Transformative Technologies: Opportunities and Risks

Transformative or Disruptive Technologies are the ones that "transform" the business, society or lifestyle of individuals that dramatically change the business models of organisations - how a business operates, how to interact with customers or service their requirements to make money. These revolutionary technologies have the potential to usher in Blue Ocean strategies and become growth drivers, by creating new revenue streams or change the business processes that can save time, cost or make it more convenient to use by customers. Transformative Technologies during the current decade include 5G telecom, Artificial Intelligence, BlockChain, 3 D printing, Internet of Things (IOT), Remote Process Automation (RPA), Digital Marketing etc. While each of these technologies are expected to enable quantum growth in business and economy, they entail different types of risks, which include regulatory compliance, cyber security, data privacy, money laundering, reputational risk, public safety etc. So, it is imperative for every organisation to identify the potential risks and put together strategies to manage and mitigate the risks effectively. While the top leaders, including Board Members, do not need to be technology experts, they need to know broadly about disruptive technologies, understand the opportunities and challenges these innovations present for the organizations they serve. Besides giving an overview of the range of Transformative Technologies and the potential business opportunities, this article presents the attendant risk factors and suggests ways of managing and mitigating the risks.

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INTRODUCTION

TRANSFORMATIVE TECHNOLOGIES

While a number of technologies have been evolving in the last few years, a few of them stand out and have the potential to "transform" the business, society or lifestyle of individuals. Such technologies are known as "Transformative or Disruptive Technologies". They are innovative and can dramatically change the business models of organisations - how a business operates, how to interact with customers or service their requirements to make money. These revolutionary technologies have the potential to create new revenue streams or change the business processes that can save time, cost or make it more convenient to use by customers, thereby becoming growth drivers. However, some of these disruptive technologies could be expensive, to start with or may be difficult to deploy or implement, as they may call for radical changes in the way we think or work. Yet, if properly planned and implemented, they can be a game changer for the industry or the concerned company

Internet, Laptop, Smart Phones, SearchServices, Mobiles, Cloud computing, Artificial Intelligence, IOT, Block Chain, Virtual and Augmented Reality, etc are but a few examples of transformative technologies in the last 3 decades. Though some of them took time to scale up, they rooted out, overnight, the established products and technologies, some of which were there for hundreds of years. In the last few decades, start-ups like Google, Amazon, Microsoft, Uber, Tesla, etc. sprang up around such technologies and leveraged them for unparalleled growth using Blue Ocean strategy.

TRANSFORMATIVE TECHNOLOGIES DURING THE CURRENT DECADE

5G Telecom Technology

While 4G technology in telecom was synonymous with speed, 5G will be the enabler of distributed computing, making available computing power locally to the end users. As data is increasingly turning out to be the fuel for the business,5G networks will facilitate AI and Edge Computing, unleashing intelligent and connected society, creating a platform for innovation, immersive customer experiences, thereby opening up tremendous business opportunities for all enterprises.It is expected that by 2035, 5G will enable additional global GDP of $10 trillion, as 5G networks modernize a range of manufacturing and service industries, creating new businesses.

Internet of Things (IOT)

Internet of Things, which is a network of gadgets/devices connected in cyber-physical ecosystems will create immense opportunities for automation in the industry as well as at homes. By the end of 2019, there were over 6 billion active IoT-connected computer networks, which is projected to scale up to 24.1 billion by 2030, according to new Transforma Insights research. Short-range connected devices, through Wi-Fi, Bluetooth, and Zigbee, are expected to grow by 72% by 2030. Public networks dominated by mobile networks are projected to grow from 1.2 billion to 4.7 billion connections in 2030. (Morrish & et. al., 2020).

Artificial Intelligence

Artificial Intelligence (AI) is a massive disruptive force during the current digital age (Grand View Research, 2020) and is expected to drive innovative applications in industrial sectors like automotive (self-driving vehicles), healthcare (quick and comprehensive diagnosis of diseases) , restaurants (food serving robots), finance (investment advisory chat bots) and manufacturing (self-driven Robots) etc. (Lee, 2017). Global Artificial Intelligence market is estimated at US$ 39.9 billion in 2019 and is projected to ramp up at a CAGR of about 42 percent between 2020 and 2027.

3D printing

3D printing is an innovative technology that can create complex artefacts, including human body parts like heart, kidneys, prosthetics etc., offering a broad range of opportunities to manufacture, design and implement modern architectural styles, construction processes and materialsand transplant of human organs. From about US$ 13.7 billion in 2019, 3D printing market is expected to reach US$ 63.46 billion by 2025, at a CAGR of 29%.

Block Chain Technology

Block Chain Technology refers to secure decentralized storage and updation of data so that it cannot be owned, controlled or manipulated by a central agency, thereby ensuring good security. Though it has come into prominence due to Crypto-Currencies, its applications go far beyond virtual money, disrupting sectors and practices as diverse as financial markets, content distribution, supply chain management, the dispersal of humanitarian aid and even voting in a general election. Block Chain is expected to make operations more efficient, thereby reducing the costs of infrastructure of banks by 30%. Market for blockchain technology services is expected to cross $20 billion by 2025, as new sectors like healthcare will deploy it. (Petrov, 2020)

Disruptive Technologies in Service functions

Besides manufacturing, service functions like Accounting, Marketing, HR etc., are also impacted by Disruptive

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Technologies, affecting the roles of the working professionals in the respective disciplines.

Accounting Function

Robot Process Automation (RPA) facilitates the integration of Artificial Intelligence (AI), Machine Learning and Cloud services to automate activities, streamline processes, improve the productivity of workers and eventually deliver customer loyalty. By using RPA, a robot can carry out repeating high-volume tasks and release the resources of the organisation to function in higher-value activities. The automation of robotic processes can save 25-50% on costs; allows 24x7x365 working and at the same time error free operations in functions like Accounting. Key functions, such as accounts receivable and account payables can leverage RPA technology, as it enters data automatically.

Marketing

Digital Marketing, which encompasses the use of Digital tools like Social Media Marketing, Search Engine Optimisation etc., can help in reaching millions of target customers faster and more cost effectively. Big Data and Business Analytics tools can churn huge transactional data very quickly and enable dynamic marketing strategies involving products, pricing, and promotion. In the field of e-commerce, consumer customization and product reviews, merchandising, search optimization and promotions, such as ChatbotAssistants and analytics support. Virtual Reality allows customers to experience the products before buying them.

Human Resources (HR)

As it is increasingly becoming difficult to match applicants with the required competencies manually, Digital Recruitment Tools like Social Media Crawling and HR Analytics can be used to identify the right candidates. COVID-19 pandemic has dramatically changed the work environment, wherein freelancing and work-from-anywhere have taken off in a big way, making it more challenging to manage the employees more effectively. Digital technologies like RPA can be used to address the challenges in performance management.

Qualitative benefits of Disruptive Innovation

Table-1 gives the qualitative benefits of products /services using disruptive technologies to the customers andthe industry

Table 1: Qualitative benefits of Disruptive Innovation (Source: (Ananthakrishnan, B; et. al., 2020)

DRIVER OF DISRUPTIVE INNOVATION	DESCRIPTION	BENEFITS
Freelancing due to COVID-19 pandemic: over 50% of the employees are projected to do freelance work by 2025.	Transformative technologies like AI, ML, IOT, Digital Marketing may offer freelance jobs.	Repair time reduction by 10%-25%. Labour cost reduction of 5%-20%.
Smart workforce: enabled by AI, as a key component.	Service sectors like Banking, Insurance, Telecom will engage smart workforce	10%-20% increase in efficiency.

Augmented Reality (AR) and Virtual Reality (VR): will enable immersive customer experience digitally thereby replacing physical interaction.	Service sectors like Media and Entertainment	10%-20% improvement in customer satisfaction.

Risks entailed in deploying Transformational Technologies

While transformational technologies will create huge opportunities, there will also be challenges. Following are the major risks that may surface while deploying Transformational Technologies

Compliance and Legal Violations

Organisations are expected to identify, address, and mitigate risks surrounding the privacy and protection of consumer data in the cloud. It necessitates keeping abreast of current and upcoming data protection legislation like GDPR in Europe and HIPAA in US healthcare, compliance and risk mitigation measures need to extend beyond simply complying with legislation. In July 2021, European data regulators levied a record-shattering €746 million fine against Amazon, claiming that the company's processing of personal data did not comply with the EU General Data Protection Regulation. It marks a massive leap from last year's €50 million fine against Google by French authorities, for failing to clearly inform users about the use of data for personalized advertising. Besides, regulators as well as stakeholders increasingly want companies to be fully transparent about where their data goes, who sees it, and what will be done with it. Besides, in today's interconnected world, ensuring compliances on data sharing with stakeholders, including employees, vendors, business parterres, etc. are also critical.

Cyber Security

Cyber Security is the biggest risk, as more people and devices get connected through IOT. For example, a hacker can shut off the engine of a running car, that is connected in a network, through IOT. As per IBM's 2019 Cost of a Data Breach Report , average cost of a data breach is $3.92 million , affecting about 25,000 records. The report also says that, while the average lifespan of a breach is 314 days, containing the breach to 200 days or fewer results in significant savings to organizations. It was noticed that despite the best controls, data breaches do happen, but some measures that have proven helpful in containing their costs have been incident response teams and the use of encryption. As per the regulations in most of the countries, the defaulting organisations are required to pay penalties for Cyber Security lapses.

Data Privacy

Concerns about consumer privacy are increasing all over the world, as a number of companies suffered high-profile data breaches that compromised their customers' private information. Through Cyber Attacks, the hackers are able to gain access to names, phone numbers, emails, passport numbers, travel details, and payment information of customers. With breaches like this on the rise, companies are facing the difficulty of gathering this data without violating their users' privacy or exposing their personal information to malicious actors.

Money Laundering

Introduction of Cryptocurrencies enabled misuse of funds as it is not possible to trace the money movements due to the security features of BlockChain Technology. There have been reports of cases of misuse like drug trafficking, terror funding, cheating, etc.

Fairness and Equity

Artificial Intelligence and Machine Learning can be highly useful in taking a range of decisions, as it offers the possibility of removing human intervention and biases when making important judgments and decisions. However, it is effective only if the dataset and model are objective and free of bias. In October 2018, Amazon had reportedly scrapped a machine learning tool for selecting the top resumes among its job candidates because the system discriminated against women. The bias was apparently due to the fact that the tool was trained on a dataset of resumes from previous applicants, who were predominantly male.

Reputational Risk

AI chatbots, left to run unchecked, can represent a major and even existential risk to a company's business reputation and bottom line. Artificial Intelligence systems that are prone to errors, subject to bias, or easily hacked can expose the organization to public criticism, as the government of Australia recently discovered when they implemented an algorithm that was designed to detect welfare fraud. Flaws in the algorithm caused thousands of welfare recipients to receive false debt notices. This eventually led to a large public outcry and an official investigation by the Australian Senate.

Spoofed Chatbots

Impostors or Cybercriminals can create a malicious chatbot with the branding or look alike of a legitimate business entity and keep it in an app store, where unsuspecting and gullible customers of that brand may download the chatbot. From there, they have a direct line to that consumer and all the sensitive information and Personally Identity Information (PII) that they are willing to request, in order to fraudulently help the client with their real query. To make matters more complicated, hackers may not even require consumers to download an app to encounter a spoofed chatbot. Through malware, they may be able to place their spoofed chatbot right on the company's legitimate website.

Ethical and Legal Concerns

As AI systems become more intelligent and gain more acceptance, addressing the ethical and legal issues of these disruptive innovations will be a critical concern. For example, companies that are researching self-driving cars must deal with their own versions of philosophical dilemmas such as the trolley problem. For instance, when a traffic accident is inevitable, is it acceptable for a self-driving car to divert its course in order to save more people, even if that puts its passengers' lives at risk? Whose lives need be prioritized, the passengers of the vehicle or the pedestrians outside the vehicle?

Technological Complexity

Ericsson forecasts that there will be 29 billion devices connected to the Internet of Things by 2022, from smartphones and GPS devices to "smart" thermostats and toasters. This massive IoT growth exposes billions of new attack vectors for malicious actors. Businesses need to make sure that their IoT-connected devices are safe, which will be a technologically daunting task, considering the diversity of the devices, a number of which use proprietary operating systems.

Public Safety

When Data breaches of customers' personal and financial data happen, the repercussions are limited to the individual. But, when attackers are able to breach an IoT networks that manages public infrastructure like power, civic services, or telecom, the risks are severe and the impact could be devastating. When the IoT is applied to infrastructure such as electrical grids, they must be protected with both physical security and cybersecurity. The massive Northeast blackout of 2003, which affected more than 50 million people, presents the worst-case scenario during an IoT attack.

How to manage the risks?

Following are a few ways in which the risks could be mitigated and managed: -

Awareness among the corporate leaders on how to manage new technologies strategically

While the top leaders, including Board Members, do not need to know everything, they need to know broadly about disruptive technologies, understand the scope of opportunities and challenges these innovations present for the organizations they serve. As per a recent survey among users of these technologies, less than half felt their level of understanding was at a strategic level. At least 29 percent of respondents said their organizations were using AI, and another 18 percent were actively exploring its use. Yet of those using it, only 12 percent knew what it was being used for. Blockchain was being used by 11 percent of organizations, yet only 3 percent of risk professionals knew the specifics of how it was being implemented. The use of the Internet of Things is more widespread. At least 59 percent said their organizations used or planned to use IoT. Still,25 percent were unsure of the specifics of how it was being used. Only 14 percent strongly agreed their organizations have a clear process for identifying and addressing the risks of new technology before it is implemented. Nearly half were unclear about their technology risk management process. It is essential for the leaders and risk management professionals to reach out within their organization to get a better handle on which technologies are being used in their organizations and how they are being used. Those who do not do so, run the risk of being left out of decision making. They may also fail to foresee risks or develop adequate strategies to mitigate them.

Use of Right technical expertise

One key to a successful disruptive technology implementation is to anticipate potential problems that are likely to emerge during the implementation process. There are two approaches that are normally adopted by organisations. One approach is

to lean on in-house architects to learn the new technology, then come up with an implementation plan to integrate it into an infrastructure, they are familiar with. The other approach is to bring in external technical consultants that have a deeper knowledge of the disruptive technology but do not have intimate insight into the company's existing infrastructure architecture. A good understanding of the company's business processes and technology can be used to facilitate current processes, combined with a deep technical understanding of the emerging technology is beneficial. Thus, implementations are usually more successful, when internal and external resources are integrated and work in tandem to accomplish effective change management.

Timing of implementation

Correct timing of implementation of disruptive technology is another critical aspect that often gets overlooked. When dealing with cutting-edge technology tools, it is observed that there are wide differences among the tools, with regard to their levels of maturity, in terms of readiness to deploy in specific scenarios of the organisations, If the appropriate technology is not selected or timing is not correct, it may destabilise the entire organisation. The leadership must also assess the attitudes of their technical staffers and functional leaders, that are required to decide on the appropriate technology solutions and the right time to strike. This is also an example of how external technical consultants can be used to help make a final decision, as they are well versed with such situations in other similar companies.

Tools for Mitigating the Risks of Disruptive and Transformational Technologies

Although the risks in technologies like cloud-based storage, chatbots, and machine learning are substantial, there are technology tools to address them. When identifying and addressing cloud-based data risks, the solution generally requires a strong monitoring and oversight function to keep

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abreast of current and coming legislation. It also involves meaningful investments in technology tools and technologies that provide the organization with protection against data breaches. There are several approaches to protecting a users' personal information.

Software Tools to identify Vulnerabilities and Manage Risks

Regularly assessing a company's website and networks with a vulnerability scanner can help identify known security holes. Many organizations also hire outside security technology consultants (such as penetration testers) to identify and fix the vulnerabilities that are noticed. While identifying, managing, and mitigating the vast matrix of risks that today's companies encounter, many risk management professionals turn to software that helps them keep track of risks, prioritize their mitigation, and track action plans and due dates.

CONCLUSION

Transformational Technologies have the potential to transform the business and enable quantum growth in business and profitability and can become the growth drivers. In some industries, they may build a competitive barrier. However, there will be attendant risks involved, during deployment of such technologies. So, it is imperative for every organisation to identify the potential risks and vulnerabilities and put together strategies to manage and mitigate the risks effectively.

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