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ASSUMPTIONS

ECONOMICS SOCIETY
THE UNIVERSITY OF WARWICK

INNOVATION

THE FUTURE OF INVESTMENT BANKING / SAUDI ARABIAN ECONOMIC DIVERSIFICATION / AI IN FINANCIAL REGULATION / US DEMOGRAPHY / CENTRAL BANK DIGITAL CURRENCIES / EDTECH / US ENTEREPENEURSHIP

ASSUMPTIONS

EDITORIAL TEAM

ECONOMICS SOCIETY
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EDITORS' NOTE

Happy New Year and welcome back! This Spring 2024 edition of Assumptions delves into the realm of **innovation** - a force to be reckoned with that has the power to transform the way we live. Our newly appointed Junior Editors discuss the groundbreaking impact of innovation on existing industries and how innovation can help birth new business models.

Happy reading!

Manish Vekaria & Deepan Sakthivel

EDITORS IN CHIEF

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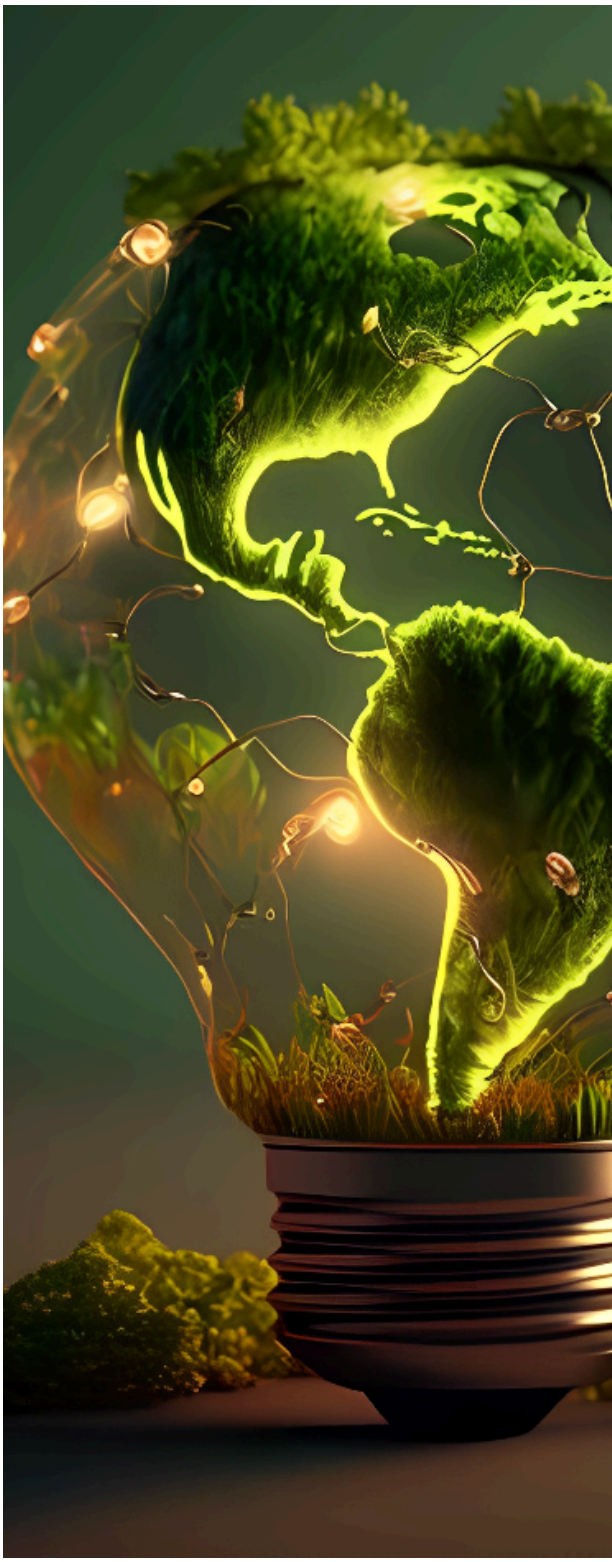
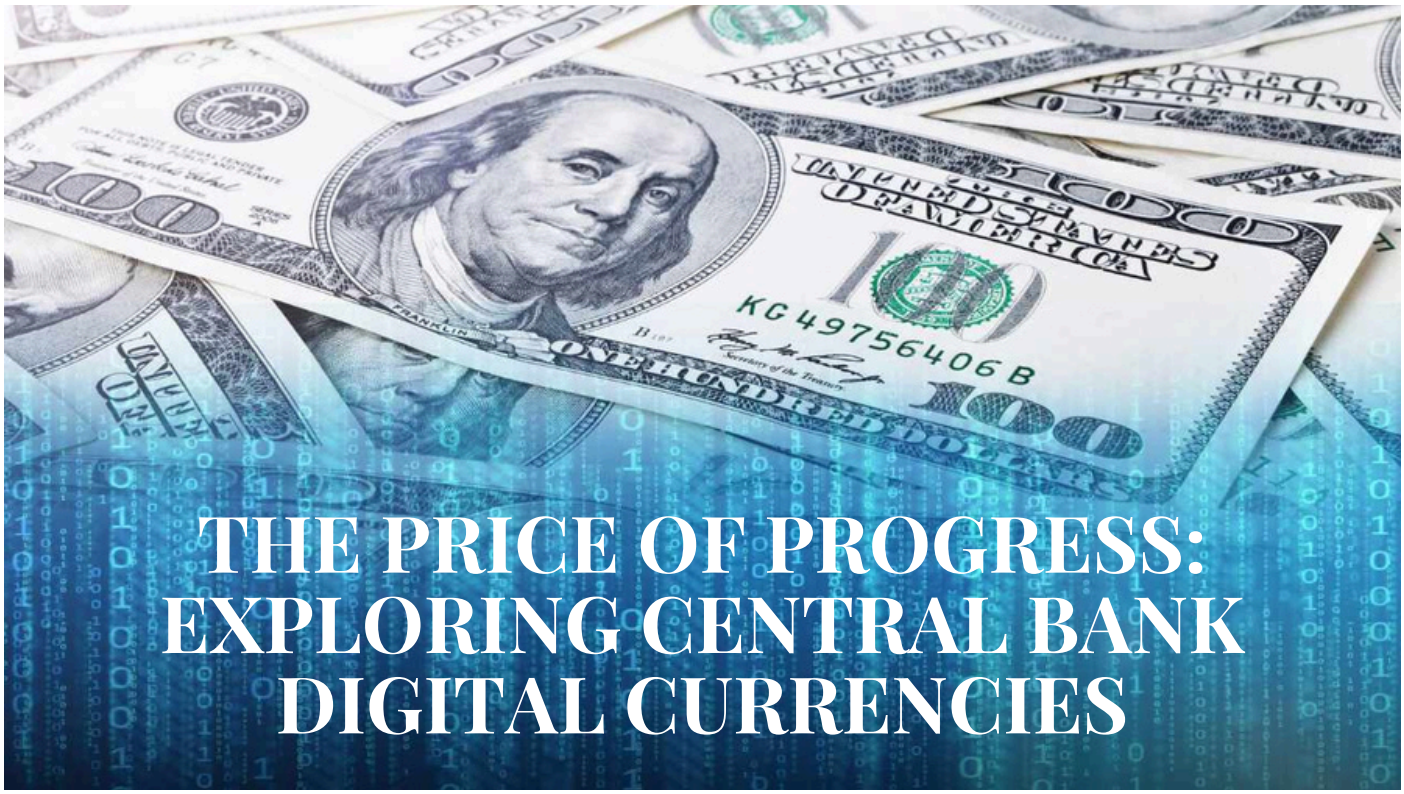




THE PRICE OF PROGRESS: EXPLORING CENTRAL BANK DIGITAL CURRENCIES

BY DIXON JUNIOR GAO-CHEUNG

When was the last time you used cash and coins? For both consumers and firms, the allure of card and contactless is all too real. Cash and coin simply takes longer in terms of facilitating transactions, business cash flow, and is becoming less relevant as a tool for budget management. Card solutions simply accelerate processes for all stakeholders, and in a post-Covid environment in which hygiene was paramount, card has become an entrenched default option.

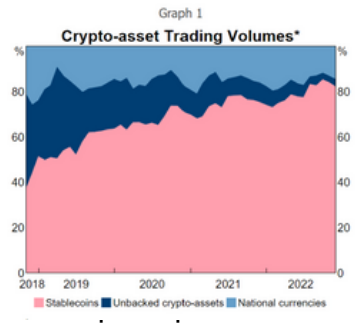
According to UK Finance, a trade association for the UK's banking and financial sector, cash as a percentage of all payments fell to 14%, fitting into a long-term decline for physical money. So, to answer my question, it's probably been a while since you've used cash and coins.

Displacement of cash by card and the efficiency of card transactions are the most visible amongst a variety of reasons for central banks wanting to pursue Central Bank Digital Currencies (CBDCs). These are essentially a digital form of cash, backed by the central bank, but stored in a digital rather than physical wallet. For reference, discussion of CBDCs encompasses both retail and wholesale CBDCs. A retail CBDC refers to digitalised cash for the general public, with wholesale CBDCs intended for larger financial transactions, such as interbank transfers and other related transactions in reserves.

According to the Atlantic Council, an American think tank, 130 countries, representing 98% of global GDP, are currently exploring CBDCs, with 64 countries in development, piloting and launch stages.

A significant push factor for central banks in developing CBDCs has also come from the rise of stablecoins, which are crypto assets pegged to underlying assets such as dollars, liquid reserves or precious metals. They offer reduced volatility, but simultaneously benefit from the speed and security of blockchain technologies.

Seen below is a graph from Reserve Bank of Australia (RBA) research, detailing how crypto-asset exchanges as a share of monthly trade volumes have shifted towards stablecoins and away from unbacked crypto assets.



Central banks are spooked by the prospect of stablecoins, which already account for a massive chunk of crypto trading, expanding in terms usage, due to the potential of massive operational and financial risks.

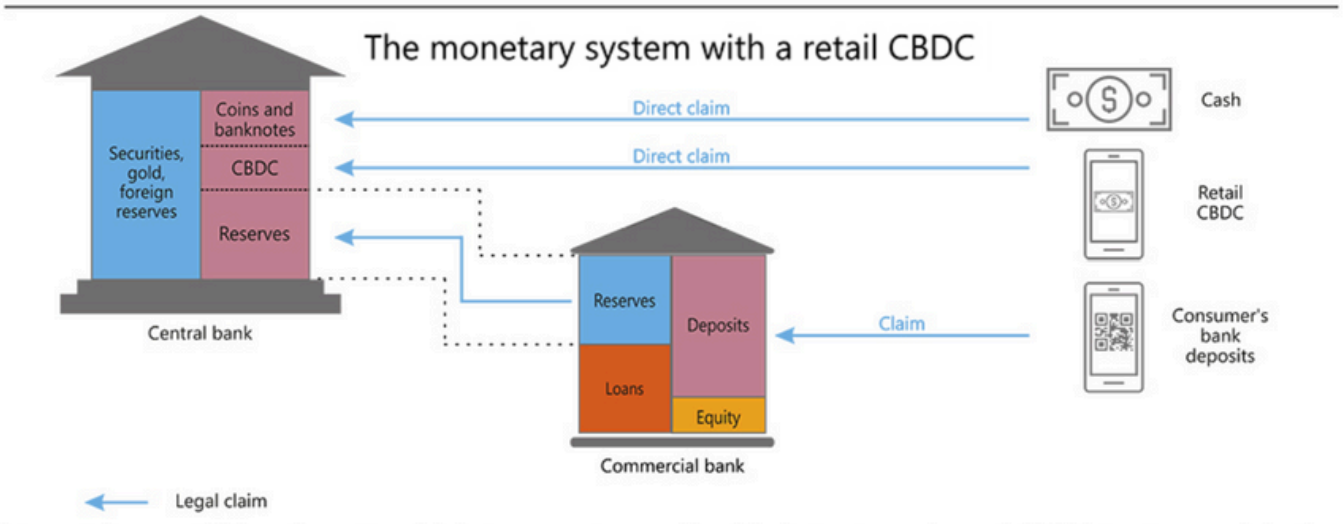
According to the RBA, stablecoins are currently risky to users given that they are vulnerable to "runs", as a rush of demand for deposits may not be sufficiently met due to illiquid assets.

On top of that, the reserves held by asset-backed stablecoins are subject to broader market, credit and liquidity risks. Further operational risks such as underregulation and legal uncertainties exacerbate the issue and if stablecoins were to expand more broadly, to say encompass payment services, exposure to risk could grow exponentially, with millions of households subject to potential crunches.

For instance, TerraUSD, an algorithmic stablecoin with a theoretical peg of $1, fell as low as $0.23 in May 2023, despite its asset-backing and additional support of $3 billion in Bitcoin reserves injected in a bid to save the coin. Other currencies such as Tether have been questioned as to whether they have backing equivalent to their market capitalisation, with USDT briefly losing its peg to USD, falling to $0.97. It's clear these coins currently pose, and will pose a threat to financial stability. Central banks aren't hallucinating. Having covered the why for CBDCs, we'll weigh up their pros and cons.

The Good

As discussed above, introduction of a CBDC could potentially hedge against the financial stability risks posed by the expanding influence of stablecoin crypto-assets, by providing central bank backing and confidence to a digital asset.



Furthermore, introduction of retail CBDCs allow households to have direct claims on the central bank (as shown by the BIS diagram in the previous page) as opposed to claims on deposits at commercial banks, subject to runs. Thus, during periods of financial instability, household deposits held as a CBDC would have a central bank guarantee, not subject to potential commercial bank collapses.

On top of that, wholesale CBDCs could play a role in boosting transaction efficiency and security by taking advantage of distributed ledger technology (DLT). DLT refers to data stored in the form of blockchain, in strict sequential ordering and can provide "transparency, integrity and availability in a decentralised environment" according to a National Cyber Security Centre whitepaper. In the wholesale CBDC environment, this means greater cross-border settlement efficiency through real-time settlements and global interoperability. Furthermore, DLT provides added security and transparency of accounts.

Furthermore, CBDCs could widen financial inclusion considering that they can cut out the commercial bank middleman. Those with poor credit, or insufficient funds could hold CBDCs without a need to open a commercial account, allowing unbanked individuals to adjust to the transition to card and contactless payments and keep in line with further developments and digitalisation of payment technology.

The Bad

However, the exact benefit of cutting out a commercial bank middleman also could plant the seeds for financial instability. By introducing CBDC accounts, central banks compete for deposits with commercial banks, potentially raising a risk of "structural and cyclical disintermediation", as economic consultancy Oxera puts it. Structural disintermediation refers to the aforementioned crowding out of retail deposits which could lead to reduced loan amounts and higher rates. Were retail banks to attempt to compete with CBDCs on deposit rates, retail banks could expose themselves to heightened interest rate risk. Furthermore, in the case of cyclical disintermediation, CBDCs could greatly accelerate bank runs, as the process of withdrawing from a commercial deposit account to a CBDC could be near frictionless.

To make matters more complicated, CBDCs could also pose a risk to personal liberty and work to politicise central banks. The Cato Institute, an American libertarian think tank, states that CBDCs could make seizure/freezing of assets by governments easier, enable negative interest rates and potentially program people's spending. Politicians such as Florida Governor Ron DeSantis have already prepared paperwork prohibiting CBDC use, with DeSantis expressing opposition based upon Biden's proposals involving "surveillance and control".

What next?

CBDCs offer up huge potential in central bank-led innovation, offering up promising developments in ledger technology, financial inclusion, reduced transaction costs and mitigating future risks posed by rival private crypto-assets. However, it's clear that retail CBDCs require significant design considerations in terms of privacy and how commercial banks adapt to the change in the financial landscape.
Central banks should work from the ground up and carefully consult the general public and retail bank stakeholders in order to both legitimise and facilitate a transition into a new form of money. As revolutions often do, CBDCs offer a slew of benefits and reforms to efficiency that have yet to be seen, but also an upheaval that must be attentively managed.

THE INVESTMENT BANK OF THE FUTURE: TRENDS IN INNOVATION

BY VALERIE CHUNG

Innovation is a core value in all global investment banks, including Morgan Stanley and UBS. The slowing global economies coupled with the rapidly changing financial landscape are challenging investment banks' ability to generate revenue in new ways, such as the persistence of high interest rates, climate change and geopolitical tensions. Considering this, there has been an exponential rise in the adoption of new technologies such as AI, machine learning and Blockchain, which has influenced the operation of investment banks to remain competitive and provideval ue to their clients. Hence, the investment banks of the future will undergo significant transformation through innovation to tackle challenges such as the rise of Fintech companies and climate change.

In recent years, the investment banking industry has seen hundreds and thousands of layoffs, with Goldman Sachs' reduction of around 3200 in Q1 2023 being one of the largest cuts. One of the possible reasons for this is the continued rise in the adoption of Artificial Intelligence (AI) and automation. The adoption of AI in IB started its traction in the early 2000s but has remained restricted to robotic process automation (RPA) – the automation of repetitive tasks, such as data entry and reconciliation. An example would be UBS adopting RPA to process the large amounts of loan request processing during the pandemic when low interest rates persisted. With the collaboration with Automation Anywhere and implementation of RPA in just six days, UBS' loan request processing time dropped from 30-40 minutes to 5-6 minutes, at least an 80% cutback, reflecting how this innovation in banks' foundational layer can enable the maximisation inefficiencies.

With the rising threat of Fintech companies, financial technology revenues are predicted to grow sixfold from $245 billion to $1.5 trillion by 2030, according to a report released by Boston Consulting Group and QED Investors. Though fintech firms are often viewed as competing with banks as they usually operate with

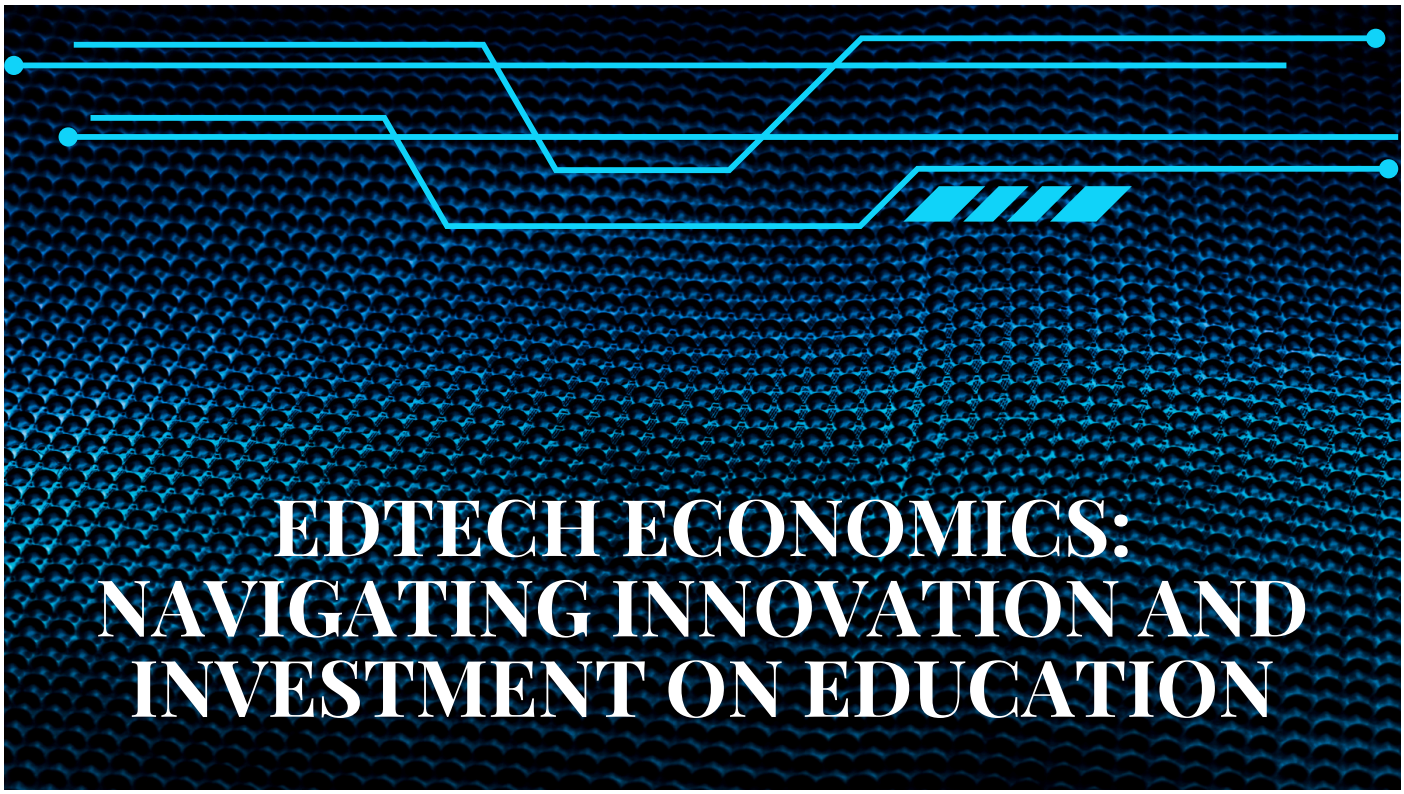
more agility, lower costs and innovative technologies, it has not been till recently that there has been growth in collaboration and acquisition between banks and fintech firms, implying a change in the strategies adopted by investment banks in navigating the changing financial landscape.

Fintech firms, short form for Financial Technology firms, have established themselves as firms which rely heavily on technology to develop tools to digitalise, automate and improve financial transactions. With traditional investment banks partnering with fintech to drive innovation, these collaborations have allowed banks to access more information on consumers through data aggregation, AI, machine learning, and other tools, such as HSBC's planned launch of a joint venture with Tradeshift in early 2024 which is expected to raise a minimum of $70 million from HSBC and other investors. By utilising technologies from Tradeshift - a cloud-based business commerce platform, HSBC can expand their revenue streams to companies who aim to digitalise and automate their operations as their global supply chains could be managed from any device with the usage of one simple digital platform. These new synergies sparked from integrations, such as acquisitions and joint ventures, will incentivise more investment banks to act in the same manner, with JPMorgan Chase investing in and buying more than 40 Fintech companies since early 2021. Hence, client services will be improved – the major aim of all investment banks.

On the other hand, many investment banks decide to do in-house innovation in finance technology instead of integrations. Research has found announcements on these integrations have a negative value on a bank's value in the short term. While these findings do not indicate much about the ultimate profitability of bank–fintech alliances, they suggest that markets believe that banks should develop new digital services themselves rather than engaging in alliances with fintechs. On top of that, it is hard to find a fintech firm that fits perfectly with how the investment bank is operating at the moment without having to change its business model. Therefore, investment banks would aim to look for technology that's sophisticated enough to fully bring in-house.

Another notable trend is the skyrocketing focus on Environmental, Social and Governance (ESG) in investment banking. The core value of sustainable growth can now be seen on many investment banking websites, especially in the tech industry. To address this mission, some banks have created entire divisions dedicated to ESG while others have made strategic investments in ESG for M&A. For instance, Standard Chartered provides a sustainable investment programme where they assist companies to achieve their net-zero goals by achieving a Sustainalytics ESG risk rating of negligible or low, supporting green mutual funds and ETFs in their investment portfolios. Beyond the corporate social responsibility initiative, ESG leadership serves as a key justification for higher deal valuations, according to a survey from Bain. With the constant rise in awareness of climate change, how investment banks alter their strategies to address ESG will differentiate them as it could build up a long-lasting reputation.

To conclude, the increasingly competitive investment banking industry has placed more importance on innovation where different banks, like Goldman Sachs and JPMorgan, launched in-house incubators to provide a platform for the rise of new solutions to clients' requests. With major innovation occurring in technology where AI and automation, Fintech, as well as rising focus on ESG, are being widely adopted in different divisions of banks. However, the future of banking will look very different from today. As a result, banks will need to start visualising the future beyond immediate restraints and utilise the freed-up time from using AI to harness unique insights and trends from data and build client relationships, to remain competitive in the future years ahead.



EDTECH ECONOMICS: NAVIGATING INNOVATION AND INVESTMENT ON EDUCATION

BY PRARTHAK SHARMA

In recent decades, general innovation has been seen as critical to retaining competitiveness in a globalized economy. Innovation can revitalize sluggish markets and serve as a vehicle to improve any organization's ability to adapt to changing conditions. This revolutionary impact of innovation has taken over the education industry. For hundreds of years, the education industry was untouched with a marker and board being the regular norm for teaching in schools, however, we are living proof of the sudden change in the education industry due to the impact of COVID-19 which led to a surge in the growth of EdTech.

EdTech bridges the gap between education and technology by leveraging technology to enhance the learning experience. Simply put EdTech is the new global phenomenon in the educational industry as it continues to stay booming as the current market value sits at $340 Billion with a potential to grow by 15% come 2027. The demand for EdTech continues to rise due to the demand for innovation in education, as innovation leads to improvement in learning outcomes as well as the quality of education provision, more importantly globally education is viewed as the means of enhancing equality and equity and innovations of EdTech helps to enhance equity in the access to and use of education, as well as equality in learning outcomes.

The majority of current trends in EdTech belong to online learning-based solutions such as immersive and personalized learning. The catalyst for this surge can be traced to the transformative impact of COVID-19, coupled with the demand for flexible learning options. Subsequently, AI and data analytics solutions employ administration data to streamline learning. Cloud computing expands on this by providing

infrastructure-free scalable platforms that improve flexibility and operational efficiency. Additionally, EdTech businesses employ blockchain to confirm academic credentials and other documents, as well as to monitor various classroom and school activities via IoT.

What distinguishes immersive learning from traditional schooling is the non-linear activities it offers allowing for students to improve information processing and retention, creating a risk-free space fostering student engagement and performance. The innovation of AI and machine-based learning in the education industry has taken over multiple manual tasks like activity monitoring and attendance, allowing teachers to be more focused on student performance.

For instance, a US-based start-up Smart Invigilator develops an AI-driven exam monitoring system that leverages deep learning to enable audio, face, and video recognition. This proved to be revolutionary during the pandemic especially as it allowed universities and schools to replace manual invigilators and offer at-home examinations. AI also employs innovative ways to enhance learning by providing students with suitable learning resources, personalized routes, and feedback based on their skill set. Clevai, a Singaporean start-up, employs AI to analyse a student's learning background, identifying moments of distraction and suggesting strategies to bridge learning gaps.

Innovations such as Blockchain also improve security in the education sector by allowing learners as well as employers to verify the authenticity of certificates. This helps prevent fraud and increase employment in the education industry. Blockchain serves as a means to improve efficiency as it proves to be a secure platform for schools and colleges to store sensitive information. These features shorten the time necessary for academic data verification and re-issuance of documents.

A great example of this is an Indian start-up TruScholar which uses blockchain to facilitate the production of digital certificates for educational institutes such as universities. Subsequently, the integration of IoT enhances accessibility to resources, ensuring student safety, as demonstrated by Iryx Corporation in the U.S., leveraging IoT and sensor fusion to monitor environmental conditions for optimal learning environments.

Clevai

TruScholar

Together, these innovations not only reimagine education but also promote efficiency, security, and personalized learning experiences, demonstrating EdTech's transformative capacity.

This constant technology change has forced companies to upskill their labor force, to keep up with the market's demand. As innovations arise every day the EdTech industry continues to boom with venture capitalists investing $20.8 billion in 2021. This surge in capital inflow promotes competition within the space forcing companies to invest in reskilling and upskilling their employees to meet the dynamic demands of the EdTech sector. Even companies such as Coursera which focuses on consumerism have gained a majority of its revenue via enterprise clients. This cycle of human capital investment increases individual employability but also enhances the wider economic fabric by producing a trained workforce that meets the demands of the booming EdTech sector.

Thus, the revolution of EdTech allows for an opportunity for growth and advancement of the economy. As it allows for competition to flourish and forces companies to continue to inject cash into the economy allowing for an appreciation of GDP in the economy while benefiting employment at the same time.

EdTech has flourished in Asian countries like India. However, only 48.7% of the population have access to the internet making it difficult for those who don't have any internet to take advantage of the technology. Thereby, creating inequality in the education sector. This also gives rise to economic disparity with the wealthier population having greater access to EdTech. As stated earlier there are multiple sources of innovation in the space however, this can potentially lead to excessive market fragmentation making it difficult for educators to decide as to what piece of technology to focus on. Subsequently, a lot of money will also go into maintaining the technology as well as reskilling the workers. While this allows employees to acquire new skills, however, those who fail to keep up the pace of technological growth will face unemployment and this may further lead to a recession in the economy.

In conclusion, the EdTech industry, marked by rapid innovations, offers significant growth potential. The economy, drawn to its proven success, is likely to invest more. EdTech's role in economic growth, innovation, and job creation is evident, yet challenges like unequal access persist. Striking a strategic balance is crucial for navigating hurdles and optimizing opportunities in this dynamic landscape.

HOW HAS RETROFITTING BECOME A PART OF THE UK'S NET ZERO STRATEGY?

BY MAHA AHMED

Innovation is one of the main drivers of economic development and growth. It is not only focused on creating new products, but it also refers to developing new strategies and methods to reduce costs and increase efficiency.

Today we are faced with many concerns and issues regarding climate change and the state of our environment. As a result, policymakers and governments have put heavy emphasis on green innovation; aiming to produce new ideas that will reduce detrimental impacts on the environment. While this takes time to develop and implement it is often able to promote sustainable development.

In 2019, the UK began working towards its net-zero target and has since regularly updated its strategies. This is an accumulation of policies to decarbonise all the sectors in the economy to reach a zero target for 2050. As of September, this year, we have already seen a 48% cut in the UK's carbon emissions.

In particular, the UK has put its efforts into retrofitting its homes and buildings. This essentially means that they are improving homes to lower their carbon emissions and make them more energy efficient (10). These changes include insulating buildings to regulate the temperatures, double-glazing windows and even implementing renewable technology like heat pumps.

Retrofitting is a vital step for the UK as homes account for 20% of carbon emissions hence, the adaptions made in homes will make it possible for households to use less energy to heat or cool their homes, significantly reducing the amount of carbon emissions. This will therefore bring throughout closer to their goal and such changes will stimulate sustainable development in the economy.

Furthermore, reducing carbon emissions will have knock-on health effects. Currently, the excessive consumption of energy by households creates a negative externality where the costs to society include significant environmental and health risks from the pollution. Thus, if homes reduce their emissions through retrofitting, this externality will be reduced, and society will be better off. However, the benefits of retrofitting do not stop here.

Firstly, and most significantly, retrofitting can help improve living conditions. For one, households will be more comfortable and will hence require less energy because they can rely on the improvements in their homes. This is especially important because in recent years energy prices have increased exponentially exacerbating 'fuel poverty' where households are unable to heat their homes. This had harmful impacts on residents last winter in the UK because the prices meant some people had to forgo heating their homes. However, retrofitting homes will lower energy bills for many, allowing households to allocate their spending on other necessities. Additionally, the comfort given through retrofitting will have health benefits, keeping people healthier which in turn will improve the efficiency and productivity of the workforce.

Secondly, with the increased demand for retrofitting, more jobs will be created in the economy which will help decrease unemployment rates which are expected to rise. While this will require training which will be costly, the long-term benefits of retrofitting are likely to outweigh this concern.

Lastly, retrofitting could become an alternative instead of demolishing older buildings (5). This is particularly helpful for buildings in large cities which would create significant disturbance. Similarly, it has been suggested that retrofitting homes will help them last longer because they will be more adapted to future standards. Therefore, instead of rebuilding structures, construction can be focused on new buildings.

While these benefits are not exhaustive, the cost of retrofitting is a main concern. To overcome this, the government has tried to implement incentives – for example, cutting VAT and offering subsidies and grants – for private owners and landlords to undergo retrofitting. They have also implemented the Great British Insulation Scheme which aims to help fund retrofitting for lower income households. Also, although costs in the short term are high, the amount of money saved from energy bills in the long term is likely to exceed them.

Overall, retrofitting homes is an example of innovation that is crucial for the UK to meet its carbon goals and will have various knock-on benefits for many groups in society.

HOW INNOVATION IS LEADING THE SAUDI VISION OF ECONOMIC DIVERSIFICATION

BY ARUN SITHAMPARAPILLAI

As the second largest oil producer in the world behind the USA, Saudi Arabia is well known for its dominance in the industry. With oil production and extraction contributing up to 46% of its GDP and 80% of Saudi's exports being oil, it is a country that maintains a heavy reliance on its oil sector. This is where the Saudi Vision 2030 programme comes in. Launched in 2016, its aim is to achieve economic diversification for the country away from oil production and alleviate the risks associated with a potential resource curse (Chaudry et al, 2021). Through innovative projects which aim to alter the international perception of the country's economy, Saudi Arabia looks to achieve the status as the hub of economic activity which connects Afro-Eurasia.

In particular, the development of NEOM highlights the underlying theme of innovation within the Saudi Vision 2030 government programme. NEOM is an urban area planned to be built in the northwestern region of Tabuk. Its most prominent features will include the infamous city 'The Line', as well as Trojena, which will become the first major outdoor skiing resort in the Arabian Peninsula. So, where does innovation come into the project?

The Line, a linear smart city in the Tabuk region spanning 170 kilometres, will be powered entirely by renewable energy, have no streets or cars, and have zero carbon emissions. The 34 square kilometres will eventually accommodate 9 million people, resulting in a population density nearly 6 times as large as Manilla – the most densely populated city in the world. Economic activity across The Line is expected to generate 460,000 jobs, contributing $43bn to the economy's GDP by 2030, therefore beginning to repay the estimated building cost of up to $200bn. By creating such strong economic activity outside of oil production, Saudi Arabia can comfortably achieve its target of economic diversification.

However, The Line does not only seek to impact the wider economy, but also redefine the urban style of living in Saudi Arabia. Through artificial intelligence, city activity will be monitored, and predictive data models will be applied to find methods of improving daily life for its citizens. This will be combined with feedback which citizens will be paid to give, in order to accommodate the needs of the city's residents in the most efficient manner. Unlike other cities, The Line claims to prioritise people's wellbeing over the traditional factors such as infrastructure and transportation. With a reduced infrastructure footprint, The Line will offer equitable access to pristine natural environments, all within a 2-minute walk for residents. The elimination of unnecessary infrastructure will subsequently create a zero-carbon city, with the integration of open-air spaces and nature throughout serving an important role in improving air quality. Therefore, the innovative initiatives employed by the Saudi government not only aim to diversify the economy from a higher level, but also provide a greater quality of life for its citizens, subsequently helping to attract skilled service workers to the country.

The NEOM project also seeks to attract more tourists to Saudi Arabia, enabling the country to compete with strong tourism industries in other Middle Eastern countries such as the UAE. Trojena is a futuristic outdoor ski resort – the first of its kind. Trojena boasts impressive engineering innovations, aiming to be fuelled entirely by renewable energy generated from the NEOM energy grid, which is carbon neutral and emits no greenhouse gases. The project, which is already in its initial development stages, intends to bring in 700,000 annual tourists by 2030. Furthermore, the Trojena complex will also house nightlife activities, a mountainside amphitheatre, and a man-made freshwater lake. This aligns with the overall green vision of the NEOM project, and overall aim of the Saudi Vision 2030 project.

Clearly, the driving innovation behind Trojena will have a multifaceted impact on the country. Once again, Trojena aims to alter the international perception of Saudi Arabia as a place to live. The engineering advancements involved in the construction of Trojena look to attract top brands and firms to the complex. Additionally, Trojena plans to host the 2029 Asian Winter Games, continuing the previous strategy of driving mass tourism in Saudi Arabia through hosting sports events. The hope is that through hosting an iconic event at a one-of-a-kind venue, international perceptions of Saudi Arabia will be challenged. The creation of a diversified portfolio of sporting events will not only allow the economy to reduce its dependence on oil production, but also attract skilled international workers to a service sector which the government seeks to grow through an improved reputation globally.

The project does not end there either. NEOM alone will have 4 other regions, including a floating industrial complex and a new airport. Furthermore, the Saudi Vision 2030 programme will implement over 15 other major initiatives aside from NEOM, each of which boasting its own unique innovative qualities. The Saudi government have a strong desire to kickstart a new era for the Saudi economy by shifting dependency away from oil production. The underlying benefits of the project extend beyond the economic benefits of diversification, seeking to also improve the international reputation of Saudi Arabia as both an economy and a country in general. Indeed, innovation will be the key in driving economic diversification in the Kingdom.

AS AI'S ROLE IN FINANCE ACCELERATES, HOW WILL FINANCIAL REGULATORS COPE?

BY HARLIE PATEL

Whilst the role of AI in financial markets has been a talking point over the past decade, recent developments in Generative AI over the last year has caused a stir within the banking industry. Already, banks have begun the race to develop their own platforms to outperform their competitors. Most notably J.P. Morgan has begun development into 'IndexGPT', a Robo Advisory platform combining Generative AI to inform investment strategy far more efficiently and accurately than before. With the industry in the chokehold of a digital revolution, it raises the question how regulators will keep up with these developments and innovate to maintain order in the financial realm.

Given the self-learning nature of LLMs, which requires minimal human intervention, regulators have come up with novel solutions to ensure transparency standards and investor trust is maintained. There is an active exploration into "human in the loop" strategies to address the "black box" nature of AI (Zetzsche et al., 2020). By integrating human oversight at critical stages of AI decision-making processes it enhances the transparency and accountability of these systems. With skilled professionals monitoring and evaluating AI outputs, regulators can better understand how AI models arrive at their conclusions, and ensure these processes align with ethical and regulatory standards. Finding a balance between the usage of AI and human involvement is necessary to maximise investor trust.

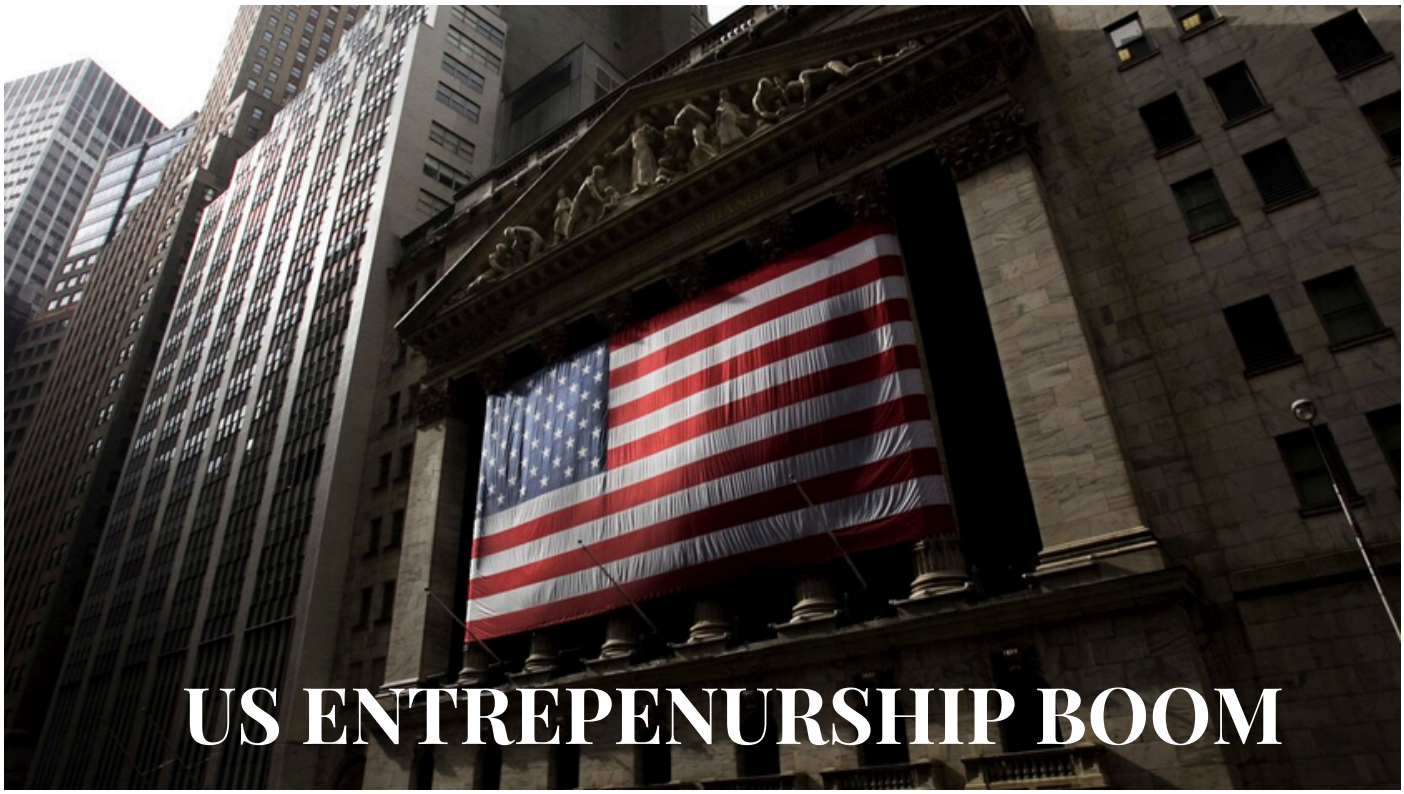
One area of concern is Generative AI's potential to exacerbate existing inequalities leading to strong bias and discrimination. As evidenced with Google Pixel's first facial recognition program which identified black individuals as gorillas, these systems tend to perpetuate bias and it is the goal of the financial regulator to mitigate this. For instance,

regulators are mandating the use of diverse and representative data sets to train AI models, providing a broad canvas for AI to learn from. Additionally, regulators are increasingly requiring AI developers to conduct rigorous bias and fairness assessments before deploying their models in financial contexts. These assessments include examining the AI's decision-making processes and outcomes across different demographic groups to identify and rectify any discriminatory patterns. Crucially, understanding the 'personality' of AI systems like deep learning robo-advisers is crucial for regulators to assess their safety and suitability (Chia, 2019). By demanding clear explanations of how AI models make decisions, they can effectively identify and mitigate bias.

At the same time, innovation in regulation has proved pivotal in improving their practices. Most notably, the development of Generative Adversarial Networks (GANs) is useful in helping regulators better understand AI decision making, helps regulators understand AI decision making, and the logic behind these steps allowing them to better regulate such systems. They are also vital in maintaining the integrity of financial systems. GANs can generate near-authentic, human-like reviews, improving fraud detection effectiveness, which is crucial for safeguarding consumer interests and market stability (Shehnepoor, Togneri, Liu, & Bennamoun, 2020). They can generate synthetic data that mimic real financial transactions, providing regulators with extensive, realistic datasets for training and testing fraud detection algorithms without compromising sensitive financial information (Efimov, Xu, Kong, Nefedov, & Anandakrishnan, 2020).

This ability to create high-fidelity simulations of financial markets enables regulators to anticipate and identify patterns indicative of market manipulation or other illicit activities, whilst also critical in developing more robust models for anomaly detection (Zenati, Foo, Lecouat, Manek, & Chandrasekhar, 2018). By integrating GANs into their surveillance and monitoring systems, financial regulators can significantly improve their capacity to detect and prevent fraudulent activities, thereby enhancing the overall integrity and security of financial markets.

In conclusion, as Generative AI continues to evolve and integrate deeper into the finance sector, it presents both challenges and opportunities. Financial regulators must navigate these waters carefully, balancing the need for innovation and technological advancement with the imperatives of market stability, consumer protection, and risk management. The regulatory landscape is adapting, but it remains a work in progress, requiring ongoing vigilance and adaptation to the rapid developments in AI technology.



US ENTREPENURSHIP BOOM

BY ASLI VURAL

With restrictions to leave our houses, masks that never left our faces, and meetings moved to our small computer screens, the pandemic has brought plenty of changes to our lives. People headed towards online streaming for entertainment, workouts were carried to living rooms, and food delivery and commerce were on the rise. While only some of these changes persisted throughout the years, there was a particular area on the rise after the pandemic in America whose boom still seems to be persisting: Entrepreneurship.

Due to the changes in trends during the pandemic, big companies who thought those shifts in preferences would be permanent, hired in masses. However, the economic conditions after the pandemic with high inflation heightened interest rates, the increase in energy prices, as well as changes in habits after the pandemic, now shows that the acceleration in some industries wasn't as permanent as it was assumed with companies like Netflix, Amazon, and Meta engaging in big-scale layoffs throughout the past 1-2 years (Zinkula). However, the boom in entrepreneurship which seems to have started during the pandemic seems to continue amid high inflation, increased interest rates, and shaky supply chains which raises questions about the nature of this boom in entrepreneurship and how it does/and could help the economy.

The reasons for the boom in entrepreneurship varied. With digitalisation, there has been an increased emphasis on flexible and freelance working which has increased even more with the pandemic and shift towards working from home. The increase in flexibility in using working hours, as well as increased resources due to the decrease in money and time spent commuting and socializing, has also increased household cash buffers in rich countries, which further increased interest in ventures. For the ones hit financially hard by the pandemic, entrepreneurship,

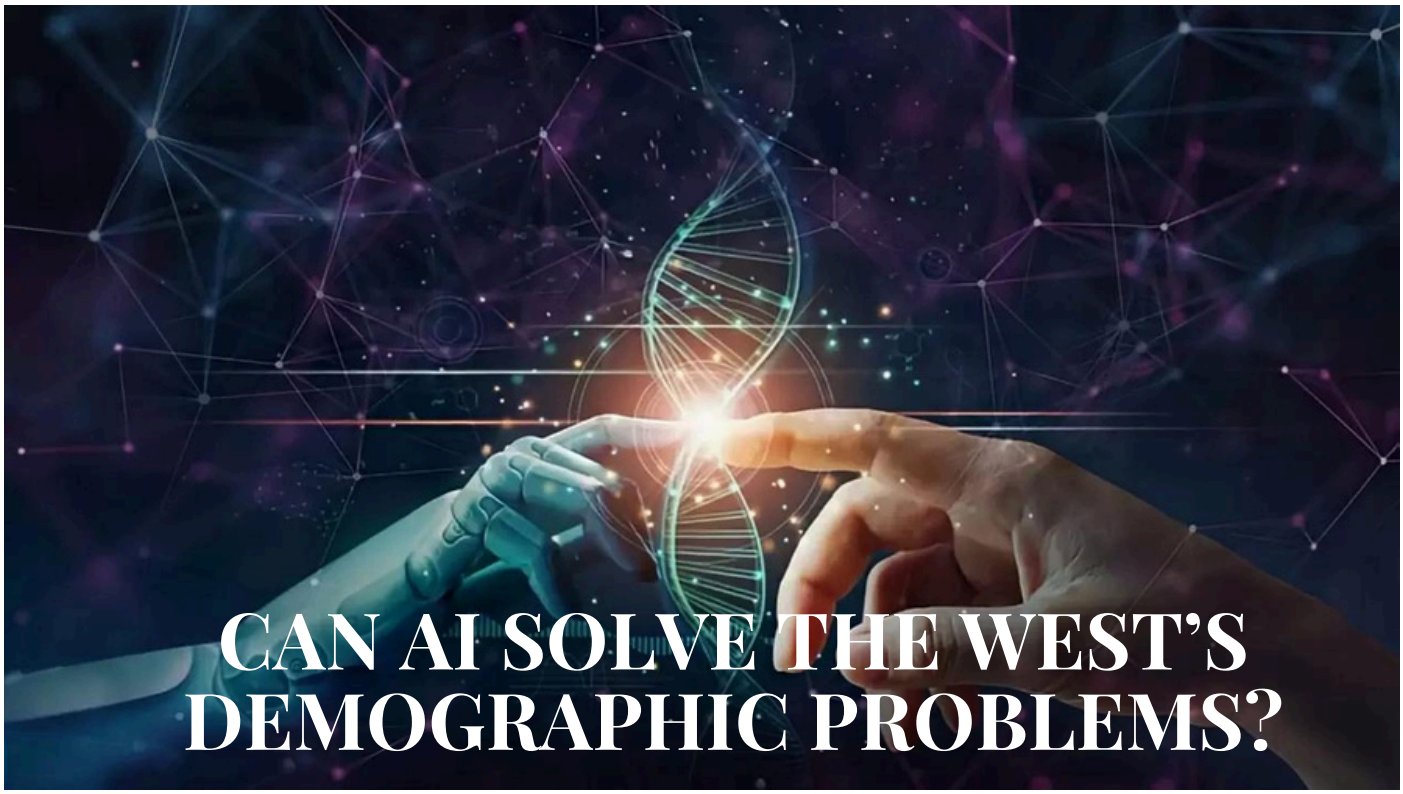
although risky, offered a way out. With deaths and ill people all around the media, the "you only live once" mindset was more generally accepted, and with easier access to investors through various online platforms and decreased set-up costs due to technology, many thought: Why not? As a result, according to the Financial Times, "in 2022 new business applications filed by Americans totaled 5.1 million, more than 40 percent higher than in 2019."

Another interesting aspect of this rise of entrepreneurship is the founders of these new ventures and the people who are leading this change. "I've looked at this data going back 50-60 years, and we've never seen a kind of boom like this during a recession. And we've never seen it led by the kinds of people who are creating businesses today" says Luke Pardue, an economist at Gusto ("Entrepreneurship"). With 49% of entrepreneurs being women in 2021 and 28% of 2021 business incorporations being founded by people of color, this boom seems to be significantly affected by the contribution of women and people of color, two groups that have historically been affected worse during economic turndowns ("Entrepreneurship"). While it is discussed whether this rise in women/people of color founders can be attributed to the efforts to increase inclusivity in venture creation, the main reason for the success of these businesses seems to be their preparedness for the market conditions and willingness to hire.

So why does a boom in entrepreneurship matter? First of all, entrepreneurship means the creation of new small businesses and ventures, that hire people to operate and therefore create a large number of entry-level jobs and train the workers into skilled ones while creating new products or services in their business. As a result, entrepreneurship stimulates economic growth, and while many entrepreneurs fail, the few that are successful seem enough to classify entrepreneurship as a way to create wealth (Stahl). Additionally, entrepreneurship fosters competition and is driven by innovation. Entrepreneurs create solutions for problems that are not already solved by current products or services or fill where they see a lack of opportunity. Due to its nature, it is also a great tool for social change as "innovative thinkers are using entrepreneurship to build a more just and sustainable world" (Stahl).

Knowing some of the reasons that led to the boom of entrepreneurship, the role of women/people of color in the trend, and the importance of entrepreneurship for the health of an economy, one last question persists: How long can this boom last? According to Soumaya Keynes, we should "hope for the best but expect the worst" ("How Long"). France, Sweden, Netherlands, and the UK are only some of the countries that have passed their period of peak business entry and the research shows that "UK companies created during the pandemic were less likely to post jobs and more likely to dissolve" (Keynes).

However, it is still possible that the US will defy these trends. Early stimulus cheques, generous cash support made to people, and the hotter US economy's effect on consumer confidence offer some explanation as to why the shock has lasted in the US (Keynes). Also, the increase in applications from the potentially innovative high-tech professionals and services that happened before the industrial policy was triggered and the fact that only a few innovative companies are needed for sustained growth offer glimmers of hope for the continued boom of entrepreneurship in the US. On the other hand, with the pandemic-era savings fading and the Federal Reserve trying to cool demand, there is still a significant chance that like other countries, the boom in the US will also come to a stop (Keynes).



CAN AI SOLVE THE WEST'S DEMOGRAPHIC PROBLEMS?

BY NAMAN MAHESHWARI

In the last 70 years, global fertility rates have fallen from 4.7 children per woman in 1950 to just 2.3 children in 2023. This trend is exacerbated in the developed world by large middle classes who are having fewer children than ever before. Low birth rates have, however, been the case in the West for centuries. Economic historians argue that the European Marriage Pattern (late female marriages leading to low birth rates) has stimulated growth in the continent since the 1600s. This trend's modern implications are much bleaker though, when coupled with Western life expectancies, which are at their highest point in history, it leaves top-heavy population pyramids with more people over 60 than under 20.

The most prominent issue arising from ageing populations is the pressure it puts on a country's support structure. Smaller working populations mean a greater tax burden is placed on the existing workforce to finance welfare spending such as the state pension. The Department of Health also reasons that investment into public services will have to increase with age-induced illnesses making up 70% of health and social care spending in England.

The discussion around AI has largely centred around how the technology will only contribute to several of these challenges facing the workforce. However, with its ability to function endlessly, it's worth asking if AI could be the solution rather than the problem. Technology can almost certainly ease the present and future obstacles facing healthcare. AI diagnostics are thought to reduce error and bias, whilst also giving doctors and nurses more time to carry out tasks that only humans could. Moreover, researchers at the Institute of Engineering and Technology used AI recommendations to encourage healthy eating and healthy ageing as a

result. This could help solve the West's labour force crisis with workers able to work more efficiently for longer. The care home industry is the latest to experiment with AI, using it to monitor elderly patients' health conditions and to allow them to live independently for longer. The sector has spent the last few years ravaged with staff shortages; AI could be used to drastically reduce that pressure.

Among the other structural issues, the West has a surplus of skilled workers. In Europe 32% of workers are overqualified (36% in the UK), a clear indication of wasted labour. Automating jobs that are attracting overqualification, such as administrative positions, frees up capacity, while likely decreasing the bureaucracy often associated with these positions. The efficiency boom that comes from this replacement could propel business growth increasing their demand for skilled labour hence allowing them to reemploy these workers in jobs more suited to their abilities. Furthermore, in a survey of US workplaces half of all employees said AI eliminated the need for them to carry out boring or tedious tasks. Workplace happiness has risen as a result as workers have more time to carry out assignments that excite and interest them. In the long run it is therefore likely we will see several of the productivity declines of high job turnover corrected.

Despite all the benefits of blending AI into the workforce the ethical considerations of automation do still need to be addressed. AI has been used to in the NHS to decide the recipients of organ transplants. The questionable morality of using an algorithm to make life or death decisions has led to apprehension from healthcare professionals. Moreover, the system has at times prioritised older recipients over younger ones who perhaps need the transplant more. Additionally, regional inequality, deeply rooted in numerous Western economies, is one structural difficulty AI may widen rather than shrink. In the UK, for example, if research and development in AI is centred around London the benefits of this innovation will fail to ever reach the North.

It is worth noting that heightened need for skilled workers will also result in several workers having to upskill inevitably creating short term frictional unemployment. Although, the pain of limited current work may be offset by the benefits of long-term skilled worked such as higher pay. Furthermore, active government intervention can, to an extent, prevent misuse. Within healthcare this may mean a law that only allows AI to create shortlists of possible treatments so that a doctor is always making the final call. Regional disparities can also be avoided with government-sanctioned research in poorer regions and AI-proof training should be subsidised making it more accessible.

Ultimately, through history, economists have repeatedly been anxious that humans will be replaced. For most of the Industrial Revolution there was serious concern that men would never work again. Literature stating that human life would soon become one solely of 'leisure' with no need for a career, was the focus of the Great Depression. The 1860s even saw unionisation to prevent the US grain sorting process from being carried out by robots. Technological unemployment will always be a source of panic, but as long as governments aid the workforce, to bridge existing gaps, AI can increase efficiency, reduced workplace boredom and in turn drive economic growth.

APPLE: NO LONGER A SYMBOL OF INNOVATION

BY ALBIE STACEY

The tech giant has encountered a slowdown recently: as of January 2024, Apple Inc.'s market cap stands at $2.99 Tn, a minute uptick from $2.91 Tn in January 2022. Furthermore, Apple has experienced its longest revenue slide in 22 years, falling in each successive quarter throughout 2023, to $383.3 Bn, making for a 2.8% fall on the previous fiscal year.

Some may blame the firms' distress on enhanced US-China protectionist tensions, resulting in a 2.5% revenue dip in China (Q3 2023), and rapid supply chain relocation. Others may look to the ampler scrutiny being placed on big tech by regulators and society amid cloud security and privacy concerns. Nevertheless, the most vehement critics of the firm contend that Apple products, at their essence, are nowadays void of innovation. Arguably the firm now bears a resemblance to other players in the retail industry, whose complacency has precipitated their decline.

Indeed, many consumers have observed, not only the absence of ground-breaking products since the introduction of Apple's Airpods in December 2016, but also incremental improvements to each iteration of existing products annually. Take the iPhone, which sales accounted for 52% of Apple's revenue in Q3 2023, since the release of iPhone X in 2017, Apple has stuck to a similar design language. The distinctive notch, rounded corners, and nearly edge-to-edge display have broadly become iPhone staples. In the case of the iPhone 15 Pro, a rather superfluous 'action button', USB-C charging and a titanium chassis represent the bulk of innovation. In contrast, as early as 2019, Samsung and Huawei brought folding phones to market. In February 2023, Samsung excelled the Galaxy S23 ultra to new heights with a quad-camera system including a 200MP shooter, joined by a 10MP periscope camera, a 10MP telephoto lens, and a 12MP ultra-wide lens.

The question now posed by industry observers, is why has Apple seemingly lost its innovative edge?

One answer may be that in the face of greater market maturity, Apple has struggled to compete with its historically high standards for ingenuity. Under the leadership of Steve Jobs between 1997-2011, Apple championed the slogan 'think different', bringing jaw-dropping products to market, which consumers couldn't even conceive of at the time. For instance, in October 2001, Apple launched the iPod, which enabled users to store thousands of songs in a sleek digital device, allowing Apple to dominate the portable audio player market. In the case of the iPad in January 2010, its larger screen combined with unrivalled versatility disrupted the tablet market. Nowadays, Apple's iPad stands as a 10th generation product, prompting debates about the decline in the prevalence of technically feasible innovations. The level of product augmentation appears to have diminished when juxtaposed with the advancements witnessed 14 years ago. As such, iPad's have seen a 13% fall in sales since 2020.

Furthermore, there are assertions that under Tim Cook's stewardship, Apple has transitioned its emphasis from pioneering product development to product diversification and strategic foresight aimed at driving the firm's success. In fact, under Cook, Apple has grown from a market cap of $350 Bn in 2011, to being the first company to breach a $3Tn market cap in June 2023. Much of this has been credited to Cook's diversification and gross margin expansion, propelled by a concentration on the firm's services such as Apple Music and Apple TV+, which according to CNBC carry a gross margin of 70.5%. Coupled with the initiative to make Apple's production entirely reliant on renewables by 2018, Apple might have yielded advantages in profitability and brand image, but at the expense of hardware innovations for consumers.

Finally, certain tech experts posit that Apple's apparent stagnation in innovation is a self-inflicted problem, stemming from the inherent characteristics of Apple's business model. Verily, much is made of the Apple 'ecosystem', whereby Apple's products feature vast compatibility with one another. While companies like Google and Huawei prioritize swiftly bringing the latest product innovations to market, Apple, managing an extensive 'ecosystem' of products, faces the additional imperative of ensuring that innovations seamlessly integrate across its network. As such, Apple often struggles to develop innovative products. Indeed, whilst Samsung successfully launched a commercial wireless charging pad for Droid Charge in February 2011, Apple faced challenges and eventually cancelled its planned Airpower wireless charger in March 2019, citing difficulties in bringing the product to life.

In defence of Apple, while the firm may have lost its innovative mojo and has recently stagnated in terms of market share, its profitability has risen sharply in the last quarter, rising by 11.4% to $22.96 Bn in Q4 2023. In the interim, the outlook for growth appears promising, notwithstanding a decrease in market share in China. This decline is partially offset by substantial opportunities in the Indian smartphone market, where Apple secured a 6% market share in Q1 2023, reflecting an impressive 34% year-on-year growth.

Looking ahead, it's essential to recognize Apple's penchant for keeping its innovations shrouded in secrecy. As the introduction of the $3,500 Apple Vision Pro in late 2024 is poised to shake up the virtual reality market, it remains entirely plausible that Apple's next ground-breaking innovation may be in the realm of construction and could be just around the corner.

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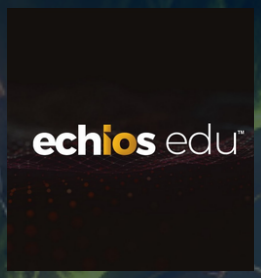

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