the world. Beyond his leadership in the high-tech sector, he manages an extensive corporate portfolio as a director and managing director across various business units of the M&J Group. He is also deeply committed to social impact, actively contributing as a co-founder and board chairman to educational and healthcare initiatives in Bangladesh.

iTest

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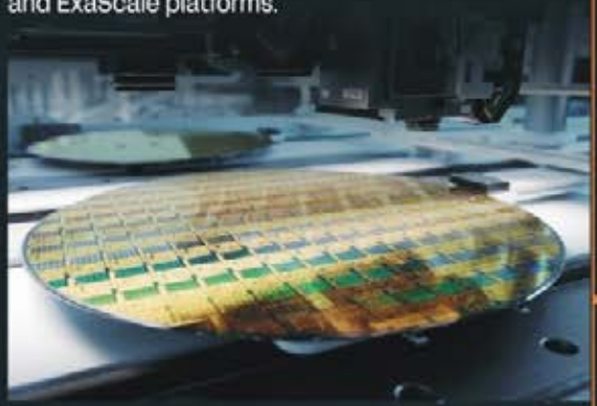
ABOUT US

Founded in 2016, iTest is headquartered in San Jose, California, with a global presence spanning five locations and over 40,000 square feet of advanced production and offce facilities.

Since its establishment in 2021, iTest Bangladesh has become an integral part of iTest's test engineering excellence.

Backed by a team of more than 40 skilled engineers, iTest specializes in test development, wafer process and foundry qualification, and high-reliability testing under the most demanding conditions, powered by cutting-edge Advantest V93000 SmartScale and ExaScale platforms.



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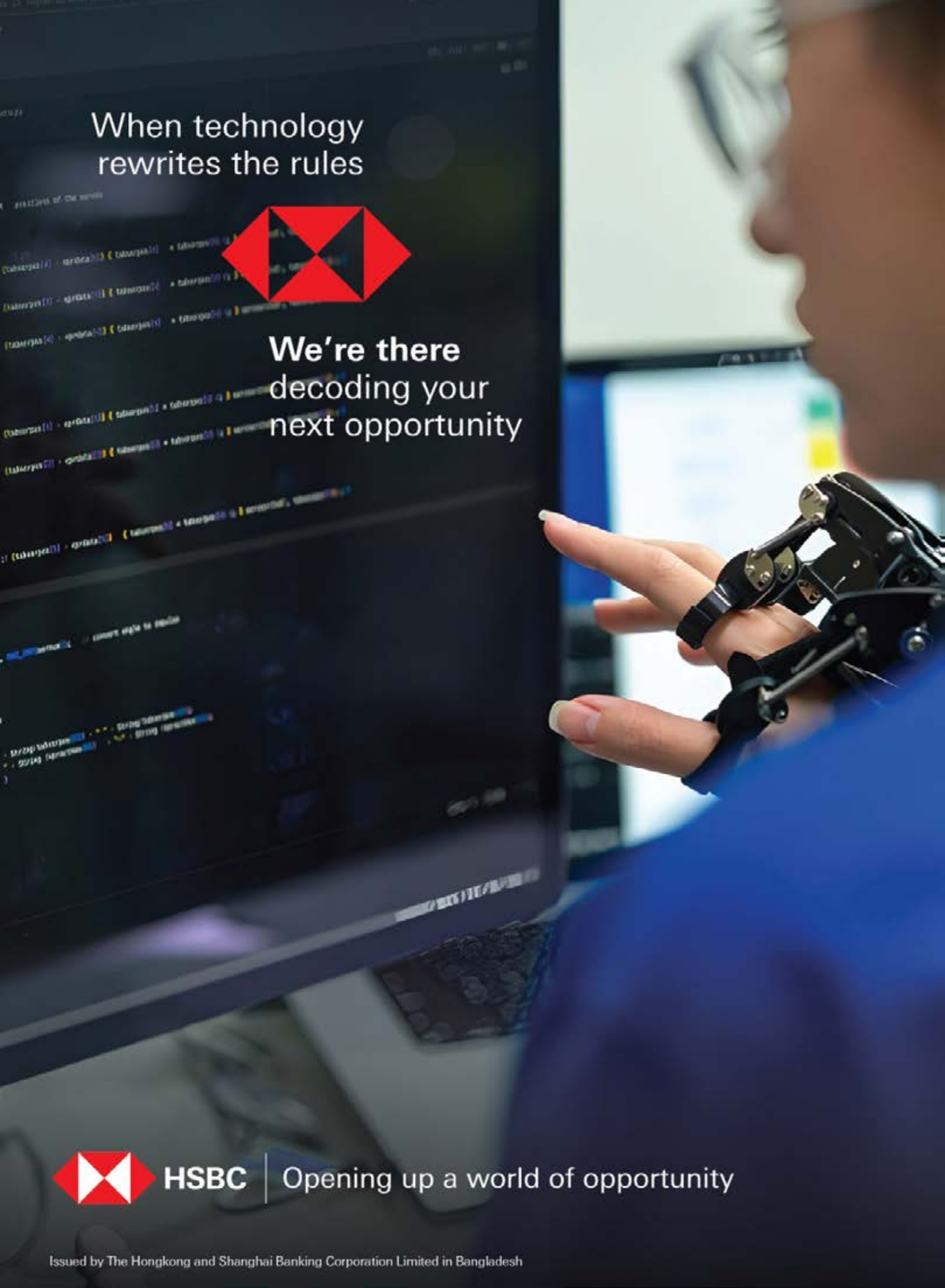
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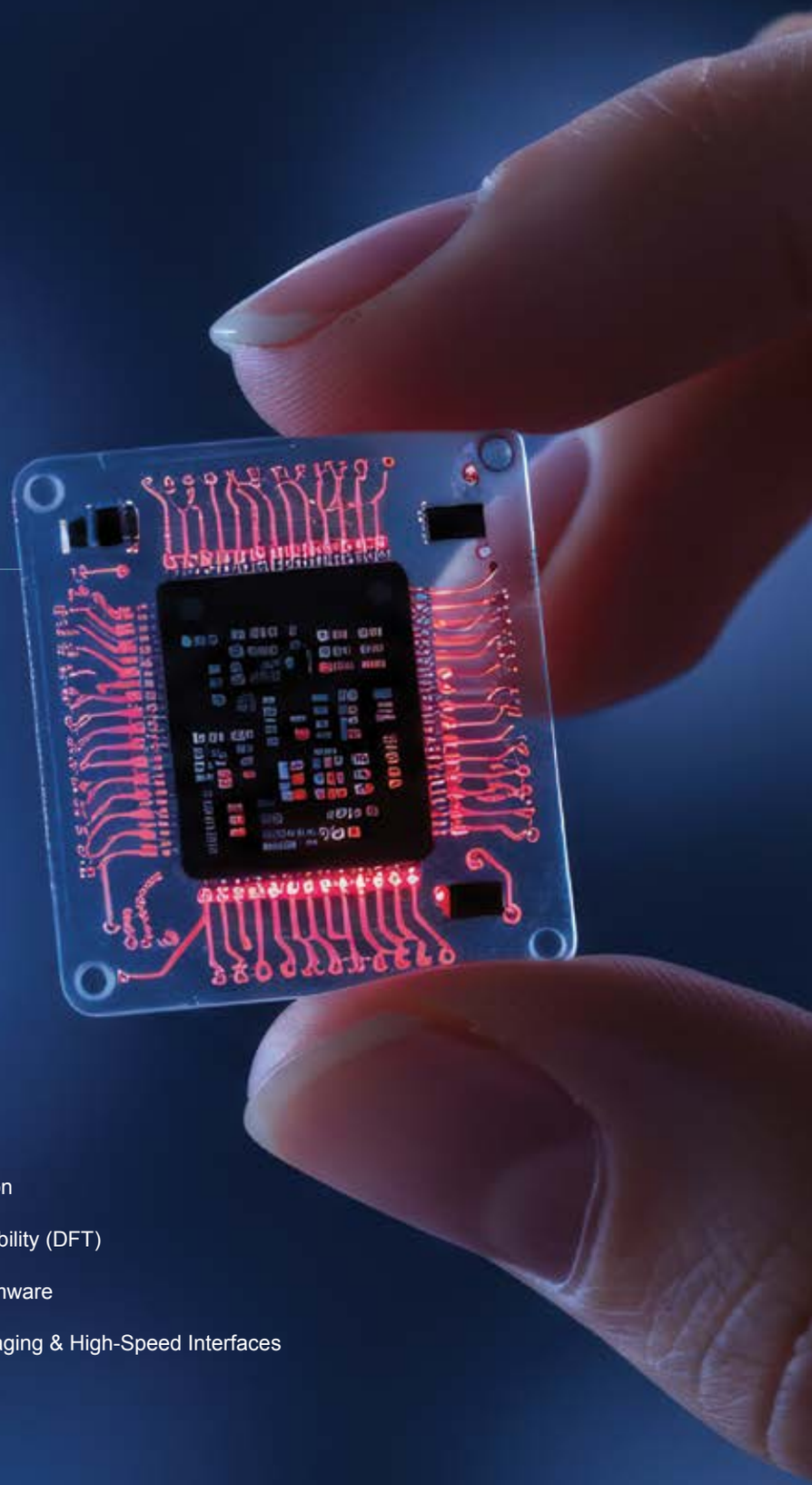

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