

2nd C4IR Saudi Arabia Forum: Fostering Innovation Through Collective Impact for Sustainable Development

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On October 9th, The Centre for the Fourth Industrial Revolution Saudi Arabia (C4IR Saudi Arabia) called on its global network of partners, policymakers, business leaders, startups, entrepreneurs, innovators, and experts to discuss and explore some of the pressing challenges and transformative opportunities that lie at the intersection of innovation, global integration, and public-private partnerships.

The event underscored Saudi Arabia's emerging role as a leader in early technology adoption. It emphasised the need for supportive regulatory and policy frameworks that encourage innovation and protect intellectual property. It aimed to explore how the Kingdom is building a collaborative innovation ecosystem with global partners.

The event also focused on the importance of innovation, global integration, and public-private partnerships in today's interconnected world. It highlighted the role of innovation in driving economic growth, competitiveness, and societal progress, emphasising its potential to create human-centred applications that spread globally. Public-private partnerships leverage collective expertise, resources, and networks to foster innovation for positive global impact.

Forum Sessions

Fostering Innovation Through Collective Impact for Sustainable Development drew inspiration from the Kingdom's efforts to build and drive a culture of innovation across major sectors, including industry, energy, health, and agriculture, to name a few. Take, for example, the Research, Development & Innovation Authority (RDIA) in Saudi Arabia, which was established in 2021 to support and promote innovation with three main objectives: developing national policies and strategies for research, coordinating, facilitating, and supporting research activities, and providing financial resources. It promotes collaboration among academia, research entities, non-profit organisations, industry, and government. It plays a crucial role in Saudi Arabia's Vision 2030 by diversifying the economy and cultivating an innovative culture.

The RDIA's National Aspirations and Priorities pivot around Health and Wellness, Sustainable Environment and Supply of Essential Needs, Energy and Industrial Leadership, and Economies of the Future. Building on this, the Forum's agenda framed these priorities within the context of collective impact and sustainable development.

— As such, the Forum Sessions were as follows:

1. Fireside Chat — Accelerating the transformation and growth of manufacturing in KSA.
2. Panel — Technology for Progress: Championing Change and Innovation in KSA.
3. Fireside Chat — Leading the Way: Higher Education Institutions' Role in Shaping the Future Amidst a Rapidly Changing Economy.
4. Panel — Enabling Investment and Funding for Biotech Innovation.
5. Panel — Global Partnerships in the Evolving Space Ecosystem
6. Fireside Chat — Role of Women in Innovation.
7. Panel — Agritech Innovation for Global Food Security.
8. Panel — Role of 4IR in shaping the future of industry: Pathways to Industrial Leadership.



Fireside Chat — Accelerating the transformation and growth of manufacturing in KSA

This fireside chat featured H.E. Bandar Alkhorayef, the Minister of Industry and Mineral Resources, and was moderated by Dr. Basma AlBuhairan, the Managing Director of the Centre for the Fourth Industrial Revolution in Saudi Arabia.

The session aimed to highlight the challenges and opportunities associated with industrial clusters, showcasing their pivotal role in realising the goals outlined in Vision 2030. Manufacturing has always been a cornerstone of economic development, especially in a new era where emerging technologies such as artificial intelligence, robotics, additive manufacturing, and the Internet of Things are revolutionising the manufacturing landscape. The 4IR presents unprecedented opportunities to drive innovation, enhance productivity, and create sustainable growth. With its Vision 2030, Saudi Arabia has set ambitious goals to diversify its economy and reduce its reliance on oil. The manufacturing sector plays a critical role in achieving these objectives as it has the potential to not only create jobs but also attract investments and contribute significantly to the Kingdom's GDP; by embracing the innovations of emerging technologies, the Kingdom can position itself as a global leader in advanced manufacturing and also drive economic transformation.

— H.E. Minister Alkhorayef discussed how the Ministry of Saudi Arabia actively promotes innovation and technology in the manufacturing sector to achieve its ambitious economic diversification goals. Key initiatives include building digital infrastructure and regulatory frameworks to support technology adoption, fostering collective government efforts, leveraging the young and tech-savvy Saudi population, and embracing changes in manufacturing trends towards advanced technologies like AI, 3D printing, and more sustainable mining practices. The government's vision is to expand the country's economic and industrial complexity, diversify the economy, and position Saudi Arabia as a global innovation and technology adoption leader. Specific initiatives include the "Future Factories Program," attracting strategic investments, improving the regulatory framework, and creating value through innovation and advanced manufacturing. The mining sector is also crucial in fostering innovation and meeting global demands for essential materials. The government actively accelerates innovation through governance structures, research institutions, financing, and a conducive regulatory environment. These initiatives aim to drive sustainable economic growth and transform Saudi Arabia into a significant player in the global manufacturing and technology landscape.



Panel — Technology for Progress: Championing Change and Innovation in KSA

This panel discussion featured Jeremy Jurgens, the Managing Director & Head of the World Economic Forum C4IR Network; Haitham Alfaraj, Group Chief of Technology Officer at STC; Nayef Al-Otaibi, Vice President/Chief Digital Officer Digital Transformation at Aramco, and was moderated by Faisal Hamady, Managing Director & Partner, BCG Dubai.

The discussions highlight the paramount importance of digital innovation as a solution to government and corporate challenges, underscoring the need for collaborative efforts in overcoming these obstacles. Leading organisations in Saudi Arabia, such as stc and Aramco, are actively contributing to promoting innovation by aligning their strategies with the national agenda.

For instance, the Saudi Telecom Company (stc) is transitioning from a traditional telecom company to a digital services provider, emphasising the development of a robust digital infrastructure. Meanwhile, Aramco is strategically building its capabilities in critical digital areas like AI, cloud computing, advanced robotics, and cybersecurity with the establishment of Aramco Digital. The Centre for the Fourth Industrial Revolution network is a model for effective public-private collaboration, showcasing how diverse sectors can exchange best practices. Aramco and stc both adopt a public-private partnership approach,

working closely with entities such as the National Digital Transformation Unit and ministries to design objective-driven policies. Aramco's global AI corridor partnership with SDAIA and NASA is a prime example of the power of collaboration in advancing strategic agendas and positioning Saudi Arabia as a global hub for A.I. investment. Centres dedicated to accelerating digital innovation journeys and fostering ecosystem links, like India's AI for AI project and Germany's GovTech centre, have proven successful.

These discussions also emphasise the challenge of balancing the regulatory landscape with innovation. stc adopts a collaborative approach with regulatory bodies and maintains a level of risk acceptance. At the same time, Aramco underscores the need for robust cybersecurity measures as digital expansion and innovation present heightened cybersecurity risks. Regarding the future of technology governance, the conversation points to the necessity of looking beyond organisational and national boundaries. Governments play a critical role in setting baseline standards for governance, with contributions from companies and citizens vital for innovation. The co-development of appropriate guidelines, particularly in emerging areas like AI, is deemed essential for effective technology governance.

President, King Fahad University of Petroleum and Minerals



Fireside Chat — Leading the Way: Higher Education Institutions' Role in Shaping the Future Amidst a Rapidly Changing Economy

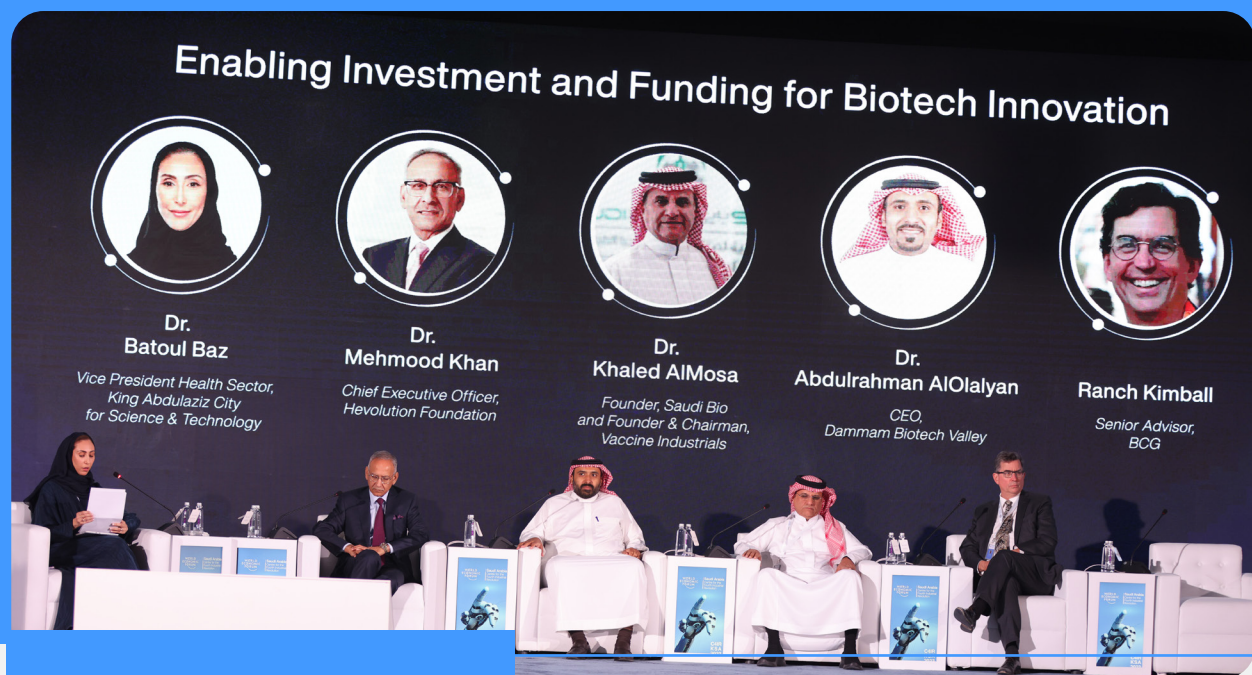
This fireside chat featured Dr. Muhammad Al-Saggaf, President of King Fahad University of Petroleum and Minerals and was moderated by Dr. Leila Hoteit, Managing Director & Senior Partner, BCG Dubai. This session highlights King Fahad University of Petroleum and Minerals' (KFUPM) recent transformation to align with national and global trends. Key points include:

1. **Diversification into Essential Sectors:** KFUPM expanded its academic and research programs into vital sectors like energy, digital computing, fintech, and more.
2. **Promoting Interdisciplinary Collaboration:** KFUPM promotes cooperation between departments and research centers to encourage innovation.
3. **Research Centres** The university established research centers that collaborate with businesses to translate research into practical applications.
4. **Educational Innovations:** KFUPM integrated digital skills into its undergraduate programs and introduced innovative master's programs.
5. **Support for Female Enrolment:** The university actively encouraged female enrolment in engineering, surpassing global averages.
6. **Anticipating Emerging Sectors:** KFUPM foresaw the importance of emerging sectors like the digital economy and established research centers accordingly.

Dr. Muhammad underscored the paramount importance of talent in Saudi Arabia's efforts to diversify its economy by launching new sectors. He emphasised that talent is not merely equal to investment; it is even more potent. The multiplication effect of talent amplifies the impact of investment. This has inspired KFUPM's extensive focus on different sectors, aligning with the university's expertise and the Kingdom's strategic priorities.

The Fourth Industrial Revolution, characterised by AI, upskilling, and ingenuity, is at the forefront of KFUPM's agenda. The university aims to produce talent capable of driving new sector development. It seeks to instil in students the mindset of not merely learning for employment, but learning to create jobs and foster innovative thinking. AI is not regarded with trepidation at KFUPM but is embraced as an essential tool. The curriculum has been realigned to ensure students first acquire AI competence and then integrate it into their major disciplines, ensuring they are well-prepared for the future job market.

Dr. Muhammad emphasised that research at KFUPM should have a primary objective: making a tangible impact on society and improving the human condition. Research for institutional prestige and rankings is not a driving force. KFUPM champions interdisciplinary research, demolishing barriers between departments and encouraging collaboration across different disciplines. Furthermore, KFUPM's approach to research extends beyond its borders, aiming to provide support and expertise to institutions in emerging economies, thus enhancing the impact of research on a global scale. In a historic shift, KFUPM, which was exclusively male in the past, has rapidly and significantly increased female enrolment in engineering programs. The university now boasts the highest intake of female engineering students globally. These female students have proven to be highly competitive, raising academic standards. The shift is seen as a progressive and vital step toward gender equality and is expected to contribute positively to the academic and economic landscape of the region.



Panel — Enabling Investment and Funding for Biotech Innovation

This panel discussion featured Dr. Mehmood Khan, Chief Executive Officer of Hevolution Foundation; Dr. Khaled AlMosa, Founder, Saudi Bio and Founder & Chairman of Vaccine Industrials; Dr. Abdulrahman AlOlalyan, Chief Executive Officer, Dammam Biotech Valley; Ranch Kimball, Senior Advisor at Boston Consulting Group, and was moderated by Dr. Batool Baz, Vice President Health Sector at King Abdulaziz for Science and Technology.

In this session, the focus was placed on promoting innovation in biotech research and development, emphasising the need for effective policies and mechanisms for investment. It explored strategies for enabling investments in the biotech sector and delved into key policies and mechanisms to create an environment conducive to innovation and attract capital and resources. The discussion revolved around financing and funding strategies, addressing critical challenges, creating robust funding structures, and supporting biotech research and development policies. Public-private partnerships were highlighted as a crucial approach to driving innovation in the biotech sector, emphasising examples of successful partnerships. Additionally, the importance of stability and density in innovation ecosystems is underscored. The commitment of higher leadership, a large and untapped market, and available capital in Saudi Arabia are key factors contributing to venture capital's and angel investors'

current significance in the biotech R&D landscape. The hunger for innovation among scientists and entrepreneurs further adds to the investment appeal.

— Dr. Khaled discussed the challenges impeding biotechnology localisation and technology transfer, citing factors like high investment costs, inadequate infrastructure, stringent regulations, technology transfer difficulties, and a lack of R&D capabilities. Dr. Mehmoud emphasised the significance of public-private partnerships (PPP) in driving biotech innovation. He noted that a successful innovation environment necessitates the involvement of academic, public, and private sectors. He mentioned the role of the public sector in de-risking initiatives, as seen in the development of the COVID-19 vaccine.

The Kingdom is encouraging PPPs that support innovation and operational experience. Ranch shared insights on the importance of stability and density in innovation ecosystems. Stable government commitments and a dense, talent-rich environment are crucial for fostering innovation clusters. He highlights the significance of a stable commitment to biotech research, demonstrated by mRNA vaccine development. Density in innovation districts attracts a diverse range of talent. Dr. Abdulrahman noted why venture capital firms and angel investors play a crucial role in the biotech R&D landscape today. He mentioned three factors: the strong commitment of the Saudi leadership to unlock the biotech industry, the ample opportunities in the Saudi market, and the availability of capital in the country. He also highlighted the enthusiasm among scientists and entrepreneurs to engage in the biotech innovation ecosystem, making it an attractive area for investors.



Panel — Global Partnerships in the Evolving Space Ecosystem

This panel discussion featured Matt Oндler, President and Chief Technology Officer at Axiom; Frank M. Salzgeber, Acting Vice Governor for Space Communications, Space & Technology Commission; Kimberly Washington, Executive Vice President, Deep Space Biology & Founder of Space4Girls; Dr. Mariam Nouh, Vice President Future Economies Sector at King Abdulaziz for Science and Technology; Rayyanah Barnawi, Biomedical researcher and the first Saudi female astronaut, and was moderated by Jeremy Jurgens, the Managing Director & Head of the World Economic Forum C4IR Network.

Space agencies play a pivotal role in shaping the future of the space sector. Frank M. Salzberger emphasised that while rockets represent a small portion of space activities, Earth observation and satellites are vital for the digital economy, highlighting the growing significance of space exploration in various sectors like agriculture and transportation. The impact of space extends to multiple economic sectors, as mentioned by Kimberley Washington. Space biology data contributes to biotech discoveries, and the example of finding a solution for non-alcoholic fatty liver disease illustrates space's role in driving innovation, particularly in healthcare.

Space exploration continues to evolve rapidly, with contributions from companies like Axiom in building commercial base stations. Matt Ondler stressed the importance of microgravity for manufacturing and medical research, citing how molecules behave differently in space, offering unique research prospects. Earth observation (E.O.) remains vital for monitoring afforestation and climate change. As an astronaut and researcher, Rayyanah Barnawi envisions a promising future for the space economy, presenting opportunities in various sectors. Space exploration significantly impacts human life, allowing for research in microgravity environments and fostering a greater sense of responsibility towards Earth's well-being.

Saudi Arabia's King Abdulaziz City for Science and Technology (KACST) has made substantial progress in its research and development efforts within the space sector. Dr. Mariam Nouh highlighted KACST's historical involvement in satellite development and its commitment to leveraging space technologies for agriculture, urban planning, and weather monitoring. Collaborating with international space stations and agencies is crucial to accessing cutting-edge technologies. The space economy has the potential to drive key economic developments. Frank M. Salzberger emphasised the importance of connectivity, particularly for autonomous cars. At the same time, Dr. Mariam Nouh underscores agritech advancements, such as detecting and identifying crops needed for farming and using earth observation and satellite imaging for tracking climate change and carbon offsets.

Challenges in governance and policy within the space economy involve the high costs of sending people into space and the necessity for government commitment, infrastructure development, and a trained workforce. Frank M. Salzberger underscored the role of government support in enabling space investments, while Dr. Mariam Nouh highlighted the challenge of building human capital and raising awareness.



Fireside Chat — Role of Women in Innovation

This fireside chat featured H.E. Dr. Einas Al-Eisa, president of Princess Nourah bint Abdulrahman University and was moderated by Noor Nugali, Assistant Editor-in-Chief at Arab News. Managing Director & Head of the World Economic Forum C4IR Network.

The discussion highlighted the significant presence of women in STEM fields in Saudi Arabia, particularly in Vision 2030's context. Princess Nourah University (PNU), the largest women's university globally, is equipping its female students for future jobs. Dr. Einas mentioned that 25% of the academic community in the university is in STEM colleges. She emphasised the importance of gender diversity in fostering innovation. She mentioned that companies with diverse leadership teams tend to produce more innovative research, reinforcing the need to nurture female talent in STEM. She proposed a shift from information technology to innovation using technology.

Regarding the large number of women in STEM, Dr. Einas attributed it to the significant opportunities provided by Vision 2030. She noted the role of Saudi women in heading companies and the remarkable growth of women in STEM and technology. Dr. Einas believes that Saudi women live in an era of

great opportunity. PNU's approach to fostering innovation involves exposing students to emerging technologies, providing opportunities for extracurricular activities, and emphasising identifying research questions. Additionally, PNU aims to establish an e-Innovation Hub that connects students with real-world problems and encourages students to exhibit their innovations in graduation projects.

The discussion pointed out that governmentled programs, such as those in partnership with the Ministry of Human Development, have effectively supported women in leadership roles and innovation. These programs offer training, mentorship, and networking opportunities to advance women in the workforce. For the future, PNU is developing programs to assess values and skills, encouraging students to engage in extracurricular activities that strengthen these attributes. An example is instilling empathy in STEM students, demonstrating the university's commitment to holistic development. Dr. Einas concluded by urging aspiring women innovators and policymakers to network, persevere, be patient, possess the right grit, maintain a positive outlook, and most importantly, support other women.



Panel — AgriTech Innovation for Global Food Security

This panel discussion featured Dr. Abdulaziz AlMalik, Deputy Minister of Research & Innovation, Ministry of Environment, Water, and Agriculture; Purushottam Kaushil, Head, Centre for the Fourth Industrial revolution India; Adair Gallo Junior, Chief Executive Officer at Terraxy; Suzanne Tate, Chief Design Officer at Smart Oasis Farms, and was moderated by Shelly Trench, Managing director & partner at BCG Dubai).

This session revolved around the role of government in Driving policies and regulations to remove constraints effectively for the advancement of Vision 2030, particularly in the agriculture, water, and environmental sectors. Dr. Abdulaziz AlMalik emphasised the government's role in achieving sustainability goals. Given challenges like climate change and limited water resources in Saudi Arabia, innovation is vital to protect the environment, manage water resources efficiently, and ensure accessible and affordable food. The government plays a key role in introducing sustainable policies and fostering change.

Purushottam Kaushil highlighted the complexities of the agriculture sector, especially when dealing with millions of small-scale farmers in countries like India. To overcome the challenges, education and adoption of technology are vital. He discussed the AI4AI initiative that involved startups, government policymakers, and workshops to bridge the gap

between technology and farmers. They have successfully increased farmers' income using AI and data and created digital certificates for crop produce.

— Dr. Abdulaziz AlMalik also discussed the nexus between environment, water, and agriculture and how innovation can revolutionise traditional farming practices. Examples included precision farming, smart irrigation, biological pest control, and efficient supply chain management, all contributing to environmental sustainability. Dr. Adair Gallo, from Terraxy, discussed the challenges they faced in soil water conservation and plant growth. He highlighted that innovation thrives in environments that allow experimentation and learning from failures. An environment conducive to innovation could minimise errors, and collaboration between people with diverse expertise is essential.

Suzanne Tate pointed out that technology should be accessible to small and medium food growers to address climate change challenges. She emphasised redefining how agriculture shares risks, particularly in developing regions. The panel stressed the importance of merging various technologies, making them open-source, and collaborating across sectors to enhance agriculture and environment efficiency. They also discussed existing technologies that should be scaled, such as biochar for carbon sequestration. Regarding social and economic value, the session concluded that international collaboration and frameworks are essential to share knowledge and practices globally, allowing countries to adapt and catch up with advanced nations.



Panel — Role of 4IR in shaping the future of industry: Pathways to Industrial Leadership

This panel discussion featured Sulaiman Almazroua, CEO of National Industrial and Logistics Program; Michael Sonderby, Managing Director and Senior Partner at BCG; Sertaç Yerlikaya, Steering Committee Member, C4IR Türkiye and Advisor to the Deputy Minister of Industry and Technology; Dr. Majed Algwaiz, Director General, Advanced Manufacturing and Innovation, Ministry of Industry and Mineral Resources, and was moderated by Giedre Malinauskaite, Chief Strategy Officer at CNTXT.

In the day's final session, the discussion focused on "Pathways to Industrial Leadership," emphasising innovation, adopting Fourth Industrial Revolution (4IR) technologies, and addressing the skills gap in the industry. Saudi Arabia's innovation and advanced manufacturing priorities were detailed, including factories' digitalisation and efficiency enhancement, turning them into technology producers, and nurturing innovation cycles. Digital infrastructure initiatives, smart industrial cities, funding, training, and more have been introduced to support these priorities. Key sectors for innovation encompass aerospace, drones, electric vehicles, batteries, pharmaceuticals, desalination, robotics, manufacturing, 3D printing, and advanced materials. Saudi Arabia is actively developing technologies like industrial AI, autonomous factories,

digital twins, and IoT platforms to accelerate the adoption of Industry 4.0 technologies. The Vision 2030 program is pivotal in realising Saudi Arabia's industrial and technological potential.

The National Industrial Development and Logistics Program (NIDLP) is central to these priorities. Aligned with Vision 2030, NIDLP aims to transform Saudi Arabia into an industrial powerhouse and a global logistics hub by leveraging 4IR technologies. NIDLP focuses on efficiency, resilience, connecting continents, clean energy, and reducing carbon emissions, contributing to Saudi Arabia and global community objectives. Comparatively, Saudi Arabia's digital transformation, infrastructure development, and innovation efforts align with global trends. The nation's focus on technology investments and creating a holistic environment with regulations, incentives, and a skilled workforce sets it apart globally. Skills development is crucial to this transformation, emphasising the importance of upskilling the workforce to bridge the manufacturing sector's skills gap. Collaborations with startups are encouraged to learn from and employ technology talent effectively. Coding skills are increasingly vital, serving as a universal language for problem-solving and managing challenges, akin to English in business.

Sulaiman shared three key success factors for Vision 2030 and the NDLIP program: a strong belief system, comprehensive engagement across sectors, and agile governance. Dr. Majed highlighted success stories from the Future Factory Program, demonstrating the adoption of advanced manufacturing technologies, including additive manufacturing, digital twin technology, and automation for labour efficiency. These stories exemplify the program's transformative impact on efficiency, cost reduction, and workforce development.

Collectively, these insights illustrate Saudi Arabia's commitment to advanced manufacturing, innovation, and workforce development, all contributing to the nation's global industrial leadership and transformative potential.



In conclusion, the event provided a comprehensive overview of Saudi Arabia's ambitious Vision 2030 and its concerted efforts to drive innovation, technological adoption, and economic diversification. Key takeaways from various sessions highlighted the pivotal role of industrial clusters in achieving these goals, particularly in the manufacturing sector, where the Fourth Industrial Revolution (4IR) is driving innovation, job creation, and economic growth.

Government initiatives, exemplified by programs like the "Future Factories Program," place a strong emphasis on the development of digital infrastructure, the adoption of cutting-edge technologies, and fostering collaboration. These endeavours are central to diversifying the economy and positioning Saudi Arabia as a global leader in the realms of innovation and technology adoption. Furthermore, the discussions resonated with the critical role of digital innovation in navigating challenges and capitalizing on opportunities. Distinguished organizations like STC and Aramco are proactively shaping the innovation landscape.

They leverage public-private partnerships to advance strategic objectives, amplifying the impact of these initiatives.

The pivotal role of talent in the journey toward economic diversification was a recurring theme. Talent, often regarded as more potent than mere financial investment, is exemplified by the forefront position of King Fahd University of Petroleum and Minerals (KFUPM) in nurturing a pool of highly skilled individuals, poised to meet the demands of future job markets. The session addressing women in STEM underscored the substantial presence of women in these fields. Institutions like Princess Noura University (PNU) play a pivotal role, and gender diversity is acknowledged as a catalyst for innovation.

The biotech sector discussion highlighted the imperative need for well-crafted policies, effective funding mechanisms, and robust public-private partnerships to drive innovation. Additionally, the critical role played by venture capital and angel investors in advancing biotech research and development was duly recognized. In the context of space exploration, the profound impact on various economic sectors became evident. Saudi Arabia's progress in this domain and the vital role of government support and infrastructure development were underlined.

Conversations surrounding the government's role in the agriculture, water, and environmental sectors emphasized the importance of sustainability. Innovation is deemed a linchpin in addressing challenges, and ensuring technology is accessible to small and medium food growers was emphasized.

Lastly, discussions on pathways to industrial leadership outlined Saudi Arabia's dynamic innovation and advanced manufacturing priorities. Aligned with the Vision 2030 agenda, these initiatives encompass a diverse spectrum, including aerospace, drones, electric vehicles, and advanced materials. These efforts aim to transform factories into technology hubs, embracing innovation cycles. Further highlighting the pivotal role of talent in the journey toward economic diversification, nurturing human capital and upskilling the workforce, particularly in areas like coding, were recognized as vital components of this transformation, which ultimately positions Saudi Arabia as a global leader in advanced manufacturing and innovation. Overall, these insights collectively illustrate Saudi Arabia's commitment to advanced manufacturing, innovation, workforce development, and global industrial leadership, positioning the nation for a transformative future.

