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A conceptual study of artificial intelligence in the modern business ecosystem

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Abstract

Artificial Intelligence has an everlasting impact in making businesses competitive. The services and product offering has been upgraded and advanced because of the Artificial Intelligence augmentation. The disruptive technology has supported the social and economic activities. The organisations are scaling up with Internet of Things (IOT), data, data science, big data, cloud computing, artificial intelligence (AI) and blockchain and others. The present study is a theoretical study tracking the path of Artificial intelligence in transforming business.

Keywords: Application, design, business

Introduction

The emerging technologies namely internet of things (IoT), data science, big data, cloud computing, artificial intelligence (AI), and blockchain are changing the way we live, work and amuse ourselves. Innovation has always been the main engine of an improved standard of living throughout the history. However, the process of innovation is highly disruptive as it turns old technologies into obsolete (Neha Soni et al. 2019)^[13].

Artificial Intelligence may be regarded as any software program that depicts human intelligence and consequently has the ability to engage in a humanlike activity. AI tools can enhance decision-making abilities, allowing enterprises to perform increasingly complex tasks. They are versatile tools that enable people to rethink how we integrate information, analyze data, and use the resulting insights to improve decision making. Artificial intelligence (AI) is becoming commonplace in our daily lives. It is now a household name. Amazon's virtual assistant Alexa may soon be in every home in America. AI is already disrupting virtually every business process in every industry. AI has become an important technology that supports daily social life and economic activities (Mathew et al. 2020)^[11].

Table 1: The world 2050

Computing tasks in 2017	Computing tasks in 2050
<ul style="list-style-type: none"> ▪ Optical face recognition ▪ Voice translation ▪ Location awareness ▪ Transport simulation ▪ Basic robotic movement ▪ Biological wellbeing ▪ 3D Printing (Digital to physical object - basic) 	<ul style="list-style-type: none"> ▪ Emotional interpretation built-in by default ▪ Natural language subject expert advice by default ▪ Location sensing and context advise—protect, promote and coordinate unconnected or connected participants ▪ Real time integrated transport systems ▪ Natural physical movement in situ of other objects and humans ▪ Integrated body implants/augments and health services ▪ 3D assembly and fabrication manipulation of complex objects

Source: (Mark Skilton Felix Hovsepian, 2016)^[10]

Defining Ai

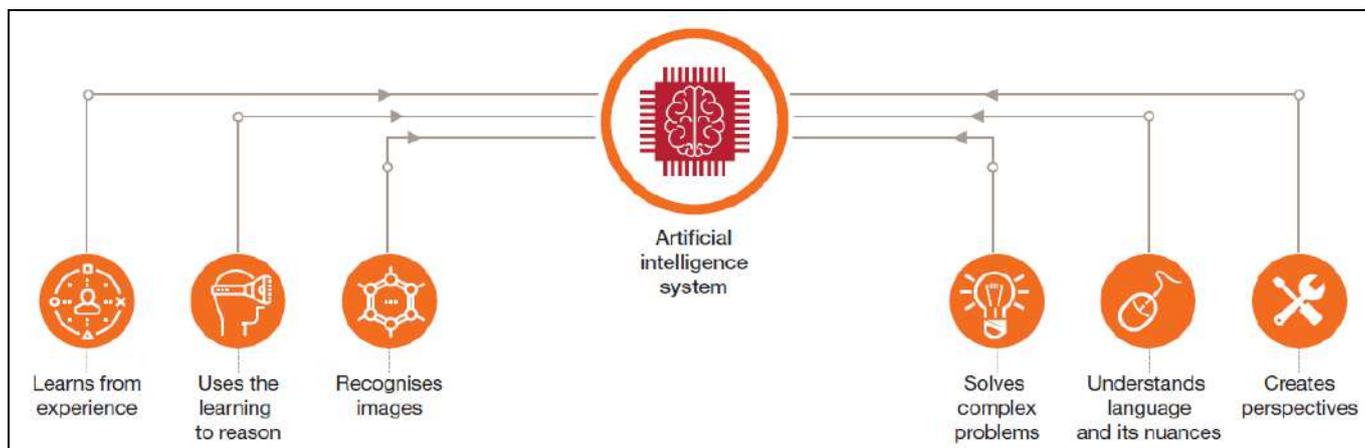
There is no single definition of artificial intelligence. In an article in *Forbes*, the author argues that many companies are claiming their programs have AI, but he disagrees. The author describes Artificial Intelligence as, "A true artificially-intelligent system is one that can learn on its own."

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We're talking about neural networks from the likes of Google's Deep Mind, which can make connections and reach meanings without relying on pre-defined behavioral algorithms. True Artificial Intelligence can improve on past iterations, getting smarter and more aware, allowing it to enhance its capabilities and its knowledge.

Artificial intelligence (AI) refers to the “ability of a

computer or a computer-enabled robotic system to process data and produce results in a manner similar to the thought process of humans in learning, decision making and solving problems”. In addition, the goal of AI systems is “to tackle difficult problems in ways similar to human logic and reasoning”.



Source: PwC analysis

Artificial Intelligence: Reshaping the Innovation Process

Artificial Intelligence has reached a place where it can take real-world financial decisions, chat with people, play games against humans, and work hand in hand with them. Behind all these real-world applications, there is an AI-driven system or an intelligent agent (IA). It interacts with the environment in a repetitive cycle of sense-think-and-act. It takes in the data from the environment, makes an informed

decision based on the input data and past experience, and finally performs an action affecting the environment. This IA can be a machine (industrial and home robots, self-driving cars) or a software agent (chatbots, recommender systems). It takes the data in the form of images, videos, sound, text etc., analyses this data using AI algorithms and delivers AI-powered solutions. Fig. 1 shows the sense-think-and-act cycle for an IA.

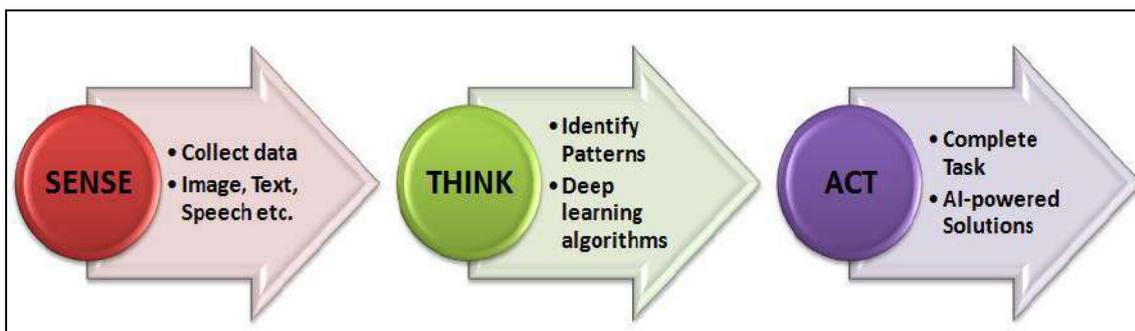


Fig 1: Sense-Think-and-Act process followed by an intelligent agent

Working of artificial intelligence (Ai)

Building an Artificial Intelligence system is a careful process of reverse-engineering human traits and capabilities in a machine, and using its computational prowess to surpass what we are capable of. To understand How Artificial Intelligence actually works, one needs to deep dive into the various sub-domains of Artificial Intelligence and understand how those domains could be applied to the various fields of the industry.

Machine Learning

Machine Learning teaches a machine how to make inferences and decisions based on past experience. It identifies patterns and analyses past data to infer the meaning of these data points to reach a possible conclusion without having to involve human experience. This automation to reach conclusions by evaluating data saves human time for businesses and helps them make better

decisions.

Deep Learning

Deep Learning is a Machine Learning technique. It teaches a machine to process inputs through layers in order to classify, infer and predict the outcome.

Neural Networks

Neural Networks work on similar principles to Human Neural cells. They are a series of algorithms that captures the relationship between various underlying variables and processes the data as a human brain does.

Natural Language Processing

Natural Language Processing is a science of reading, understanding, and interpreting a language by a machine. Once a machine understands what the user intends to communicate, it responds accordingly.

Computer Vision

Computer vision algorithms try to understand an image by breaking down an image and studying different parts of the object. This helps the machine classify and learn from a set of images, to make a better output decision based on previous observations.

Cognitive Computing

Cognitive computing algorithms try to mimic a human brain by analysing text/speech/images/objects in a manner that a human does and tries to give the desired output.

Table 2: Differences between augmentation and Ai

Artificial Intelligence	Augmented Intelligence
1. AI replaces humans and operates with high accuracy.	1. Augmentation does not replace people but creates systems that help in manufacturing
2. Replaces human decision making	2. Augments human decision making
3. Robots/Industrial IoT: Robots will replace all humans on the factory floor	3. Robots/Industrial IoT: Collaborative robots work along with humans to handle tasks that are hard and repetitive
4. Real-Time Applications of AI in Customer Success	4. Real-Time Applications of IA in Customer Success
i. Automated Customer Support and Chatbots	i. IA-enabled customer analytics
ii. Virtual Assistants Automated Workflows	ii. Discover high-risk/high-potential customers
	iii. Forecasts Sales

Artificial intelligence across industries

Artificial Intelligence for Enterprise

After decades of promise, enterprise-ready AI is fast becoming a reality. And with organisations producing data at unprecedented rates, technology that can turn this data into insights and efficiencies can't come fast enough.

Artificial Intelligence for Financial Services

New digital technologies are quickly reshaping the financial services industry, and financial institutions are turning to AI and machine learning to meet both increased regulatory requirements and customer demand for mobile and web-based access to banking products.

Artificial Intelligence for Healthcare and Life Sciences

Research institutions and medical facilities are using the ability to analyse massive data sets to sequence the human genome, develop new forms of treatment, accelerate and improve patient care, and better manage electronic health records.

Artificial Intelligence for Manufacturing

The future of manufacturing is connected, automated and digitally driven. As plant floor operations technologies converge with IT, numerous use cases across the manufacturing cycle become possible to ignite innovation, create more efficient operations, reduce downtime and improve worker productivity.

Table 3: Commercially available intelligent machine and services, intelligent software behind them, their developers and user base

Task	Intelligent software/Device	Developer	Compatible Products/ Capabilities	Number of Users
Voice-based virtual assistant	Alexa	Amazon	Speaker, light bulbs, switches, lamps, and other home automation products	100 Million (January 2019)
	Siri	Apple	Watch, computer, mobile, speaker, television, lights, fans, switches, locks, cameras, windows, and other home automation products	500 Million (January 2018)
	Google Assistant	Google	Speaker, refrigerator, oven, car, washer, and dryer	500 Million (May 2018)
	Cortana	Microsoft	Windows 8.1 and 10 computers and mobiles, watch, video game, glasses, headsets, speaker	700 Million (June 2018)
Web Mapping	Google Maps	Google	Android and iOS-based devices	1 Billion (May 2018)
Ridesharing Apps	Uber	Uber.com	Android and iOS-based devices	75 Million (December 2018)
	Lyft	Lyft.com	Android and iOS-based devices	23 Million (January 2018)
Filter Spam	Deep Text	Facebook	Can provide simple suggestions like offering Uber or a Lyft, selling or purchasing options etc by understanding text on messenger	2.23 Billion (June 2018) (Currently, processing 10000 posts/second in 20 different languages)
Humanoid Robots	Pepper	SoftBank Robotics	<ul style="list-style-type: none"> Optimized for human interaction Can engage with people through conversation and touchscreen 	2000 companies (October 2018)
Healthcare	Virtual Medical Assistant (Molly)	Sense.ly	Blood pressure machine, glucose meter, weight machine	Not disclosed
	Disease Diagnosis- IBM Watson	IBM	Identify key information in a patient's medical record and explore treatment options.	Adopted by various hospitals and cancer centres worldwide.
Collaborative robot (Cobot)	Robot CR	FANUC	Can recognize and lift heavy objects	Not disclosed
	Kiva Robot	Amazon Robotics	Capable of automating the picking and packing process in industries.	15000 (at Amazon warehouses in the U.S.)
Self-Driving Cars	Nissan NV200	Drive.ai	Can navigate without human intervention	In the initial phase of testing on real roads
Assistive Device for Blind	Horus	Eyra	It consists of a headband and a stereo camera that can recognize text, faces, and objects.	In the initial phase of testing

(Source: Neha Soni, Enakshi Khular Sharma, Narotam Singh, Amita Kapoor. (n.d.). Impact of Artificial Intelligence on Businesses: from Research, Innovation, Market, India Meteorological Department Ministry of Earth Sciences, Delhi, India, 1-38.)

Review of Literature

Neha Sonia et al. (2019) ^[13] feels that the present age is possibly the most exciting period of human history where technological innovations are taking place at the rate of the blink of the eye. Robots working in industries, self-driven, smart watches monitoring patient's health, and AI playing games (e.g. Chess and Go) better than world champions are some of the technological innovations under AI. Internet today is full of AI-related articles, its recent advances and its impact on human, society, and business. 2016 has been an amazing year for machine learning, deep learning and AI. The emerging technologies have a large potential to transform the lifestyle and living standards of humans and the business operating models of companies all over the world. It becomes important to study both the capabilities and limitations of machine intelligence and its potential impact on human life, society and business.

Zhilin Yang et al. (2022) ^[19] contend that AI is poised to reshape emerging markets; for example, finance, labor, human resource management, marketing, advertising, business strategy, supply chain management, services, retail

and information systems. Consequently, savvy entrepreneurs are pondering the use of facial, image and speech recognition applications to mitigate costs and barriers, enhancing their productivity. In emerging markets, AI provides a technological solution to the economic and social challenges faced by governments, firms and people at the bottom of the economic pyramid.

Ann geisel (2018) ^[2] opines that the use of artificial intelligence (AI) programs has become widespread in business processes. There is some confusion as to what technology is considered AI. There are several levels or types of AI. When referring to artificial intelligence, it is necessary to define the capabilities of the technology. Businesses use a fundamental form of AI, with limited learning capabilities. The costs of the use and development of AI run the continuum from potential job loss or retraining to danger to human life. There may be aspects of the evolving technology that haven't yet been considered. AI has the potential to create a better world for humanity. Artificial intelligence will continue to evolve in the future and change the landscape of business .

Table 4: Review of literature- excerpts from various studies

Authors/ Study	Data/Approach	Key findings	Contributions to the SI
Shao <i>et al.</i> (2022) ^[11]	Qualitative study with a sample of non-SOE-listed companies in China from 2011 to 2018	The development of AI finance can alleviate financing constraints for non-SOE firms. This effect is more pronounced for smaller firms, more innovative firms and firms in developing areas	Emerging market countries can ease financing constraints on non-SOE firms by promoting AI finance development
Lai and Luo (2022) ^[2]	Qualitative study with a sample of 86 listed financial institutions in China from 2010 to 2019	A persistent inhibitory effect exists on the nexus of intelligent technology investment and employee compensation in financial institutions. The increase in intelligent investment has a positive two-year lagged effect on firm value	Help practitioners in emerging countries better understand that firms need to reasonably deal with the subsequent cost of growth caused by intelligent technology input
Fan <i>et al.</i> (2022) ^[3]	Online survey data collected from 507 AI chatbot users	As the benefits of personalization decreased and the risk to privacy increased, the inherently negative (positive) effects of imbalanced (combined) chatbots' sales-service ambidexterity had an increasing (decreasing) influence on customer experience	Enrich the literature on frontline ambidexterity and extend it to human-machine interaction
Jiang <i>et al.</i> (2021) ^[4]	Experimental data collected from 203 undergraduate students (Study 1) and 217 frontline staff members (Study 2)	When served by a humanoid service robot (vs. human employee), consumers exhibit more positive attitudes and purchase intentions toward functionally (vs. culturally) mixed products	Offer insights for managers to develop service marketing for mixed products
Hamdan <i>et al.</i> (2021) ^[5]	Used a machine learning method to collect data from 167 SMEs in Palestine's largest industrial sectors	Perceived benefit and ease of use are the most influential determinants of blockchain adoption	Deliver a decision support system for business leaders to estimate the potential for blockchain adoption
Dong <i>et al.</i> (2021) ^[6]	A theoretical framework is developed through grounded theory and case analysis	Collaboration value is a building block for intelligent product ecosystems. These eco systems are upgraded by coordinating products, platforms and networks	Provide a framework for enterprises to build an intelligent product ecosystem
Yao <i>et al.</i> (2022) ^[7]	Experimental data collected from 93 consumers	Higher social class participants were more willing than lower social class participants to choose robot services	Help multinational enterprises (MNEs) develop strategies for scaling

¹ Shao, J., Lou, Z., Wang, C., Mao, J. and Ye, A. (2022), "The impact of artificial intelligence (AI) finance on financing constraints of non-SOE firms in emerging markets", *International Journal of Emerging Markets*, Vol. 17 No. 4, pp. 930-944.

² Lai, Z. and Luo, H. (2022), "How does intelligent technology investment affect employment compensation and firm value in Chinese financial institutions?", *International Journal of Emerging Markets*, Vol. 17 No. 4, pp. 945-966.

³ Fan, H., Han, B., Gao, W. and Li, W. (2022), "How AI chatbots have reshaped frontline interface in China: examining the role of sales-service ambidexterity and the personalization-privacy paradox", *International Journal of Emerging Markets*, Vol. 17 No. 4, pp. 967-986.

⁴ Jiang, H., Xu, M., Sun, P. and Zhang, J. (2022), "Humanoid service robots versus human employee? How consumers react to functionally and culturally mixed products", *International Journal of Emerging Markets*, Vol. 17 No. 4, pp. 987-1007.

⁵ Hamdan, I.K.A., Aziguli, W., Zhang, D., Sumarlah, E. and Fauziyah, F. (2022), "A machine learning method to predict the technology adoption of blockchain in Palestinian firms", *International Journal of Emerging Markets*, Vol. 17 No. 4, pp. 1008-1029.

⁶ Dong, X., Cao, W. and Bao, Y. (2022), "Product intellectualization ecosystem: a framework through grounded theory and case analysis", *International Journal of Emerging Markets*, Vol. 17 No. 4, pp. 1030-1048.

⁷ Yao, Q., Wu, Z. and Zhou, W. (2022), "The impact of social class and service type on preference for AI service robots", *International Journal of Emerging Markets*, Vol. 17 No. 4, pp. 1049-1066.

	(Experiment 1) and 196 participants (Experiment 2)	in credence-based service settings. Risk aversion mediated the interaction effect	up robot services
Sharma <i>et al.</i> (2021) ^[8]	Used a modified total interpretive structural modeling (m-TISM) approach	Identifies ten key factors essential for analyzing AI's impact on a firm's competitiveness	Detailed analysis of the ten factors can help tourism firm managers enhance competitiveness
Anil and Misra (2022) ^[9]	Cross-case study based on semi-structured interviews with 6 NBFC-P2P founders and 12 fintech and P2P industry experts	Showcases AI's evolving role in Indian peer-to-peer lending (p2p) markets. Findings indicate that AI has reached a tipping point in India	Illustrate P2Ps still stuck to manual underwriting and show the merit in AI-driven processes
Sui and Mo (2022) ^[10]	Experimental data collected from 396 participants in China (study 1) and 300 participants in the UK (study 2)	Moral standards declined for low-SES but not high-SES persons when using smart devices (vs non-smart devices)	In emerging markets, managers and marketers should be aware of this morality erosion and use preventive measures in advance
Gao <i>et al.</i> (2022) ^[11]	Survey data collected from 209 survey participants from August to December 2020	Two dimensions of AI technology stimuli positively affect smart customer experience; the moderating effects of contrasting dimensions of technology readiness are significantly different; smart customer experience has a positive effect on consumers' word-of-mouth intentions	Help enterprises better understand customer psychology and AI technology to promote a positive customer experience and improve consumers' word-of-mouth intentions, especially in the emerging markets
Wang <i>et al.</i> (2022) ^[12]	Interview data collected from 66 SMEs across 20 industries in central China	SMEs in central China are enthusiastic about intelligent transformation while facing internal and external pressures. They have been forced to take a step-by-step strategy based on actual needs instead of long-term overall system design, constrained by limited resources	Firms should attend to executives' role in promoting intelligent transformation and fully use policy support to access additional resources

Source: Zhilin Yang et al. (may 2022) ^[19]. Guest editorial: Impact of artificial intelligence on business strategy in emerging markets: a conceptual framework and future research directions. *International Journal of Emerging Markets*, 917-929.

Challenges faced by artificial intelligence

Every new technology comes with risks. As an emerging technology, Artificial intelligence is changing at a fast pace and may present some unexpected challenges. Some of the challenges facing business Artificial intelligence include the following

▪ Lack of familiarity

Most people in business are not very familiar with artificial intelligence, what it is and what it can do for them. In spite of this. Artificial intelligence is a technology that is transforming every walk of life.

▪ Misunderstanding

AI is misunderstood by many, especially by the mainstream media. The media has overpraised AI for techniques that are not new, and over-criticized it for overly optimistic promises.

▪ Public Fear

Everywhere you look, it seems AI is assisting and displacing human effort. There are plenty of doom and gloom predictions around AI. AI offers both promise and peril as it revolutionizes the workplace. There is a public fear around the world particularly in the business community that AI technology such as robots will overtake us and force humans into obsolescence. This fear is considered unfounded by some. For sure, Artificial

intelligence is nowhere near replacing humans, but it will automate repetitive tasks and free us up to do more complex tasks.

▪ Ethics

There are currently no standards concerning data access, data sharing, or data protection. How should we promote data access? How do we guard against biased or unfair use of data in algorithms? What types of ethical principles are introduced through software programming? To answer these and related questions may require an international body that will set the standards by which ethical dilemmas are resolved. The IEEE Global Initiative has ethical guidelines for Artificial intelligence and autonomous systems.

▪ Shortage of Workforce

Due to the fast-growing Artificial intelligence market, people with AI skills are in short supply. To realize the full capacity of Artificial intelligence, we need the right people and the right culture. Right now, there are shortages of data scientists, computer scientists, engineers, and software developers because students are not receiving instruction in AI skills. More emphasis should be put on STEM subjects (science, technology, engineering and mathematics). Not generating more people with these capabilities will limit AI development. While AI offers valuable benefits to businesses, implementation is usually expensive and time-consuming. Overall, the pros outweigh the cons **Matthew et**

⁸ Sharma, K., Jain, M. and Dhir, S. (2022), "Analysing the impact of artificial intelligence on the competitiveness of tourism firms: a modified total interpretive structural modeling (m-TISM) approach", *International Journal of Emerging Markets*, Vol. 17 No. 4, pp. 1067-1084.

⁹ Anil, K. and Misra, A. (2022), "Artificial intelligence in peer to peer lending in India: a cross-case analysis", *International Journal of Emerging Markets*, Vol. 17 No. 4, pp. 1085-1106.

¹⁰ Sui, J. and Mo, T. (2022), "Morality in the era of smart devices", *International Journal of Emerging Markets*, Vol. 17 No. 4, pp. 1107-1122.

¹¹ Gao, J., Ren, L., Yang, Y., Zhang, D. and Li, L. (2022), "The impact of artificial intelligence technology stimuli on smart customer experience and the moderating effect of technology readiness", *International Journal of Emerging Markets*, Vol. 17 No. 4, pp. 1123-1142.

¹² Wang, J., Lu, Y., Fan, S., Hu, P. and Wang, B. (2022), "How to survive in the age of artificial intelligence? Exploring the intelligent transformation of SMEs in central China", *International Journal of Emerging Markets*, Vol. 17 No. 4, pp. 1143-1162.

al. (2020) ^[11].

Artificial intelligence enablers

The enablers are the foundations for adoption and absorption of AI (as well as other emerging technologies), and some are likely to correlate with AI-related indicators (and therefore these dimensions may not be orthogonal):

Digital absorption

Conventional measures of digital readiness, maturity, or competitiveness of countries tend to focus on digital infrastructure: internet penetration, broadband speed, and affordability for households, for example. There is a wide variety of data on these measures. However, how companies are developing digital assets and using them across their organization is perhaps the more important precondition of Artificial intelligence. MGI analysis of digitization in China, Europe, and the United States demonstrated wide variances among sectors and countries. In general, the United States leads, closely followed by a few European countries such as the United Kingdom and Scandinavian economies, and with China still some distance behind. Because this assessment was based on bottom-up sector-level data, there are limited samples for broad cross-country comparison on a global basis. Therefore, this analysis used alternative sources from the Global Talent Competitiveness Index report. It drew on the technology utilization index, a proxy for the ability of companies to absorb digitization.

Innovation foundation

The degree of innovation can determine whether a country is able to develop and commercialize powerful AI solutions. This research assessed overall innovation capacity using data on R&D investment from the OECD and evaluated industry dynamism using data on ICT and business-model creation and ICT organizational model creation from the Global Innovation Index 2017 report by INSEAD and WIPO. The modeling focused more on differences among companies in terms of whether they can use the technologies and create new business models, and whether companies can improve their organizational models in order to absorb technologies.

Human capital

Economies need to ensure that they update the skills available not only to ensure that there are sufficient AI specialists, but also to enable large numbers of individuals to work alongside machines.⁶⁶ Human capital is critical to the absorption of new knowledge and its real-world applications. This research looked at problem-solving skills using scores from the OECD's Programme for International Student Assessment (PISA); the availability of scientists and engineers as well as employment in knowledge-intensive sectors from INSEAD; the overall quality of human capital from the World Economic Forum's Global Human Capital Index; and the availability of talent using data on science, technology, engineering, and math (STEM) graduates from UNESCO and Eurostat.

Connectedness

Countries with stronger connections to the world may have better foundations for innovation and are most likely to have increased potential to reap the benefits of Artificial intelligence. Connectedness can help countries use cross-

border data flows to enhance the performance of Artificial intelligence applications and participate in global value chains, as noted. Global flows and connectedness have been looked in detail, and this analysis builds on that work. This analysis used MGI's Connectedness Index, which ranks countries on their flows of goods, services, capital, people, and data. Data sources behind this index include the United Nations, ITC Trade Map, and TeleGeography.

Labor-market structure and flexibility

Widespread penetration of Artificial intelligence will almost certainly displace many existing working tasks. Minimizing the risk of societal backlash will require as smooth as possible a transition to AI by putting in place mechanisms such as transitional support and training for displaced workers.⁶⁷ Countries that have robust social support and extensive provision of training may be less likely to run into popular opposition to AI that could add cost to its implementation. Scores were compiled on aspects including collaboration between workers and employers, active labor-market policies, development of employees, and environmental performance from the Global Competitive Talent Index report published by INSEAD. The research also referred to redundancy cost (costs related to advanced notice and severance payments when terminating workers) from the World Bank.

Other factors may also play a role, including various legal frameworks governing the use of data in certain geographies. Examples include the EU's General Data Protection Regulation and the California Consumer Privacy Act of 2018, US sector-based regulation such as the Health Insurance Portability and Accountability Act, and the Gramm-Leach-Bliley Act in finance. Regulation and other factors may affect outcomes, but the model used in this research is limited to those factors that can be quantified.

Conclusion

Artificial Intelligence connotes different meanings to different people. The Artificial Intelligence has impacted the businesses and society. The companies have realised the adaptation of Artificial Intelligence for the sustainable competitive advantage. The technological innovations and scientific know-how has opened up opportunities for the skilled labour at workplace. The Artificial Intelligence has reduced the response time and also the efficiency of the output. The companies can now analyse the data and use for rapid and swift decision-making.

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