Deep Tech

Understanding its strategic role within Vision 2030 and beyond.

Article 1 of 4

FOUNTECH.LABS

Preamble

Dear Deep Tech Fan,

Having frequently spoken on the fledgling but fast-growing deep tech ecosystem in Saudi Arabia, I thought it would be useful to share a more in-depth analysis in the form of a series of commentaries. The result is an overview on deep tech as an enabler, how it features in the present and its potential to positively shape the future of Saudi Arabia.

As it's a huge subject, I've broken it down into bitesize pieces:

- **Part 1.** This first article kicks us off with deep tech's strategic role in the kingdom, some scene setting, the key characteristics, benefits, and challenges, and wrapping up with the ecosystem players and ecosystem management.
- **Part 2. Coming Soon:** A technical dive into what is and what isn't deep tech, why application-level tech is so last week, and the inside track on the emerging technologies we're watching.
- **Part 3. Coming Soon**: An anatomy of deep tech entrepreneurship and why it presents its own unique challenges, and the inside track on our researcher-to-entrepreneur process.
- **Part 4. Coming Soon**: Capacity building - the benefits and challenges of deep tech ideation, venture building and accelerating.

I hope you enjoy this article and please do get involved. Deep tech is a participatory endeavour – the more the merrier!

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Deep Tech - Understanding its strategic role in Vision 2030 and beyond.

As an entrepreneur who geeks-out on strategic planning, operational roadmaps and KPI's, I have been dissecting Vision 2030 for over a year now. Since my first business trip to the kingdom in 2022, I have been hugely impressed by the focus, commitment, and ambition of the people of Saudi in general, and with the deep tech ecosystem players in particular. Much of this evidence of progress is surely down to Vision 2030. As a blueprint that sets the direction, the pace, areas of focus and KPI's for an entire country, Vision 2030 has to date proved to be a very effective driver and enabler for success.

As Vision 2030 is pivotal for Saudi Arabia, deep tech is pivotal in enabling the kingdom's strategic aims. Deep tech, (not an actual technology but the name given to R&D-based startups or the methodology they deploy to create IP-rich solutions) has an outsized role in much of country's ambitions.

Mapping out all of the opportunities deep tech would bring to Saudi Arabia is outside the scope of this simple commentary, but the following is a good start in identifying how deep tech adoption would diversify the economy beyond oil, foster a knowledge-based society, create sustainable infrastructure, enhance quality of life, and position the Kingdom as a global investment powerhouse, ensuring long-term prosperity and stability for its people.

Diversification of the Economy. Vision 2030 aims to reduce Saudi Arabia's dependence on oil and diversify its economy. Deep tech plays a crucial role in this by fostering new industries and innovation-led sectors such as renewable energy, biotechnology, and advanced manufacturing.

Attracting Foreign Investment. By investing in deep tech, Saudi Arabia can position itself as a hub for innovation, attracting foreign investors and multinational companies looking to tap into cutting-edge research and development.

Creating High-Quality Jobs. Deep tech industries are typically knowledge-intensive and create high-quality, high-paying jobs. This aligns with Vision 2030's goal to expand employment opportunities for Saudi nationals in the private sector.

Supporting Entrepreneurship. Vision 2030 emphasises entrepreneurship as a driver of economic growth. Deep tech startups represent high-value entrepreneurship opportunities and can stimulate the creation of an ecosystem that supports innovation and business development.

Enhancing Quality of Life. Deep tech innovations in healthcare, smart cities, and environmental technologies can significantly improve the quality of life for residents, a key objective of Vision 2030.

Sustainable Development. Deep tech is essential for developing sustainable solutions, such as clean energy and water conservation technologies, which are important for the long-term sustainability of Saudi Arabia's environment and resources.

Education and Research. Vision 2030 includes goals to reform the education system and promote research. Deep tech initiatives can drive the development of research institutions and universities, fostering a culture of knowledge and innovation.

Global Leadership. By leading in certain deep tech domains, Saudi Arabia can establish itself as a global leader in strategic technologies, enhancing its geopolitical and economic influence.

National Security. Deep tech advancements in cybersecurity and defence technologies are vital for national security, ensuring the protection of critical infrastructure and data.

Healthcare Advancements. With a focus on improving healthcare services, deep tech can contribute to medical research, biotechnology, and digital health services, leading to better health outcomes and more efficient healthcare system

Setting the scene.

A deep tech ecosystem refers to an explicit and implicit network of interconnected and leveraged elements. These elements include academia, corporates, enabling agencies, funding entities, regulatory bodies, the state, and the all-important grassroots, being the entrepreneurs and supporting teams, working together to create, deliver, and support science and engineering based technological solutions. It is a complex, dynamic and unpredictable mechanism, where different components interact, collaborate, and sometimes conflict.

Key to how an ecosystem behaves and performs are two fundamental drivers that are often overlooked. The first driver is how the ecosystem came about, was it via *top-down* strategic planning or by *bottom-up* organic growth? The second driver is the prevailing culture and behavioural norms, influenced by location, economic factors, demographics, and societal influences.

Driver 1: Top-down or bottom-up?

"Top down" is a strategic framework, mandated by the state or a local authority, that looks to kick-start an innovation engine via the use of legislation, the creation of enablement agencies and various incentives. "Bottom up" is typically organic and unstructured, often triggered by the arrival of a large tech superstar firm but primarily powered by grassroots, entrepreneurial drive. In this case, frameworks and supporting actors may exist but they are secondary to the momentum produced by the local grassroots.

Driver 2: Culture and behavioural norms.

Culture and behavioural norms are implicit, unstructured, and unpredictable elements of the ecosystem. As a result, they play a major role in how clusters are created, how connections are made, how meetings are shaped, the pace of adoption, the effectiveness of networking, and how efficiently resources are exploited.

Observations.

At the broadest level, my overarching impression is that the kingdom has done and continues to do an excellent job in creating and expanding the framework for a deep tech ecosystem. There are many enablers (and inevitably, also a few blockers…) which provide the types of services required to incentivise and motivate deep tech startups, both domestic and foreign.

However, my impression is that the successes delivered by this top-down approach are not currently matched with an equivalent level of engagement by the grassroots of the ecosystem.

Some evidence of this, from my experience and not based on formal research, is the percentage of actual entrepreneurs/startups for any given event, (compared to the other markets I know well, London and Austin, the Saudi scene is heavy with enablers, ministries, and regulators, but lacks the dynamic mass of grassroots participation) the overall volume of university spinouts, and low representation levels of Saudi-born entrepreneurs.

This may be down to the early stage of the Saudi deep tech ecosystem lifecycle, therefore rectified over time, or it could be due to the other driver, culture, and behavioural norms.

With a traditional reliance on working for the state or the old industries, such as oil, a life of entrepreneurship may not yet be top of the list for much the Saudi workforce. Add to this, the traditional Saudi cultural norms, and attitudes towards risk-taking and failure, and it may be a reasonable conclusion that more needs to be done to unlock the hidden entrepreneurial potential of the kingdom.

The key characteristics of Deep Tech.

Being a methodology or type of approach, deep tech contains numerous, interconnected characteristics and is characterised by its foundation in substantial scientific advances and high-tech engineering innovation. It typically involves long R&D cycles, significant intellectual property, a focus on addressing complex challenges, and a transformative impact across industries, often leading to the creation of entirely new markets.

Innovation engine: The foundation of new technologies characterised by substantial scientific or engineering challenges. Research is essential to understand the underlying principles that can lead to breakthroughs in technology:

Competitive Edge. In-depth research can lead to the discovery of unique solutions that provide a competitive advantage in the market. Companies that invest in research are often the first to develop new technologies that can disrupt existing markets or create new ones.

Intellectual Property Creation. Through research, deep tech companies can develop new intellectual property (IP), such as patents, which are critical assets. IP can protect the technology from being replicated by competitors and can be a significant source of revenue through licensing or sales.

Risk Mitigation. Research helps in identifying potential challenges and risks associated with the development of new technologies. By understanding these risks early on, companies can devise strategies to mitigate them.

Attracting Investment. Investors are more likely to fund companies that have a solid research foundation because it demonstrates a commitment to innovation and a potential for groundbreaking discoveries that can lead to high returns.

Collaboration Opportunities. Research often involves collaboration with universities, research institutions, and other companies. These collaborations can bring in additional expertise, resources, and networking opportunities that can accelerate the pace of innovation.

Regulatory Compliance. Deep tech innovations, especially in fields like healthcare, space, biotechnology, and energy, often require adherence to strict regulatory standards. Research is necessary to ensure that new technologies comply with these regulations before they can be commercialised.

Societal Impact. Research-driven deep tech innovations can address some of the most pressing challenges facing society, such as climate change, healthcare, and sustainability.

Market Validation. Through research, companies can validate the market need for their technology. Understanding the market helps in tailoring the innovation to meet customer demands and increases the chances of commercial success.

Benefits, and challenges for Saudi Arabia

Deep Tech. R&D-based technologies built on scientific breakthroughs and engineering innovations are strategically significant to Saudi Arabia. They also come with challenges:

- **Economic Diversification:** Saudi Arabia has been working towards reducing its dependence on oil and diversifying its economy. Deep tech plays a crucial role in this process by fostering the growth of knowledge-based industries and creating new economic opportunities.
- **Job Creation:** Deep tech industries have the potential to create high-skilled job opportunities. By investing in deep tech, the country can nurture a skilled workforce and reduce unemployment rates. This is particularly important for the country's young population, as it provides them with opportunities for meaningful employment and career growth.
- **Technological Advancements:** Deep tech drives technological advancements and innovation. By investing in areas such as artificial intelligence, robotics, biotechnology, and renewable energy, Saudi Arabia can stay at the forefront of technological developments. This enables the country to address societal challenges, improve productivity, and enhance competitiveness on a global scale.
- **Global Competitiveness:** Embracing deep tech can enhance Saudi Arabia's global competitiveness. By fostering a culture of innovation and supporting deep tech startups and research institutions, the country can attract foreign investment, talent, and partnerships. This can position Saudi Arabia as a hub for cutting-edge technologies and a leader in various industries.
- **Addressing Societal Challenges:** Deep tech has the potential to address critical societal challenges, such as healthcare, energy, water scarcity, and environmental sustainability. By investing in deep tech solutions, Saudi Arabia can tackle these challenges and improve the quality of life for its citizens.
- **Knowledge Transfer and Collaboration:** Deep tech industries require collaboration between academia, research institutions, and industry. By investing in deep tech, Saudi Arabia can foster knowledge transfer, encourage collaboration between local and international experts.

Observations.

Competitive advantage, once-upon-a-time gained through what you do and doing it better than your competitors, has already been superseded by what you know. Today's knowledge economy is powered by technical innovation, and at the core of all technical innovation is deep tech. Based on my relatively short time in the kingdom, my impression is that Saudi is better placed than probably any other advanced economy to build a true knowledge economy.

Vision 2030 makes it clear that diversification is key, but with diversification must also come competitive advantage. Deep tech is that competitive advantage.

The benefit of starting with a relatively clean slate is that the kingdom is best placed to build from the ground up, therefore creating a raft of potential opportunities.

Based on my observations, the kingdom has a window of opportunity to position itself as a deep tech talent powerhouse, to include a focus on R&D-domain expertise and talent capacity building, for both Saudi-based and overseas talent. There are also challenges, including underserved ideation-stage funding, and underutilised IP commercialisation from academia and corporates alike.

Initiatives to overcome these challenges exist, but as is often the case in Saudi, it's the state and its agencies that are looking to provide solutions. For the kingdom to fully function as a knowledge economy, the commercial sector must play a bigger role, with startups and current incumbents acting as the engine to provide agile, competitive, and innovative solutions on market-aligned commercial terms.

Key Ecosystem Players.

As a multidisciplinary endeavour, deep tech thrives as part of a dynamic ecosystem, consisting of all the key players. These include:

Entrepreneurs. The founders, co-founders and early team members that create the startups which are core to the ecosystem. The quality and quantity of startups dictate much of the dynamic nature of an ecosystem, ensuring a steady creation of world changing new businesses is a huge challenge, requiring both the pull of the marketplace but also the push from the source – the grassroots need to be active and ready to engage.

Research Institutions and Academia. A critically important player in any deep tech ecosystem and the primary source of the ideas that create the startups, which in turn fuels everything else. These entities contribute to the ecosystem through education, research, development, and the commercialisation of ideas. They conduct scientific studies, publish research papers, and provide training and education to nurture talent and advance technological knowledge.

Regulatory Bodies and Standards Organisations. These entities establish and enforce regulations, standards, and guidelines that govern the use and development of technology within the ecosystem. They ensure compliance, interoperability, and security.

Investors, Venture Capitalists and Financial Institutions. These are individuals, firms or institutions that provide financial resources and funding to support the development and growth of the deep tech companies within the ecosystem. Providing capital for all the stages, from ideation to IPO.

Large corporates. Large corporates can offer deep tech startups capital, mentorship, and access to extensive networks and markets. They provide valuable resources, such as R&D facilities and operational support, and can help navigate regulatory landscapes, significantly accelerating the startup's growth and innovation cycle.

The State as buyer-of-first recourse. State entities can support deep tech startups by acting as the buyer-of-first recourse, by providing grants, tax incentives, and regulatory guidance. They can facilitate partnerships with academic institutions for research collaboration and offer access to public infrastructure and pilot programmes.

Innovation Enablers. These are critical in providing turn-key ideation services, venture building, accelerators, ecosystem-wide access, signposting, and ecosystem connections, for both domestic and foreign owned startups entering Saudi.

Ecosystem Management.

Creating and managing a deep tech ecosystem involves several key steps. Here are some important aspects to consider:

- **Define the Vision and Goals:** Clearly define the vision and goals. Determine the purpose, scope, and desired outcomes of the ecosystem. Identify the problems it aims to solve, the value it intends to create, and the target audience it serves.
- **Identify Key Stakeholders:** Identify the key stakeholders who will participate in the ecosystem. Understand their roles, interests, and contributions within the ecosystem.
- **Foster Collaboration and Partnerships:** Encourage collaboration and partnerships among participants. Facilitate networking opportunities, knowledge sharing, and joint initiatives. Foster an environment of trust, openness, and mutual benefit to encourage collaboration and innovation.
- **Provide Support and Resources:** Offer support, resources, and tools to ecosystem participants. Support the needs of all stakeholders to foster innovation and adoption.
- **Encourage Innovation and Experimentation:** Create an environment that encourages innovation, experimentation, and the development of new ideas and solutions. Provide incentives for participants to explore new models, and approaches. Foster a culture of continuous learning and improvement.
- **Monitor and Evaluate:** Continuously monitor and evaluate the performance and impact of the ecosystem. Collect feedback from participants, measure key metrics, and assess the achievement of goals. Use this information to make informed decisions, identify areas for improvement, and adapt the ecosystem strategy accordingly.

Observations

Managing an ecosystem may be seen as a contradiction in terms, (by its very nature, ecosystem implies an organic environment which thrives or dies through natural selection). However, when the imperative is to reorganise your economy by placing technical innovation at its heart, as in the case of Saudi Arabia, then managing the outcome would be a sensible ambition. In this respect, and based on my observations, it appears that the state has created a robust framework for the future.

However, in my opinion and based on my experience with deep tech ecosystems in the UK and US, as much as a centralised approach may be necessary at the outset, the medium-term objective must be a handover to both the grassroots and independent commercial entities, to provide both the operating norms and all the resources required.

The perfect deep tech ecosystem is one where the state acts as the architect and framer, then gradually steps away, leaving commercial entities to act as solution providers, enablers, facilitators, and connectors.

There is clear evidence of progress, with numerous agencies making a positive contribution to ecosystem building and development. Below I have listed out where my suggested areas of focus, some of which are already in hand, and with others yet to fully emerge.

- *Drive bottom-up enablement.*
- *Create country-wide mechanisms that drive academia-to-deep tech startup opportunities.*
- *Create country-wide mechanisms that drive business-school-to-deep tech startup opportunities.*
- *Champion local heroes.*
- *Provide L&D solutions within academia to ensure entrepreneurship is a curriculum subject alongside any R&D disciplines.*
- *Commercial involvement. Much of the enablement functions should be driven by commercial actors, providing agile and focused solutions, and aligned with the needs of the grassroots of the ecosystem.*

Conclusions and recommendations.

For any deep tech ecosystem to thrive, I would suggest; a comprehensive and multi-pronged strategy that aligns with cultural values and economic goals; that the strategy should encompass outsized investment in R&D; that education is aligned with deep tech talent development; that a culture of innovation is key; that enabling a dynamic ecosystem for startups and entrepreneurs be at the core; and that the state acts as the buyer of first recourse.

Based on my observations, much of the above already exists in the Kingdon, with far more planned. However, as a roadmap for the near term, these are the implementation areas I would focus on:

Research and Development:

- **Centres of Excellence**. Bringing together academia, investors, deep tech entrepreneurs and large corporates to establish rapid prototyping/skunk works in strategic sectors such as AI, space, quantum, renewable energy, mobility, infrastructure, and biotechnology, to drive focused R&D efforts that are aligned with present and future commercial applications.
- **IP Portfolio Commercialisation**. Incentivise and facilitate the identification, screening, selection, and commercialisation of commercially attractive deep tech IP currently lying dormant within academia, state entities and large corporates.
- **R&D Funding.** Significantly increase public and private investment in R&D, aiming to meet or exceed the global average percentage of GDP.
- **Incentives for Innovation.** Offer substantial tax incentives, grants, credits and subsidies to companies that invest in R&D and innovation.

Education and Talent Development:

- **Curriculum Overhaul.** Revise the educational curriculum to focus on creativity, critical thinking, and problem-solving skills, integrating STEM education and entrepreneurial thinking from an early age and follow this through with imbedded commercialisation training for all R&D researchers and practitioners.
- **University-Industry Collaboration.** Incentivise and encourage universities to collaborate with industries and vice-versa, to align academic research with market needs, ensuring that graduates are equipped with relevant skills.
- **Talent Retention.** Work with industry to implement programmes to retain top talent within the country and prevent brain drain, including competitive salaries, research grants, and career development opportunities.

Fostering a Culture of Innovation:

- **Innovation Awareness.** Launch national campaigns to promote the importance of innovation in economic growth and societal advancement.
- **Recognition Programs.** Create awards and recognition programs to celebrate and publicise local innovators and their achievements.
- **Community Engagement**. Encourage community involvement in innovation through hackathons, innovation challenges, and public exhibitions.

Startup and Entrepreneurial Ecosystem:

- **Access to Capital.** Better facilitate access to funding for ideation stage deep tech startups through government-backed funds and commercial investors.
- **Venture Builders and Accelerators.** Support the establishment of ideation stage deep tech venture builders and accelerators that provide co-creation, co-venturing, mentorship, networking, and business development services.

Governmental, Infrastructure and Technology Access:

- **Government Procurement.** Greatly increase the level of government procurement to provide a market for innovative products and services. Mechanisms to enable this could include digital marketplaces, regular events, and dedicated champions within the relevant state entities.

Fountech Labs - Innovation-as-a-Service firm.

Focusing on the co-creation, launching, and scaling of deep tech startups from Saudi Arabia, MENA and those keen on building a significant presence within the region. Our vision is to democratise deep tech by co-creating the innovators of tomorrow.

Our focus is on foundational AI and its application across all industrial sectors and themes, including Space, Agri, Bio, Nano, Cyber, Quantum, Power, and Climate.

At the heart of our ecosystem is scientific R&D and our programmes look to unleash the full force of research-based technologies, out from the comfort and confines of the lab and into the real world.

Our operating model is built upon three core pillars of technical knowledge, commercial acumen, and people development, all of which we have developed over decades of experience as operators and investors in early-stage technology businesses.

Key elements of our success include the use of mentoring from domain experts, peer-to-peer and expert-led workshops for rapid knowledge development and the leveraging of our networks to enable the value-add connections required by all startups.

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