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Brij Disa Centre for Data Science and Artificial Intelligence

INDIAN INSTITUTE *of* MANAGEMENT AHMEDABAD

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Successful Adoption of AI by Indian corporates key to nation's competitiveness: IIMA – BCG study on AI Readiness

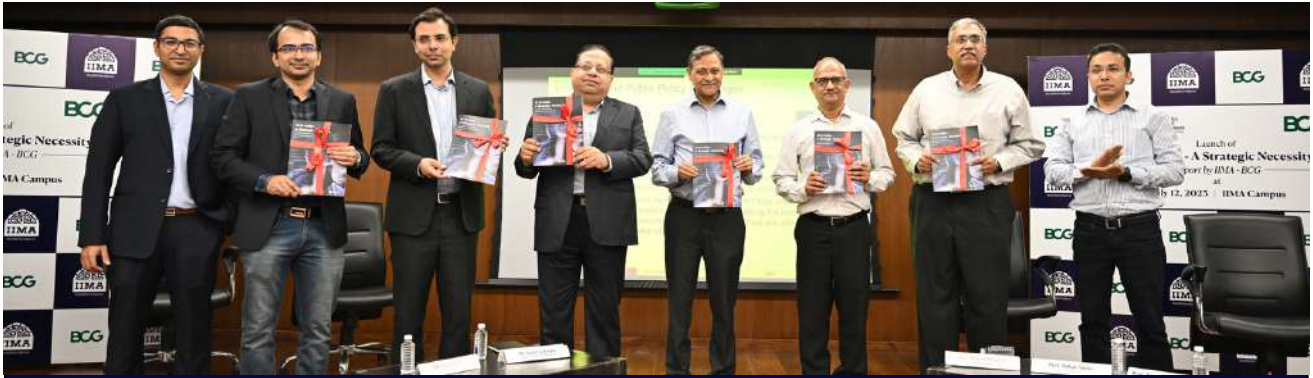
July 12, 2023: IIMA's Brij Disa Centre for Data Science and AI (CDSA) and BCG X, the AI and Digital Transformation unit of Boston Consulting Group (BCG) have collaborated to release a comprehensive report titled "AI in India – A Strategic Necessity" on the AI readiness levels of Indian businesses.

The report findings are based on the study of 130 companies from the Banking, Financial Services, and Insurance (BFSI), Consumer Goods (CG), and Industrial Goods (IG) sectors, along with extensive interviews and surveys conducted on CXO's of large-sized, medium, and small organisations. The study objectively and holistically measures the ability of a company to leverage AI to drive its strategic objectives and enhance its financial and operational performance.

IIMA-BCG joint study 'AI in India – A Strategic Necessity' identifies 11 percent Leaders, 9 percent leapfroggers, 13 percent steady followers and 67 percent laggards from a pool of large Indian companies across sectors.

Awareness, data mindset and skilled workforce key to bridge the gap.





The report was released at the IIMA campus by Professor Bharat Bhasker, Director, IIMA, Professor Ankur Sinha, Professor Anindya Chakrabarti, Co-Chairs of the Brij Disa Centre for Data Science and Artificial Intelligence, Professor Arindam Banerjee, Debjit Ghatak, General Manager, Brij Disa Center for Data Science and AI, Sumit Sarawgi, Managing Director and Senior Partner, BCG, Deep Narayan Mukherjee, Partner and Associate Director - Data Science, Rajat Mathur, Partner, BCG, all co-authors of the report from IIM A and BCG respectively.

Releasing the study, **Professor Bharat Bhasker, Director of IIMA**, said, "India is poised to enter into a digital revolution where successful AI adoption by our industry can be a crucial determinant of India's competitiveness globally. Successful adoption of AI could add up to 1.4 percentage points annually to the real GDP growth of India. From the perspective of corporates, the successful adoption of AI is expected to add, over a five-year period, INR 1.5-2.5 trillion in incremental pre-tax profit for the top 500 Indian companies alone. This presents an incredible opportunity for the Indian industry. Our companies can leverage widespread internet access and cost-effective labour to move ahead and align themselves to the global AI maturity standards. I am confident that the joint study by the Brij Disa Centre IIMA and BCG will have significant implications for policymakers and industry leaders to foster a conducive ecosystem for adopting AI by Indian organisations and their success in translating it into business performance."



Professor Bharat Bhasker,
Director of IIMA

The report emphasizes the significance of achieving advanced AI maturity for success in today's business landscape. Sumit Sarawgi, Managing Director & Senior Partner, BCG commented, "Investments into AI could deliver extraordinary returns, but success hinges on deploying AI at scale. An organisation-wide commitment is required for successful AI-driven transformation of the organisation. The reason being the success from AI adoption, algorithms drive approximately 10% of the success, while data and technology infrastructure adds a further 20%. The remaining 70% hinges on people, processes, and business transformation."

The report provides key insights into India's corporate AI landscape and roadmaps in AI adoption. The study reveals that select Indian BFSI companies (mainly banks and new-age NBFCs) have very high AI Maturity, on par with global frontrunners. It divides companies into four groups based on their maturity level— leaders, steady followers, leapfroggers and laggards. 11% of companies in the set were adjudged leaders that now face a stiff challenge from the leapfroggers (9% of the companies) who started their AI-driven transformation journey late but have improved sharply in AI maturity in the last three years, converging with the Leaders on most aspects of AI maturity.



The report offers actionable guidance for companies with mid-level AI maturity to progress towards global best-in-class AI maturity levels. For leaders in AI adoption, the report focuses on exploring the next frontiers of AI excellence. Research shows that AI investments augmenting end-user value and topline growth could drive significant economic and wage expansion. The opportunity is India's for the taking—the challenge is now to turn the enormous potential of AI into reality.

Key Highlights:

Select companies in the BFSI, CG, and IG sectors have achieved high AI maturity, positioning themselves at par with global benchmarks.

A significant leap: 10% organizations have transformed their AI capabilities in the last 3 years, and they come from across sizes.

Data mindset in leadership is the key: Top 500 Indian companies require 1 million hours of training in upskilling mid and senior-level management on the business aspects of AI, digital transformation, agile ways of working and more.

Most MSMEs are now able to leverage AI because of on-demand access to business software and the availability of services like digital payment gateways, fraud detection systems and CRM.

Dearth of data scientists with domain expertise: Need for 25,000 to 30,000 advanced practitioners of AIML expected in top 500 companies in the next 3-5 years

India has only around 4.5% of the world's AI professionals, and the talent crunch will get more acute.

Benefits of AI: INR 1.5–2.5 trillion incremental pre-tax profit for the top 500 Indian companies in next 5 years.

Link to the complete report can be found here



Challenges for AI in India: Navigating the Digital Personal Data Protection Bill and comparison with global regulations in AI



AMITA TODKAR

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Amita is a professional with 7 years of work experience across projects, operations and strategy. Experienced in business consulting, C-suite engagement, project and program management and stakeholder engagement.

In the fast-paced realm of artificial intelligence, India's Digital Personal Data Protection Bill (DPDP Bill), 2023, has emerged as a critical landmark. Passed by the Lok Sabha on 7th August 2023, understanding the implications of this bill is paramount as AI has the potential to contribute an astounding one trillion dollars to India's economy by 2035, as per a World Economic Forum report.

Following are some critical challenges for data-centric businesses and the artificial intelligence industry arising from the DPDP Bill.

The Consent Conundrum

For AI-enabled businesses, the question of obtaining user consent for data analysis is paramount. The bill stipulates that consent must be freely given, specific, and informed. However, this presents challenges, especially when AI applications have no direct relationship with the individuals whose data is being processed. Also, consent can be withdrawn anytime, and managing consent status is another hurdle for businesses. Businesses must adapt by finding suitable lawful bases for data processing and devising strategies for managing consent withdrawal.

Navigating the Compliance Maze

The bill places substantial responsibilities on data fiduciaries (entities determining the purpose and means of processing data). They must ensure data accuracy, implement robust security measures, report breaches, and delete data once its purpose is fulfilled. Penalties for non-compliance can be severe, reaching up to Rs 250 crore, underlining the importance of strict adherence to data protection regulations.

Data Privacy by Design

AI businesses must incorporate data privacy into their operations from the outset. This means adopting a "privacy by design" approach, ensuring that data protection measures are integral to AI system development. Data fiduciaries must make concerted efforts to ensure data accuracy and implement robust security safeguards.

Generative AI Regulation Missing

One omission in the Digital Personal Data Protection Bill is the absence of provisions to govern emerging technologies like generative AI. Experts express concerns about the bill's inability to address deep fakes created by generative AI tools, leaving a significant gap in privacy law. As AI evolves, it's imperative that regulatory frameworks adapt to tackle these challenges effectively.

Comparison with global regulations in AI

The AI revolution continues to shape India's technological future, and those who adapt to these changes will emerge as leaders in this dynamic landscape. While India has published two AI roadmaps - the Report of Task Force on Artificial Intelligence constituted by the Ministry of Commerce and Industry and the National Strategy for Artificial Intelligence by Niti Aayog, no laws have been passed to regulate the use of AI. As Indian policymakers still lag in regulating AI in India, the EU, the US, and China are bringing forth their policies for the use of AI by businesses. Understanding the comparative study of the three jurisdictions can inform businesses to be future-ready.

Topics	European Union (EU)	United States (US)	China
Bills and Acts under discussion	Digital Services Act, Artificial Intelligence Act	Blueprint for AI Bill of Rights, state-level rules	Cyberspace Administration of China regulations released in 2021, 2022, 2023
Approach to AI Regulation	Highly precautionary with strict rules and risks categories defined.	Promotes voluntary disclosures and lacks broad AI laws	Strict with strong domestic focus and emphasizes control of regulators on businesses
Prohibited AI Applications	Social scoring, predictive policing, emotion recognition, real-time facial recognition	No specific prohibitions and focuses on principles	Excessive price discrimination, algorithmic scheduling of workers, fake content
Registration & Compliance	High-risk AI requires registration and conformity declaration	Emphasis on safety, non-discrimination but limited statutory requirements	Registration of models and algorithms explaining the use and applications.
Liability & Fines	Companies liable, fines up to 7% of annual global profits	Limited federal regulations, fragmented state-level rules, judiciary directed penalties	Strong emphasis on compliance but unclear penalties

AI regulations could contribute to fragmentation and regionalization in the tech world. Also, just as the GDPR has affected how global tech firms operate, regulations all around the world have to be implemented to compete on the global stage. Business leaders are expected to ensure transparency, equitable decisions and fair outcomes while considering the risks and complexity that arises from AI and human interaction.

Barriers to adoption of Edtech:

Findings from a qualitative study* _____



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Neaketa is a post-doctoral Research Associate at the Brij Disa Centre of Data Science and AI. She completed her PhD in Economics from IIT Delhi, where her research focussed on two-sided/digital platforms. At the centre, her research explores the role of data science and AI, especially in the domain of skilling and education.

India has made rapid strides when it comes to access to primary schooling and enrolment. Data from a variety of sources suggests that the percentage of children in the age-group of 6 to 10 years enrolled in school is near universal, and the drop-out rates low. But at the same time, concerns about learning outcomes persist. It is well accepted that a large fraction of enrolled children are way below the level expected at the grade in which they are enrolled. Realising the gravity of the problem, the National Education Policy (NEP) explicitly mentions Foundational Literacy and Numeracy (FLN) to be achieved by all children by Grade 3. Many innovative solutions are being advocated including Ed-tech, have emerged to address this issue.

However, for these technological solutions to make a significant impact on learning, we must first understand how parents and children, together, access and use technology. In this article, we discuss some of the findings that emerged from a qualitative survey that our centre undertook in collaboration with Saajha, an NGO based in Delhi. Saajha focuses on the parents of children who attend government primary schools in Delhi. It conducts community drives through which they onboard parents on their platform, and subsequently conduct learning level assessments of their children over telephone. Depending upon the learning level of the child, content related to FLN skills is shared over WhatsApp with respective parents. It conducts periodic assessments to check whether the learning level is improving.



The main aim of the survey was to understand whether and how parents, especially from low income backgrounds, use technology to assist the education of their children.

We discuss some of the key findings below.



Access

The survey found that children who engaged more with WhatsApp educational content were those for whom smartphones were readily available at home. Interestingly, the presence of a smartphone with the mother proved more crucial than mere accessibility within the household. Often, households had only one smartphone, typically in possession of the father who was at work during the day. Therefore, the phone was not readily available for the child to use.

Use

Most parents allowed their child to use a smartphone to watch education related content. However, the survey highlighted that some parents did not look or open the learning content links shared over WhatsApp. Sometimes they were even unaware that they had received any such message. This could be because many parents, especially those whose children attend government primary schools, possess limited formal education themselves. Simply sharing content in the form of video links on WhatsApp can be hit or miss, as parents may struggle to comprehend the content or even access it on their smartphones. Effective communication strategies that are user-friendly for parents are essential to encourage their active involvement in their child's learning journey.

Human Aspect

Parents expressed a strong preference for phone-based assessments which were conducted by a Saajha calling agent. During these assessments, the agent instructed the child to read Hindi passages from their school books and also guided them in solving some basic maths problems. Parents valued the conversational approach the agent used, which made the interaction feel like their child had a supportive mentor to talk to over the phone. The finding highlights the importance of human interaction in supplementing technology based education interventions and the role it can play in the adoption of such tools.

Limited Time

The survey also highlighted the packed schedules of most parents and children. Children spent close to 6 hours at school and almost all children were attending tuition classes for an average of approximately 2 hours during the day. The anecdotal evidence from our interviews suggest that tuitions often fail to align with a child's individual learning pace or current skill level. They predominantly supplement the school syllabus, reassuring parents that school-assigned homework is being completed. Moreover, these commitments leave children with minimal time for self-study, particularly through smartphones that may require adult supervision.

While the availability of affordable smartphones and low data costs have undoubtedly reduced the problem of accessibility of technology to a great extent, relying solely on technology might be insufficient to improve learning outcomes. We must explore innovative methods of delivering information to parents that do not overwhelm them cognitively. Furthermore, a deeper understanding of the motivations driving parents to enrol their children in tuition classes is essential. This insight will enable us to refine Ed-tech products, aligning them more effectively with parental objectives. Failure to do so may result in limited adoption of these tools.

Exact Algorithms vs Heuristic Algorithms:

Different Approaches to Solve Complex Optimization Problems _____



DHAVAL PUJARA

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Dhaval is a post-doctoral research associate at IIM Ahmedabad. His research interests are scheduling, bi-level optimization, mathematical modelling, development of heuristic and meta-heuristic algorithms, and application of AI/ML-based solution methods in the domain of operations research and management.



Background

Case 1: 'Live Cakes' is a famous cake shop. As the name suggests, it serves fresh and tasty cakes to customers visiting a shop. The owner of the shop, Mr. Patel, has recently started home delivery of customized cakes. Due to personalized orders, the owner prepares the cake only after receiving the order. Currently, orders are delivered twice a day. Orders received before 10 AM are delivered in the first slot of delivery at 12:30 PM, and orders received between 10 AM and 5 PM are delivered in the second delivery slot at 7:30 PM. Currently, 'Live Cakes' is serving in the area within the range of 2 KM. As the home delivery service has just been started, the shop receives, on average 4 orders and a maximum of 8 orders in each delivery slot. The delivery boy, Raju, always decides the route of delivery (i.e., sequence of customers while delivering cakes- Routing) randomly or based on intuition. Recently, the shop owner was upset about the performance of Raju in choosing the route of delivery as it was taking a long time and more distance covered in most of the delivery slots. Jignesh, son of the shop owner, is a student and has a good knowledge of optimization algorithms. So, he helped the delivery boy in choosing the efficient route of delivery in every slot by implementing an exact (optimization) algorithm for routing. After the implementation, Mr. Patel is very happy with the solution provided by the optimization algorithm as the time and distance covered in each delivery are reduced substantially.

Case 2: 'Serving Online' is a local e-commerce company. The company sells a wide variety of products, such as apparel, electronic gadgets, groceries, books, toys, etc. The company stores all the products in a single warehouse located on the outskirts of the city. The order management system at the warehouse receives real-time updates on the online orders placed by customers. On a normal day, the company receives a total of 5000 orders on average, including all items. To deliver the orders, the company has a large fleet (group of delivery vehicles such as bikes, rickshaws, vans, etc.) capacity. The warehouse operations manager, Mr. Wasim, has to consider multiple decisions: (a) which ordered items should be combined in a single group for delivery, (b) out of multiple vehicles available in the fleet, which vehicle should be selected to deliver formed group of ordered items, and (c) decide a route of delivery (i.e., sequence of customers to be served) in each delivery trip. When asked if he uses any optimization algorithm to make these decisions, Mr. Wasim said: "it is pretty difficult to use an exact optimization method for the current system because this system is highly complex due to large variation in (a) products being delivered, (b) delivery vehicles, and (c) possible routes of delivery. Interrelation between these dimensions makes a huge number of combinations (large number of choices). In addition to that, there is a certain amount of uncertainty associated with operations side (breakdown of delivery vehicle, the ordered item gets distorted while handling, product to be delivered is not available in the warehouse, etc.) as well as customer side (such as order gets cancelled, preferred delivery time gets changed, delivery location gets changed, etc.). Due to this complexity, it is quite difficult to build a model that exactly represents the current system.

Even if we develop such a model, it takes a long time (in hours) to deliver the optimal (best) solution, which is not feasible right now as, currently, 10 to 12 delivery trips are scheduled per hour (i.e., one delivery trip is scheduled every 5th to 6th minute). Hence, we are using the heuristic (approximate) algorithm, which does not provide the optimal solution but provides a feasible (possible) solution in required time frame”.

Discussion

The scenarios (loosely referring to them as systems) discussed in both the cases above are considerably different. Compared to system considered in Case-1, system considered in Case-2 is very complex. Technically, as per the literature, there are several dimensions of the complexities:



(a) numerousness, (b) variety/diversity,
(c) interconnection/interactions, (d) opacity of interactions,
and (e) uncertainty/dynamic effects.

Complexity in the system increases with increase in the level of parameters associated with each dimension of complexity. Accordingly, the complexity of system considered in Case-2 is very high due to the following reasons: company has a large number of products and high fleet capacity, there is a high variety in products type and fleet type, decisions on- order grouping, vehicle selection, and route selection are interconnected, operations of warehouse management system are highly connected with supplier and customer management systems, there are sources of uncertainty from operation and customer sides, and there is a dynamic change in system-state due to real-time updates in input data.

The purpose of this discussion is to explain the problem-solving approaches (methodologies) followed by the users to obtain solutions in different situations. So, in general, when the system is complex and the user has limited time between successive decision-making time points, then approximation methods, also known as heuristic algorithms, are applied for problem-solving. Although heuristic algorithms do not guarantee the optimal solution, by incorporating deep subject matter knowledge into the algorithm, implementing the algorithm into a computer system using coding expertise, and executing the algorithm into a computer system having a reasonable computational efficiency, one can expect the heuristic algorithm to deliver efficient solutions most of the times.

On the other hand, one should never underestimate or discount the exact algorithms, also known as exact optimization algorithms, as they guarantee the optimal solution. In the past and in recent times, they have been used to solve very complex problems in various fields including, but not limited to, engineering, design, bioscience, finance, marketing, supply chain management, etc. Sometimes, it is difficult to express or model the real system exactly in the mathematical format to apply optimization methods; however, if one can model the system with some relaxation and can provide enough time to solve the problem using an optimization algorithm, the result can be extremely helpful to the user. That is why, while making long-term strategic decisions in business, the top management generally prefers to go for optimization algorithms and allows to wait for a certain amount of time as strategic decisions generally need high investment and even a slightly better optimal solution (1 or 2%) compared to the feasible solution provided by the heuristic algorithm can make a huge difference in monetary terms because of high amount of capital and risk associated with the strategic decisions.

In between the exact algorithm approach and the heuristic algorithm approach, there is another approach known as the hybrid algorithm approach, where the user combines the optimization and heuristic algorithms to solve a single problem. In a hybrid algorithm, users can get the advantages of both exact and heuristic approaches by making some system-oriented decisions using the optimization algorithm and by performing the remaining decisions with the help of heuristic algorithm.

Conducted webinars/seminars

in May to December 2023



The graphic features a circular portrait of Kaustav Sen on the left. To the right, the text reads: 'R&P seminar in collaboration with Brij Disa Centre for Data Science and Artificial Intelligence', followed by the title 'Environmental and Social Convergence Through Cross-border Acquisitions: Evidence from Emerging Market Multinationals' in bold. Below the title, it says 'June 7, 2023 at 4.00 pm IST'. A QR code is located in the bottom right corner, with the text 'Scan to watch the webinar' underneath it.

Kaustav Sen
Professor of Accounting,
Lubin School of Business,
Pace University, New York

R&P seminar in collaboration with Brij Disa Centre
for Data Science and Artificial Intelligence

**Environmental and Social Convergence
Through Cross-border Acquisitions:
Evidence from Emerging Market
Multinationals**

June 7, 2023 at 4.00 pm IST

Scan to watch the webinar

Environmental and Social Convergence Through Cross-border Acquisitions: Evidence from emerging Market Multinationals

June 7, 2023 | Kaustav Sen

About the seminar

EMNEs entering developed markets via acquisitions show improved ESG performance, particularly in environmental aspects, within two years. These changes often have value implications, reflecting the growing importance of sustainability and stakeholder considerations in today's business landscape. However, social improvements may not yield the same financial benefits. Sensitivity to specific sustainability factors and target market characteristics plays a role in shaping these outcomes, emphasizing the need for nuanced strategies in the global marketplace.

About Kaustav Sen

Kaustav Sen is a Professor of Accounting at Lubin School of Business, Pace University, New York. He has published in the areas of corporate governance, financial reporting and stock price anomalies. Current interests include examining sustainability issues around corporate finance decisions and the role of text analysis for financial forecasting. He serves on the Editorial Board of the Journal of International Accounting, Auditing & Taxation and has been a consultant at Prudential, New York Life and GE Capital in equity investments and risk management. He has held visiting faculty positions at Indian Institute of Management Calcutta and Hong Kong Polytechnic University.

Multi-Objective Personalization of the Length and Skippability of Video Advertisements

 September 18, 2023  6:30 - 7:30 PM IST
 SR-1, JSW SPP, IIMA



Speaker:
Prof. Anuj Kapoor
Assistant Professor of Quantitative Marketing
Indian Institute of Management Ahmedabad



Multi-Objective Personalization of the Length and Skippability of Video Advertisements September 18, 2023 | Prof. Anuj Kapoor

About the seminar

This paper explores digital video ads on content-streaming platforms, focusing on ad length and scriptability. The Skippable/Long ad increases ad consumption but reduces video consumption compared to non-Skippable/short ads. To address this challenge, we develop multi-objective personalization algorithms that improve both ad and video consumption outcomes over single-objective policies. For instance, one policy increases ad consumption by 61% with a 4% video consumption decrease, while another boosts video consumption by 47% with only a 13% ad consumption decrease. This research has practical implications for real-time platform decision-making.

About Prof. Anuj Kapoor

Anuj Kapoor is an Assistant Professor of Quantitative Marketing at IIM Ahmedabad. His research interests are in the economics of digitization, artificial intelligence, privacy, and digital platforms. His research focuses on understanding how big data and artificial intelligence shape consumer welfare and digital markets. He uses a quasi- and actual experimental variation to explore how different types of human behaviour in varying contexts affect algorithms. He works closely with firms to suggest to them more ways to become data-driven. He has ongoing collaborations with various tech start-ups in India in the digital media and health tech space. Anuj received his Ph.D. in Business Administration (Quantitative Marketing and Economics) from the David Eccles School of Business at the University of Utah. After his doctoral studies, he worked in the data science space in San Diego, USA. At IIMA, he teaches electives on Artificial Intelligence and Marketing and Privacy Paradox: Data, Artificial Intelligence, and Digital Platforms.

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