BUSINESS TECHNOLOGY COMPENDIUM

Compiled by Team ThinC

Introduction

Technology has played a pivotal role as the world is trying to coexist with COVID and function normally. From aiding researchers with the development of vaccines for COVID to the switch from traditional vehicles with combustion engines to Electric Vehicles, technology has continued its march through our society. In India, 33 startups attained unicorn status in 2021 with a high sectoral split of e-commerce, financial technology (FinTech), education technology, food delivery, mobility companies, etc. Furthermore, there is a rapidly growing number of firms in industries such as Software-as-a-Service (SaaS), gaming, new-age distribution and logistics, modern trade, biotech, and pharmaceuticals. In the year 2021, India's IT industry generated annual revenue of over US$ 195 billion and employed around 4.5 million people. It accounted for around 8% of India's GDP. The export revenue of the IT industry is estimated at US$ 150 billion while the domestic revenue totalled less than $50 billion for the mentioned period. Following is a list of the top 4 technology companies in India and the world:

➤ **TATA Consultancy Services (TCS):** TCS, a global leader in the IT sector has a market capitalization of 185 billion dollars and has over 500,000 employees. It generates a revenue of around 22 billion dollars which accounts for more than 70% of Tata Sons' revenue.

➤ **Infosys:** Infosys is a household name in the IT space with over 250,000 employees in 50+ countries. In 2021, Infosys generated revenue of 14 billion dollars and has a market capitalization of 106 billion dollars.

➤ **Google:** Google is a California-based, multinational internet company which provides digital products and services such as online search and advertising, cloud computing and software. Parent company Alphabet's market capitalization in February 2021 was valued at 1.4 trillion USD.

➤ **Microsoft:** Microsoft Corporation is an American multinational technology company that develops and sells a wide range of consumer and enterprise software, hardware, services, and consumer electronics. In 2021, it generated revenue of 168 billion USD with 61.3 billion USD as net come.

Here are a few significant headlines for the business technology industry in India from the year 2021:

➤ One97 Communications Ltd. (Paytm) launched India's biggest ever IPO worth 2.46 billion dollars.

➤ Bharti Airtel conducted India's first 5G trial in partnership with Nokia.

➤ Facebook was rebranded as Meta on October 28, 2021. It's aligned with the company's goal of building a metaverse.

➤ Grofers rebranded itself as 'blinkit' as it eyes a share in India's fast-growing quick commerce.

➤ Nykaa is the first new-age ecommerce business that launched an IPO while being profitable.

➤ Cabinet has approved Rs. 76,000 incentive plans to woo semiconductor chip manufacturers for producing locally.

➤ India has attracted $638 million in crypto, blockchain investments in 2021.

Buzzwords and Trends from the Technology Sector

1. Big Data

In the 1950's decades before anyone uttered the term "big data," businesses were using basic analytics, essentially numbers in a spreadsheet that were manually examined to uncover insights and trends. So, we have had an essential realization that data that streams into a business can be analyzed to get significant value from it. But with the ever-increasing pace of technological advancements, we had to evolve with respect to the way we handled our data. And now, in today's time when numerous sources at super-fast speeds contribute to a single firm's data, even our conventional forms of data storage and analysis have failed to cope up with this challenge. This massive amount of data from varied sources and coming at such high speeds is what we call "Big Data". More formally, big data is defined as "a collection of data sets that are so complex that it becomes difficult to process it using traditional data processing applications. It is a term that describes the large volume of data – both structured and unstructured – that inundates a business on a day-to-day basis." But it's not the amount of data that's important. It's what organizations do with the data that matters. Big data can be analyzed for insights that lead to better decisions and strategic business moves. The new benefits that big data analytics brings to the table, however, are speed and efficiency. A few years ago, a business would have gathered information, run analytics, and unearthed information that could be used for future decisions; today, a company can identify insights for immediate decisions. The ability to work faster – and stay agile – gives organizations a competitive edge they didn't have before.

2. AI and ML

In the 1950s, the fathers of the field, Minsky and McCarthy, described artificial intelligence as any task performed by a machine that would have previously been considered to require human intelligence. Often mistaken as synonyms, Machine Learning is a branch of Artificial Intelligence.

Machine learning (ML) is a branch of artificial intelligence, and as defined by the Computer Scientist and machine learning pioneer Tom

M. Mitchell: "Machine learning is the study of computer algorithms that allow computer programs to automatically improve through experience." Modern definitions of what it means to create intelligence are more specific.

Intelligence is not a skill in itself, it is not what you can do, it is how well and how efficiently you can learn new things. There are two kinds of AI—weak (or "narrow") and strong (or "general"). The anti-lock brakes in your car, the spam filter and autocomplete functions in your email, and the recommendations that Amazon and Spotify make are all examples of narrow artificial intelligence. The Maeve and Dolores in Westworld, the Samantha operating system in Her, and the HAL supercomputer from 2001: A Space Odyssey, are representations of artificial general intelligence (AGI)—but actual AGI does not necessarily require humanlike appearances or voices. Systems capable of general decision-making and automation outside of narrow specialities (DeepMind beating a world champion Go master) is AGI.

A neural network is the most important internal component where input data is entered and output is obtained from. The network is repeatedly fed input and output data set and the result is validated against actual output data. In this way the neural network continuously learns and adjusts its internal weights and biases for getting closer to perfect output.

A deep neural network is one that has many hidden layers. There is no set number of layers required to make a network "deep." Deep neural networks tend to work better and are more potent than traditional neural networks (which can be recurrent or feedforward). Machine learning programs run on neural networks and analyze data to help computers find new things without being explicitly programmed where to look. In AI, machine learning is useful because it can help computers predict and make real-time decisions without human intervention. Deep understanding is a relatively new branch of machine learning. Programmers use unique deep learning algorithms alongside a corpus of data—typically many terabytes of text, images, videos, speech, and the like. Often, these systems are trained to learn on their own. In practical terms, this means that more and more human processes will be automated, including software writing, which computers will soon start to do themselves.

3. FinTech

Fintech is a blend of words "finance" and "technology," and it refers to any company that employs technology to improve or automate financial services and operations. Startups use technology to offer existing financial services at lower costs and to offer new tech-driven solutions. Incumbent financial firms look to acquire or work with startups to drive innovation. Technology

companies provide payment tools. These can all be seen as FinTech.

Financial technology's mechanics differ from project to project and application to application. Machine learning algorithms, blockchain, and data science are being used to handle everything from process credit risks to run hedge funds in some of the most recent advancements.

Q. What does a typical FinTech company look like?

When people think of FinTech, they often focus on startups, breaking into areas that banks and other legacy financial institutions have dominated. Broadly, we can think about all the players in a larger FinTech eco-system as the As, Bs, Cs, and Ds:

"A"s are large, well-established financial institutions such as Bank of America, Chase, Wells Fargo, and Allstate. We sometimes refer to these as "incumbents."

"B"s are big tech companies that are active in the financial services space but not exclusively so, such as Apple, Google, Facebook, and Twitter.

"C"s are companies that provide infrastructure or technology that facilitates financial services transactions. This broad group includes companies like MasterCard, Fiserv, First Data, various financial market utilities, and exchanges such as NASDAQ.

"D"s are disruptors: fast-moving companies, often startups, focused on a particular innovative technology or a specific process.

Companies include CRED, BharatPe, ClearTax, JusPay, KhataBook.

FinTech is literally transforming our lives and habits by allowing us to trade, bank, and exchange money without having to deal with a human. However, the financial sector faces a number of obstacles to overcome, particularly in the areas of regulation and data protection, in order to gain customer trust & completely overtake the market. With big data, blockchain, AI, & a slew of other technological advancements already in use or on the horizon, company leaders should seize the moment and embrace FinTech.

4. Digital Twins

A digital twin is a virtual model of a process, product or service. This pairing of the virtual and physical worlds allows analysis of data and monitoring of systems to head off problems before they even occur, prevent downtime, develop new opportunities and even plan for the future by using simulations.

Q. How does a digital twin work?

Think of a digital twin as a bridge between the physical and digital world. First, smart components that use sensors to gather data about real-time status, working conditions, or

position are integrated with a physical item. The components are connected to a cloud-based system that receives and processes all the data monitored by the sensors. This input is analyzed against business and other contextual data. Lessons are learned, and opportunities are uncovered within the virtual environment that can be applied to the physical world — ultimately to transform the business.

NASA was the first to dabble with pairing technology — the precursor to today's digital twin — as far back as the early days of space exploration.

"The ultimate vision for the digital twin is to create, test, and build our equipment in a virtual environment. Only when we get it to where it performs to our requirements, do we physically manufacture it. We then want that physical build to tie back to its digital twin through sensors so that the digital twin contains all the information that we could have by inspecting the physical build."

For example, GE's "digital wind farm" opened up new ways to improve productivity. GE uses the digital environment to inform the configuration of each wind turbine before construction. Its goal is to generate 20% gains in efficiency by analyzing the data from each turbine fed to its virtual equivalent.

Q. Why is digital twin technology important?

Digital twins are powerful masterminds to drive innovation and performance. Imagine it as your most talented product technicians with the most advanced monitoring, analytical, and predictive capabilities at their fingertips.

How do you operate, maintain, or repair systems when you aren't within physical proximity to them? That was the challenge NASA's research department had to face when developing systems that would travel beyond the ability to physically see or monitor systems and when disaster struck Apollo 13, it was the innovation of mirrored systems still on Earth that allowed engineers and astronauts to determine how they could rescue the mission. Today, NASA uses digital twins to develop new recommendations, roadmaps, and next-generation vehicles and aircraft.

5. Industry 4.0

From the first industrial revolution (mechanization through water and steam power) to the mass production and assembly lines using electricity in the second, the fourth industrial revolution will take what was started in the third with the adoption of computers and automation and enhance it with smart and autonomous systems fueled by data and machine learning.
Digitalization has long been expected by industries since it opens up new opportunities, eliminates traditional risks, and allows for new marketing methods to be used. The desire for digitization has fueled the four industrial revolutions that have seen the manufacturing industry adapt and expand dramatically. Industrial Revolution 4.0, the current fourth era of digitalization, is innovative and very unique, with deeper purposes in its mission and a brighter future.

According to sources, this transformation has led to the digitization of 72 percent of firms. Connectivity, automation, and optimization are driving the industry 4.0 digital transformation. But many technologies are working together to realize the full potential of the manufacturing 4.0 movement.

Q. What are the applications of Industry 4.0?

While many organizations might still be in denial about how Industry 4.0 could impact their business or struggle to find the talent or knowledge to know how to best adapt it for their unique use cases, several others are implementing changes today and preparing for future smart machines improve their business.

➢ **Identify opportunities**: Since connected machines collect a tremendous volume of data that can inform maintenance, performance, and other issues, as well as analyze that data to identify patterns and insights that would be impossible for a human to do in a reasonable timeframe, Industry 4.0 offers the opportunity for manufacturers to optimize their operations quickly and efficiently by knowing what needs attention.

➢ **Optimize logistics and supply chains:** A connected supply chain can adjust and accommodate when new information is presented. If a weather delay ties up a shipment, a connected system can proactively adjust to that reality and modify manufacturing priorities.

➢ **Robots:** Once only possible for large enterprises with equally large budgets, robotics are now more affordable and available to every size organization.

➢ **Additive manufacturing (3D printing):** This technology has improved tremendously in the last decade and has progressed from primarily prototyping to actual production.

➢ **The Cloud:** Through the use of the cloud environment where data is stored, equipment and operations can be optimized by leveraging others' insights using the same equipment or allowing smaller enterprises access to the technology they wouldn't be able to on their own.

6. Quantum Computing

Quantum computing is an emerging technology that harnesses the laws of quantum mechanics to solve problems that are too complicated for classical computers. Quantum algorithms address these types of difficult issues in a unique way, by generating multidimensional spaces in which patterns linking individual data points emerge. A classical processor uses bits to perform its operations. A quantum computer uses qubits (CUE-bits) to run different types of multidimensional quantum algorithms.

Latest developments:

IBM: Over the last year, IBM has made headlines for its quantum computing breakthrough. IBM claimed at the recent 2021 Quantum Summit that 2023 will be the year when its systems give quantum advantage and quantum computing takes its early position as a significant tool in the high-performance computing environment.

At the summit, IBM also unveiled their new 127-qubit 'Eagle' processor, which represents a significant step forward in realising the huge processing potential of quantum-based devices. It marks the moment in hardware development where quantum circuits cannot be accurately simulated on a conventional computer.

Quantinuum: It is a new quantum computing company created by the merger of software maker Cambridge Quantum and hardware manufacturer Honeywell Quantum Solutions — announced the world's first commercial product created solely by a quantum computer: a powerful encryption key generator.

IonQ: Quantum computer maker IonQ, plans to use barium ions as qubits in its systems. The change is adopted with a view that it will improve the stability and reliability of its quantum computers.

Future scope:

With several universities across the globe making sincere efforts towards establishing quantum curricula, governments allocating funds for quantum, multinational corporations establishing quantum agendas, and venture capitalists seeking investment opportunities, the quantum ecosystem will expand at a rate comparable to the AI and alternative energy booms. 1,000-qubit computers will enable many firms to tackle difficult business challenges that traditional computers cannot, causing more organizations to adopt quantum computing and prepare for the day when it becomes a production technology.

7. Extended Reality (XR)

Virtual Reality (VR): Users can engage with a virtual world in virtual reality. Users are immersed in a synthetic environment that stimulates their eye and ears. The idea is to completely immerse the user in a virtual environment, preventing them from perceiving the actual world. VR is around 75% virtual and 25% real. Virtual reality is being increasingly implemented in different job trainings.

Augmented reality (AR): Augmented reality enhances the real-world environment by including virtual elements that the user may interact with. Unlike virtual reality, augmented reality does not really attempt to immerse the user and shut out the actual world; instead, it simply superimposes images and animation on top of real-world settings.

Real-world and digital items interact in a **Mixed Reality (MR)** experience, which includes features of both Augmented reality (AR) and Virtual Reality (VR).

Extended Reality (XR) is the word for all technologies that improve our senses, whether by delivering extra information about the real world or by building completely unreal, simulated worlds for us to explore. It covers technologies such as Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR). Extended Reality (XR) Market, by Application

- Media & Entertainment
- Retail
- Real-estate
- Education
- Healthcare
- Military & Defense
- Engineering

The global extended reality (XR) market is broadly impacted by several factors, including increasing investment in artificial intelligence and advance technologies across the globe.

Latest developments:

Apple: According to Apple analyst Ming-Chi Kuo, the Cupertino-based tech giant is working on the most advanced chips for its undisclosed AR/VR headset, and the Cupertino-based tech giant plans to introduce its new headset in the fourth quarter of 2022. The headset's primary functions will be gaming, media consumption, and communication.

CBSE: The Central Board of Secondary Education (CBSE) in collaboration with the tech giant, Meta, aims to train 10 lakh teachers and more than 1 crore students in the Virtual Reality (VR) and Augmented Reality (AR) in the next three years. As part of this partnership, Meta has already provided a curriculum on Digital Safety, online well-being, VR and AR.

8. Metaverse

Popularized by Snow Crash, a 1992 sci-fi novel by Neal Stephenson, the metaverse refers to a collection of shared online worlds in which physical, augmented, and virtual reality converge. People can hang out with friends, work, visit places, buy goods and services, and attend events. While many virtual worlds exist online, users currently can't move between them while retaining their identities and assets.

The eventual metaverse could solve this problem, turning disparate online worlds into a single, seamless entity. It has even been dubbed the next evolution of the internet.

Some tech CEOs are betting on Metaverse as being the successor to the mobile internet. In 2021, CEOs of tech companies from Microsoft to Match Group discussed their roles in building the metaverse. The tech giant formerly known as Facebook has already made significant investments in virtual reality, including the 2014 acquisition of Oculus. Meta envisions a virtual world where digital avatars connect through work, travel or entertainment using VR headsets. Zuckerberg has been bullish on the metaverse, believing it could replace the internet as we know it. "The next platform and medium will be even more immersive and embodied internet where you're in the experience, not just looking at it, and we call this the metaverse," said Meta CEO Mark

Zuckerberg after revealing the company's rebranding.

Early builders of the metaverse, including NFT artists, musicians, and crypto-native companies, are investing in digital pieces of land in popular virtual worlds such as Decentraland, Cryptovoxels and Sandbox to showcase their work and build dedicated communities around it.

9. Blockchain and DLTs

Blockchain and other distributed ledger technologies (DLT) are changing the nature of doing business and helping companies reimagine how they manage tangible and digital assets.

As companies adopt blockchain and DLT, creative use cases are cropping up, transforming the nature of doing business across organizational boundaries. The use cases include self-sovereign data, trusted data-sharing, and supply chain transparency among others. Tempted by the promise of safer, more efficient transactions, the financial services industry has been leading the way in making full use of blockchain and DLT platforms.

A majority of participants in Deloitte's 2021 Global Blockchain Survey said their industries would see new revenue streams from blockchain, digital assets and crypto solutions.

10. Cybersecurity and Privacy

By 2022, the number of connected devices – known as the internet of things (IoT) – is expected to reach 18 billion. As a result, hackers seeking to obtain access to protected digital systems now have a significantly expanded number of potential access points. Because any cybersecurity operation is only as safe as its weakest link, businesses are increasingly viewing every connection in a supply chain as a potential vulnerability. As a result, organisations will increasingly consider cybersecurity resilience and exposure to choose who they will collaborate with. Artificial intelligence (AI), in the same manner that it is used in financial services to detect fraud, may combat cybercrime by finding patterns of behaviour that indicate something out of the usual is happening. AI's predictive capabilities are what make it so beneficial in this context, which is why more and more businesses will invest in these solutions as we approach 2022.