Brij Disa Centre for Data Science and Artificial Intelligence

INDIAN INSTITUTE of MANAGEMENT AHMEDABAD

विद्याविनियोगाद्विकास:

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Cover page generated on Dall-E 2

"Map of India with AI ML Math Data Robots"

The Age of Generative Artificial Intelligence

What can one say about ChatGPT that isn't already out there? It's a tough one. We hope this article will give some food for thought. Founded in 2015, Open AI begun as a non-profit with the goal of promoting "Friendly AI" to help humanity. It also has a "capped" for-profit subsidiary Open AI Limited Partnerships (for profit) with $ 11Bn in funding from Microsoft. Additionally, its Open AI startup fund has made some interesting investments. The kind of startups being funded gives interesting insights into possible vertical integrations of this "General Purpose tool".

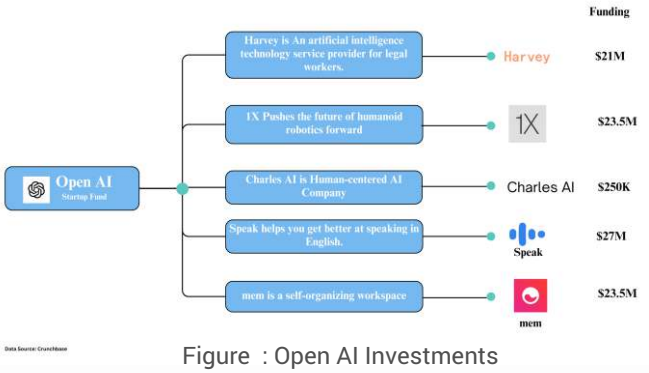

Figure : Open AI Investments

EU also recognizes the potential of these tools and are discussing "General Purpose AI license" that would put risk management and greater social benefit as a priority. On the flip side, development of AI relies significantly on open-source initiatives and excessive regulations may lead to barriers to innovation and concentration of these technologies to a few players.

"Data, methods, and computation are three key ingredients to training an AI model. Most of the large language models are trained on publicly available massive text data using deep learning technologies that are common knowledge. However, the barrier to training such models is access to immense compute resources that might be available with only large organizations. This creates an imbalance where AI innovation is driven by large corporations. While responsible AI is the need of the hour, it is also important to create an ecosystem through public and private funding to democratize innovation in AI, as well as access to AI."

Prof Ankur Sinha

Though just a large language model, ChatGPT should be termed as an inflection point in AI research as it is going to have a significant impact on several businesses and would lead to applications that will bring multiple surprises to us within the next 5 years. The size of the language model with 175 billion models and its ability to churn out helpful information that sets it apart. Google's LaMDA and Meta's LLaMA are similar attempts in this regard which are being integrating across their services, but it is the quality of the output will determine the success. With the power to transform almost any application that it is integrated into, the functions and value additions by all platforms are being re-thought. Within just a few months, this powerful model has been integrated to Microsoft's complete suite of products, to Salesforce CRM and by many other platforms.

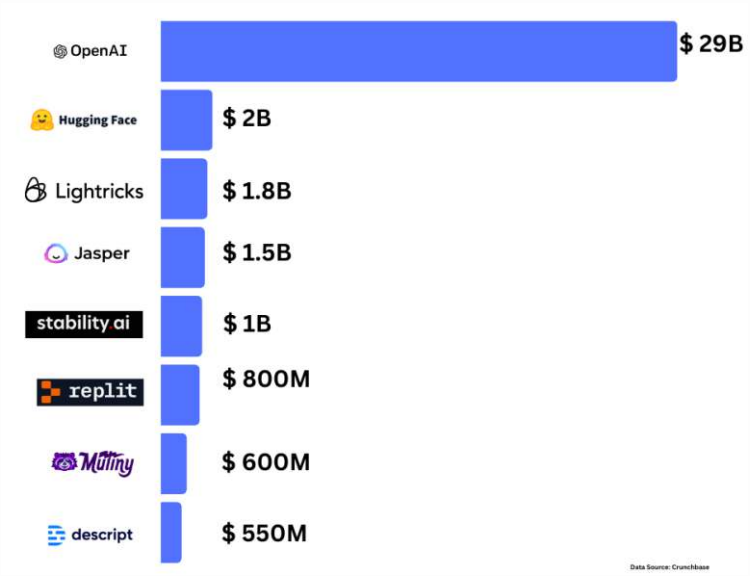

Figure : Core AI companies with $500M valuation

The next challenge that remains is to see how these large language models trained on past data are able to answer queries while accounting for the massive real time data in various forms that is flowing. Referred to as, knowledge grounding of large language models, this remains an interesting area to watch.

Here is a list of some core AI companies and their valuations. In the next few years, we will see a plethora of organizations aiming to capture a share of the pie and many organizations shrink or even disappear. With limitless applications across industries and organizational functions, the potential to disrupt is immense.

As it is with most disruptive technologies, certain job roles will be made redundant while a completely different set would come to the fore. This is skill polarization. While technology has been impacting white collar jobs for quite some time, blue collar jobs are being impacted considerably for the first time. What about the high skill jobs that involve complex analytical skills as well as soft skills. Many functions within such a role would be taken up by these tools.

Figure : Which tasks will be revolutionized with >2X productivity?

For instance, Microsoft "Co-pilot" can help in almost every task we do today in the corporate world with incredible ease. From making a project plan and list of action items to a customer presentation, such an assisting/augmenting technology would cut down the time taken drastically. An average 33% predict 25-50% gain in productivity from using these tools. Additionally, as these technologies and tools evolve further, the challenge will be about harnessing these technologies and adding greater value where these tools can't.

As it is with most disruptive technologies, certain job roles will be made redundant while a completely different set would come to the fore.

"The new AI technology will disrupt the labor market. For a very long time, we saw mechanization and automation of manual tasks. The current era of digitization has the potential of automating jobs which are of cognitive nature. The effect on the labor market will be large, especially in the context of the developing countries which often do not have economic safety nets."

Prof Anindya S Chakrabarti

This is skill polarization. While technology has been impacting white collar jobs for quite some time, blue collar jobs are being impacted considerably for the first time. For a service economy like India, what does this mean? A recent paper says that 1% increase in the AI vacancy growth rate results in a 3.61% decrease in establishment non-AI vacancy growth. This holds especially true when such technologies are deployed towards internal efficiency and automation.

So, where will jobs be created? There are 2 key areas where jobs are created when technologies disrupt. One, in the disruption itself. If the barrier of entry isn't too high (i.e if an effective copy of ChatGPT can be made), then multiple copies of the technology would crop up. Second, if the barrier is high, then organizations would embrace it and increasingly build products / services around these technologies.

We are aware how touch screen smartphones have impacted various businesses and our lives, and people call it disruptive. The question is, "Which launch was more exciting and surprising, that of a touch screen smartphone, or a conversational AI like ChatGPT?" If you think it is ChatGPT, then imagine what this has on offer for you in the future.

Debjit Ghatak
Centre Head, Brij Disa Centre for Data Science and AI

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AI Readiness in Emerging Economies : Evidence from Survey Data (Centre-led Research)

AI is altering the structure of jobs, replacing human performed tasks while also generating new tasks. However, evidence suggests that positive and complementarity effects of adoption of AI are still small relative to its displacement effects (Acemoglu et al., 2022).

Brij Disa Centre in association with BCG have explored Data and AI readiness of organization over the last year. The data collection involved in-depth interviews with leading Chief Data and Analytics Officers across industries as well as a survey specifically targeting data and data-associated functions in the organization.
The goal is to measure the AI readiness of key Indian Companies: Companies from Banking, Financial Services, and Insurance (BFSI), Consumer Goods & Retail and Industrial. Approximately 60% of AI-led value-added will be from these industries.

Prof. Anindya S Chakrabarti presented the initial findings of this study as part of discussion on 'AI, Policy Issues & Technological Revolutions' at University of Sussex Business School.

What does the management think? Some initial insights.

BFSI
• "The focus is on whether you can get a customer without a salesperson being present."
• "The cost of discovery is quite high to find and engage startups with the right talent to work and co- innovate."
• "Focus is on providing a seamless digital experience across products and minimize disruptions."

Consumer Goods & Retail
• "In India, the challenge is with respect to the cleanliness of the data. Many government organizations do not have a unified database."
• "Recruitment to build the right team size is a challenge. Finding the right talent is difficult." -

Expectations for the future of India's skilled labor population:
• Expect an increase in hiring because of 5G expansion, automation, and digitization.
• India needs 30 million digitally skilled professionals by 2026 and 50% of the current workforce will have to re-skill in emerging technologies.
• 25-30% increase in demand for tech-talent in non-tech industries
• Easier to absorb engineering (AI/ML/Full stack Engineers) than non-engineering talent (Corporate and Operational roles)

Data-driven Research in Social Sector

Brij Disa Centre for Data Science and AI is excited to collaborate with Saajha on enhancing parental engagement in student learning. Saajha is catalyzing India's public education reforms through parent and community leadership. Saajha, since its inception in 2014, has worked across 2000+ schools in Delhi, Maharashtra, Jharkhand and Karnataka. Training, personalized support, policy reforms, adaptive technology have been the strategic drivers for Saajha to enable parental participation.

The centre, collaborating with Professor Ambrish Dongre, will support this initiative by guiding Saajha through data-led insights. Through this initiative, the centre hopes to bring more awareness in India's education sector on "Data Science use-cases" in maximizing outcomes.

Prof. Ambrish Dongre

Low learning levels is an important challenge for educators and policymakers in India. The National Education Policy (NEP) 2020 has explicitly mentioned achieving Foundational Literacy and Numeracy (FLN) for all students at the end of Grade III by 2025 as an important objective. Parental role in helping their child improve learning has received relatively less attention in the Indian context. Our collaboration with Saajha could throw some light on ways in which parents could be helped better so that their engagement with child's learning and child's school improves.

Saajha, through a well-orchestrated digital push, has modernized its systems in 2022 and brought over 80,000 parents to their platform. With their app, they are now able to manage their learning programs and interventions more effectively.

Data Science Collaboration in the Power Sector

On 7th July 2022, DVC stepped into its 75th year of existence. As one of the oldest diversified power organizations of the country, DVC has drawn up an expansion plan till 2030. In line with the plans of the Government of India, DVC has taken up an ambitious target of achieving 15000 MW of installed capacity by 2030 where about 50% will come from renewable energy sources. The expansion program includes solar plants, pumped hydro projects and brownfield thermal units. Diversification into new businesses such as tourism, EV infrastructure and green hydrogen are being planned. As a fully integrated and diversified power organization, DVC will continue to fulfil its mandate in the years to come.

Over the last year, the Centre has worked with the DVC management to understand their challenges across the value chain. The centre has embarked on a 1-year collaboration plan to understand and make recommendation for data science use cases in the Power sector. During a joint meeting on 15th February at DVC HQ at Kolkata, Shri Ram Naresh Singh, Chairman DVC shared insights into the Power sector, operational challenges and expressed confidence in data science driven initiatives to improve operational performance. Prof Ankur Sinha shared insights on data science adoption across industries and sectors. Working together, the goal is to maximize operational efficiency to deliver value to end consumers.

Data tools for Industry and Academia

It was a pleasure hosting Prof Devavrat Shah from Massachusetts Institute of Technology over a Seminar and Ikigai to conduct hands-on training workshop on Creating AI data Apps using Ikigai platform at #iimahmedabad. Ikigai CTO & Co-founder Devavrat Shah with their team Vinay Gahlot, Chanikya Kesarapu guided the participants to build an AI/ML data app.

Free access (6 months, extendable to 2 years) for IIMA Community. Fill form to receive access code, training videos, and use case demos.

The workshop covered the end-to-end process of data extraction, cleaning, stitching, training the data on an ML model, visualization, and deploying the model in an AI app to recommend values of target columns for new data. By the end of the session, participants created their own functional AI data app for housing prices recommendation.

Ikigai is a platform that offers a range of data management and analysis tools, including data visualization, reporting, and dashboards. One of the key features of Ikigai is its ability to be customized to suit the needs of different industries, making it a horizontal platform that can be used across various sectors. Founded out of MIT, the powerful Ikigai tool is mainly used by operations teams that use data for mission-critical operations. The no-code, cloud based end-to-end platform works alongside or on top of existing data/application stacks seamlessly enabling it to achieve time-to-value within days.

Lottery-based auctions

Jeevant Rampal | Faculty, IIMA

Prof. Jeevant Rampal (Ph.D. Economics, Ohio State University) is an Associate Professor of Economics at the Indian Institute of Management, Ahmedabad. Dr Rampal has research, teaching, and consulting interests in behavioural/experimental economics, auctions, market design, game theory, gender economics, industrial organization, development economics, and agricultural economics. He has several publications in leading international economics research journals.

Rahul Sharma | Research Associate

Rahul is a pre-doctoral researcher at IIM Ahmedabad working under the guidance of Prof. Jeevant Rampal. He has done BS-MS in economics from IIT Kanpur. Rahul's research interest is in the intersection of economics and computer science, specifically auction design algorithms and game theory.

1 Abstract

In this paper, we will study lottery-based liquor auction procedures. Specifically, to run a retail liquor shop, many states in India organize a lottery-based auction to distribute liquor licenses. Usually, the license is valid for two years. Note that analysis of such auctions is essential because of their success in generating revenue and attracting many applicants [2, 1]. In this paper, we will compare and contrast auction rules for three states in India: Rajasthan, Telangana, and Odisha. In particular, we will use computational techniques to study the revenue and other important implications of the auction designs. The states mentioned above follow a lottery-based procedure to auction liquor licenses; the theoretical implications of this procedure are unclear from the theoretical literature. Thus, a computational approach is important. We find that: Telangana's auction design provides the maximum flexibility to the bidders, which might explain its success in generating revenue. Bayesian Nash equilibrium for lottery auction generates a complicated differential equation (unlike first-price/second-price auction), and therefore calculating optimal bid requires computational techniques.

Keywords: Lottery-based auction, liquor license, Auction design, Bayesian Nash equilibrium

2 Introduction

An auction is a selling procedure where many buyers compete against each other through bids. The design of the selling procedure/algorithm is important since it impacts bidders' incentives, and by that the obtained revenue, robustness to collusion, competitive market structure, and efficiency (an efficient auction allocates each object to a bidder who values it the highest), among other aims that the auctioneer may have []. .

One such auction routine is a lottery-based auction, which is currently favoured by several Indian states like Rajasthan, Telangana, Uttar Pradesh, and Odisha. . Specifically, in a lottery-based auction, a bidder can buy a lottery ticket (one can also purchase multiple tickets) to compete for an object (a license in a particular region). Each bidder can also enter lotteries for multiple objects. The states that have followed lottery-based auctions have claimed that they have achieved high revenues successfully. For example, in Telangana, 48784 applicants applied for a liquor license auction in 2019 for 2216 shops, while 60000 applicants applied for 2620 shops in 2021. Similarly, Odisha's liquor license auction of 2021 attracted 19416 applications for 1297 shops. Therefore, it is important to analyze such auctions and possible improvements to their designs.

3 Lottery-based Liquor Auction in India

In this section, we will analyze the auction rules of Rajasthan (2020), Telangana (2019), and Odisha (2021) in detail. The basic parameters of the lottery are laid out in table (1).

State	Lottery ticket price (lakh)	No. of Applicants	No. of Shops	Validity of license	Lottery Revenue raised	Lottery Revenue/shop
Telangana	2	48,784	2216	2 year	975.68 cr	0.44 cr
Odisha	1	19,416	1297	5 year	194.16 cr.	0.15 cr.
Rajasthan	0.25-0.30	2.87 lakh	7616	1 year	860 cr.	0.11 cr.

Table 1 : Comparison of lottery parameters between different states

Note that the auctions were successful in attracting participants. The income obtained in table 1 is the amount received by selling lottery tickets; successful applicants were required to pay additional annual taxes as well. In table 2 we have included the tax slabs imposed on the liquor shops.

State	Tax-slabs (in lakh rupees per year)
Telangana	55, 60, 65, 70, 90, 115 + Variable tax
Odisha	23.76, 15.84, 13.20, 12.67, 10.56, 9.50, 7.60, 6.33, 3.96
Rajasthan	26, 22, 16, 15, 13

Table 2: Comparison of annual tax (in lakh rupees) between different states

Note that each state has created different categories of liquor shops on the basis of previous earnings, population etc. Usually shops that tend to earn more are charged higher annual tax. Although we don't have the data for the exact tax collection, it is quite obvious from table 1 and 2 that the expected earnings/shop from Telangana's auction is the highest (high tax rate/shop and high lottery earnings/shop). Note, however, that high revenue does not imply the success of auction design, the states mentioned above are different in terms of per capita income, demand for liquor, lottery price, tax structure, and auction design. Therefore, it is not possible to infer the true return from the auction design. In the next section, we will compare the auction rules of Rajasthan, Odisha, and Telangana. Note that even a slight percentage improvement in the above auction routine can make a difference of crores of rupees. Therefore, analyzing such auctions is a critical problem

3.1 Comparison of Auction Rules

Telangana's liquor auction worked quite well compared to other states in terms of revenue/shop. In contrast to Rajasthan and Odisha, telangana's auction design provides more flexibility to the bidders. This can partially explain the success of Telangana's auction.

Before going into details, we would first like to create an abstract auction model. Specifically, assume that there are a certain number of liquor shops (say M) and players (say N) want to participate in this auction. To run any particular shop, the player needs to win the liquor license of that shop. In order to

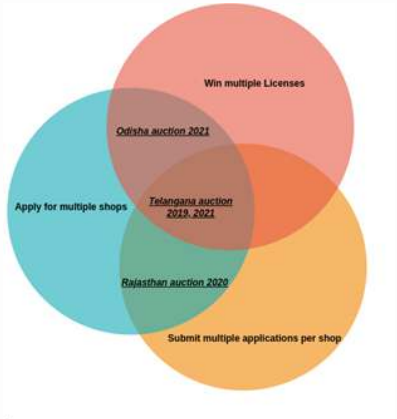

Figure 1: A comparison of liquor auctions across India. Note that Telangana's auction comes under case 1, Rajasthan's auction comes under case 3, and Odisha's auction belongs to case 2.

obtain the license of the desired shop, each player has to buy a lottery ticket to participate in the auction process. Note that it is possible that a player may want to achieve multiple licenses. Therefore, this is a multi-unit demand auction model. In this setting there could be three different scenarios:

- **Case 1**: Bidders can apply (buy a lottery ticket) for multiple shops and submit multiple applications per shop. Further, the player is allowed to win multiple shops. ex: Telangana

- **Case 2**: Bidders can apply (buy a lottery ticket) for multiple shops and can submit only one application per shop. Further, the player is allowed to win multiple shops. ex: Odisha

- **Case 3**: Bidders can apply (buy a lottery ticket) for multiple shops and can submit multiple applications per shop. Further, the player is allowed to win only one shop. ex: Rajasthan

Based on the above three cases we can categorize the liquor auctions of the aforementioned states. For more details, please refer to figure (1). The key decision variable that impacts the auction participation is the lottery ticket price and expected profit from the shop. In particular, we expect that low lottery price and high expected profit will attract a higher number of participants. In figure (1), we can see that Telangana's auction provides the maximum flexibility to the bidders. In particular, every bidder can submit multiple applications per shop (buy more lottery tickets for a shop to increase success probability). Further, it allows the bidders to bid for a package (collection of shops), enabling the players to win multiple shops.

On the other hand, Rajasthan allows bidders to win only one shop. Therefore, it discourages players from buying more lottery tickets. Similarly, Odisha restricts bidders to submit only one application per shop, which limits the bidders' strategy space. Therefore, some aspects of Rajasthan and Odisha's auction may discourage bidders from participating or restrict them. In contrast, Telangana's auction provides greater flexibility to its bidders.

A shop's profitability is usually known to the bidders in the lottery; therefore, the only uncertain variable is the private skill of the player in running the shop. For instance, the same shop can generate different profits based on the managing ability of the shopkeeper. Therefore, we can model these auctions with a private value model. The existing literature solves the Nash equilibrium of lottery auction for private value models (PVM) with single-unit demand [4]. However, the analytical expression for the optimal bidding is unavailable, and computational techniques are used to estimate the optimal bid. Numerical simulations show that first-price auctions can outperform lottery auctions (in terms of revenue) for single-unit PVM for various cases. Therefore, it's natural to compare uniform-price auction (multi-unit extension of first price) with the multi-unit lottery-based auction. Currently, we are designing computational techniques to derive the Nash equilibrium for multi-unit lottery-based auctions. The future work aims at comparing lottery auctions with uniform-price and discriminatory auctions in terms of revenue.

4. Conclusion

In this paper, we discussed the lottery-based liquor auction of Rajasthan, Telangana, and Odisha. We discussed the auction rules briefly and compared these three auction methods. It turns out that Telangana's liquor auction raised the highest revenue/shop among these states. In particular, the flexibility of rules in Telangana's auction may have helped in raising more revenue. In contrast, Rajasthan and Odisha's liquor auctions are somewhat restricted, which could discourage participants from buying more lottery tickets. However, it is essential to note that revenue is not the only criterion for judging an auction's success. Equitable distribution of resources is also crucial from a policy framework. Finally, we would like to highlight the fact that Telangana's average income is much higher than Rajasthan and Odisha. Therefore, we need to consider the average earning of bidders as well to compare these auction routines.

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TRANSFORMING CHALLENGE INTO OPPORTUNITY: AI FOR SUPPLY CHAIN RESILIENCE

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Sayantan Pramanick is a Pre-doctoral researcher at IIM Ahmedabad, working under the guidance of Prof. Aditya Moses. He is a B.tech in Computer Science and an MBA in Operations Management. Sayantan's research interests revolve around the application of AI and ML tools in business processes, with a focus on supply chain management.

Introduction:

In recent times, supply chains have undergone unprecedented shock waves. From geopolitical tension leading to supply chain bottlenecks to soaring inflation, rising interest rates, and decelerating growth, a range of complicated global headwinds have put extreme stress on various supply chains. It has brought to the forefront the urgent need to have a robust supply chain in place, for the long-term success of any business all over the world. Supply chains continue to struggle against the enduring impact of the COVID-19 pandemic, the ensuing economic crisis, and the ongoing conflict in Ukraine. Despite these challenges, companies are focusing on building business resilience and competitive advantage. Artificial Intelligence offers a promising solution for building and promoting resilient supply chains. This article will discuss the application of AI for supply chain resilience and its present-day usage in the industry.

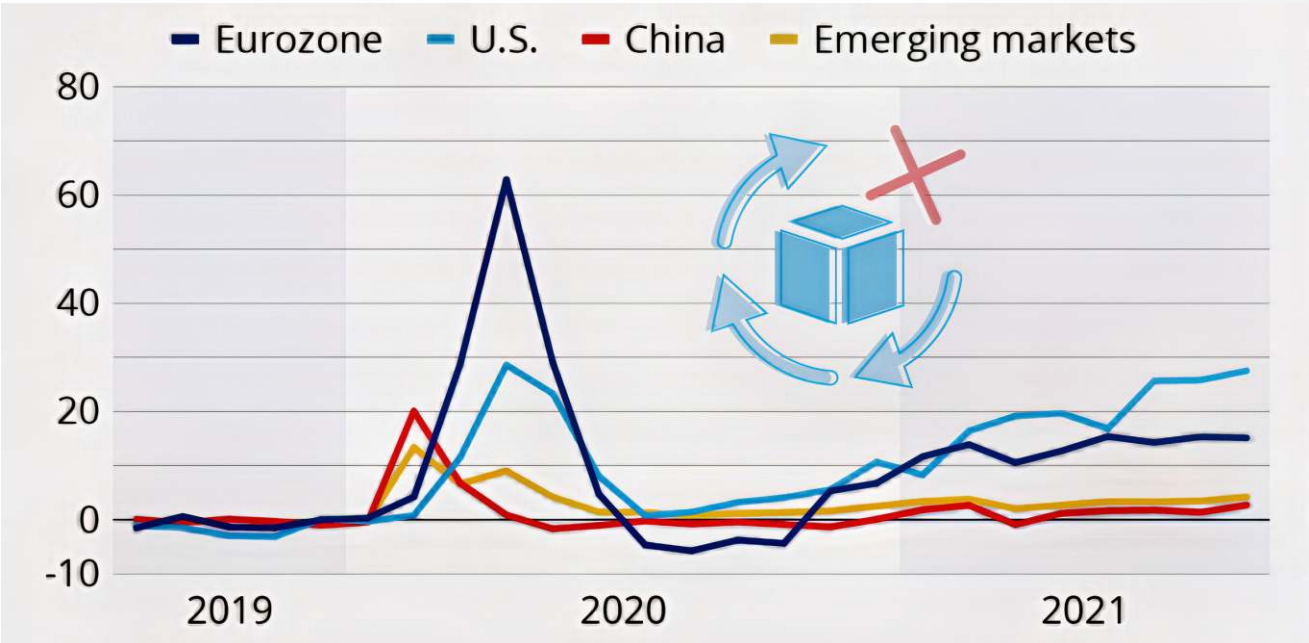
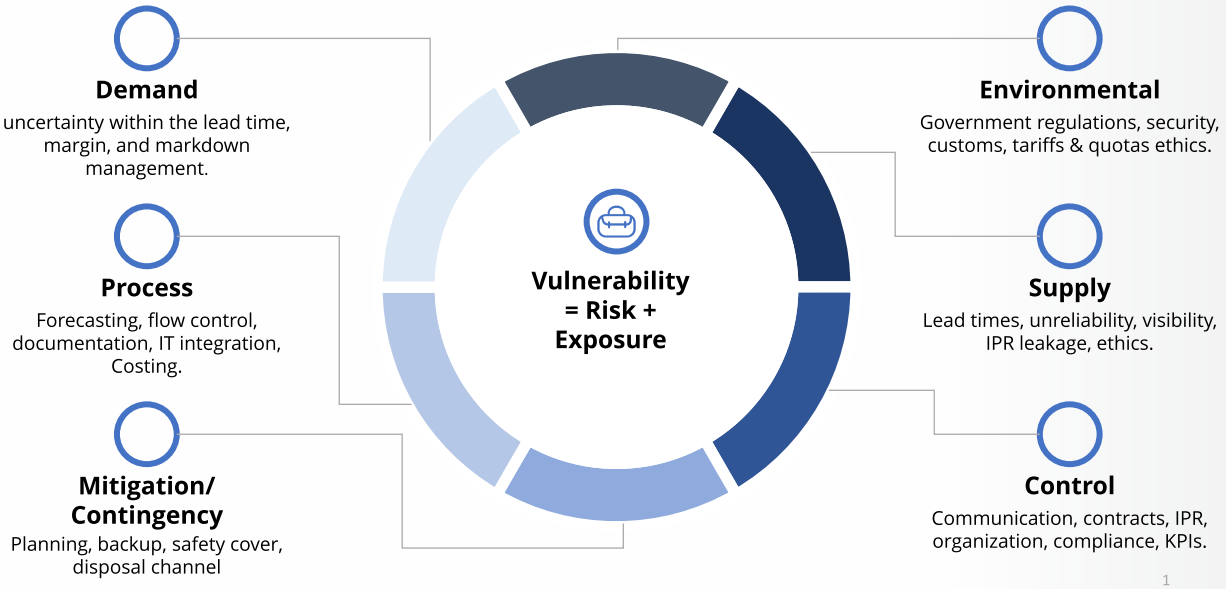


Figure 3[3] : Index of Global Supply Chain disruption: (100 = most disrupted) : Based on the difference between the supply delivery times subindex and the supply delivery times based on manufacturing output subindex

[3] https://www.statista.com/chart/25960/supply-chain-disruption-index/

Sources of Supply Chain Risk



Application of AI in Supply Chain:

AI promises to play a pivotal role in managing the risks due to its ability to analyse and process vast amounts of data quickly and accurately. The growing computational capacities, alongside the spread of big data and the broader applications of AI in the areas of operations, manufacturing, and supply chain management, have driven emphasis on AI. AI can help organizations make better decisions, optimize supply chain operations, and improve supply chain resilience. Below are a few of the applications of AI in supply chain management:

Demand forecasting: AI can analyse historical data, market trends, and other factors to predict demand accurately. This can help organizations optimize their inventory levels, reduce waste, and improve customer satisfaction.

Inventory optimization: AI can analyse data from various sources, such as sales, production, and suppliers, to optimize inventory levels. This can help organizations reduce inventory costs while ensuring adequate inventory levels.

Supply chain visibility: AI can provide real-time visibility into the supply chain, enabling organizations to identify and respond to risks quickly. This can help organizations mitigate the impact of disruptive events and ensure continuity of operations.

Risk management: AI can analyse various factors, such as supplier performance, geopolitical risks, and market trends, to identify potential risks. This can help organizations develop strategies to mitigate risks and improve supply chain resilience.

Industry Application of AI in Supply Chain:

Organizations have created a superheating optimization model for a steel plant. The model uses historical data to suggest process settings that make manufacturing seamless. This model analyses real-time operational data to achieve a higher strike rate, thereby improving production efficiency.

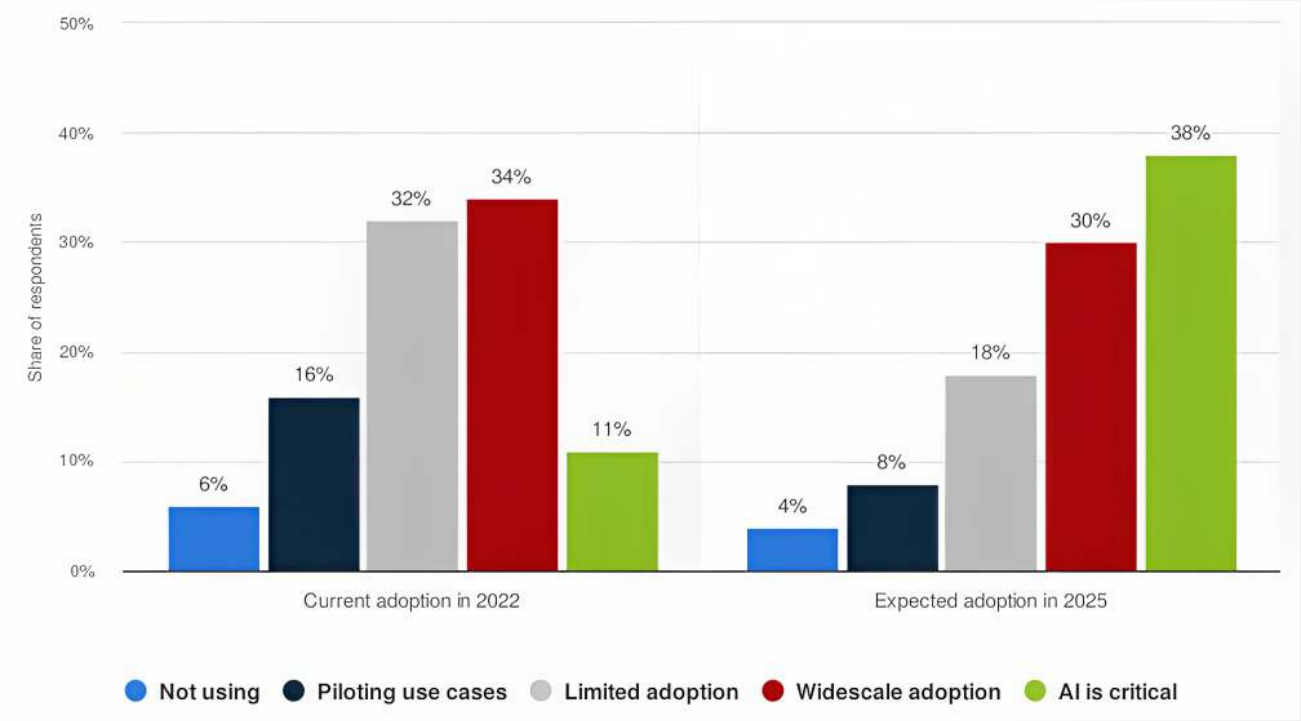
India's top FMCG companies have put in place an AI-based supply chain planning tool to improve its production and inventory management. The tool uses machine learning algorithms to predict demand and optimize inventory levels across various locations.

India's biggest platforms and online retailers have put in place an AI-based supply chain management system to improve the way it handles deliveries. The system uses machine learning algorithms to optimize delivery routes and improve delivery times.

Aerated drink companies are using AI and ML to improve its supply chain operations by predicting demand, managing inventory levels, and improving product quality control.

Shipping companies uses AI and ML to optimize delivery routes and improve shipment tracking. Companies have also implemented predictive analytics to forecast demand and optimize inventory levels.

[4] https://www.richardwilding.info/the-sources-of-supply-chain-risk.html



Conclusion:

The real-world applications of AI in supply chain management are diverse and promising. Organizations across different sectors are beginning to deploy AI powered tools to improve their operations and foster supply chain resilience. From superheating optimization models for steel plants to AI-based supply chain planning tools for FMCG companies, AI is driving efficiency, cost savings, and improved customer satisfaction.

However, it is important to note that the implementation of AI in supply chain resilience is not a one-size-fits-all solution. Each business has unique challenges and requirements, and a tailored approach is necessary for successful implementation. In supply chain management, it's also essential to think about the ethical and social effects of AI. Overall, AI is a powerful tool that can help businesses build a more resilient supply chain, increase efficiency, and reduce costs. By embracing this technology and staying ahead of the curve, businesses can stay competitive in today's rapidly changing business landscape.

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DATA DRIVEN OUT OF HOME (OOH) MEDIA ADVERTISING

Anuj Loomba

With over 10+ years of experience, Anuj is a seasoned data scientist leveraging data-driven insights to deliver measurable business outcomes. He is currently working at Woolworths group as a Data Science and Analytics Lead and is passionate about utilizing data to solve complex business problems and is committed to delivering actionable insights that enable strategic decision-making.

About the industry

The out of home (OOH) media advertising industry has been around for centuries. It provides brands with an opportunity to connect with consumers in the physical world through various channels that include billboards, street furniture, transit advertising and digital billboards. And with the advent of technology, the industry has undergone a significant transformation in recent years.

One of the main advantages of OOH advertising is its ability to reach a mass audience. For example, billboards on a busy highway can reach thousands of commuters every day, providing brands with a great opportunity to reach a large audience in a specific area. Another advantage of OOH advertising is its ability to create a strong emotional connection with consumers. The campaigns can be designed to be visually striking, with large and colourful displays that can grab the attention of consumers. This is especially true for digital billboards, which can display videos, animations and interactive content to create a memorable experience for the viewers.

OOH advertising also provides brands with an opportunity to reach consumers in the "real world" and in real-time. Unlike online advertising, which can be easily ignored or blocked, OOH advertising is difficult to ignore and it reaches consumers when they are most likely to be engaged and receptive to marketing messages.

Data Sources and metrics

As can be imagined, one of the key challenges with OOH is being able to track the number of views for its assets. But before we talk about this, we need to understand some industry standard metrics/keywords.

One of the key metrics used in the OOH advertising industry is reach. Reach refers to the number of people who have been exposed to an advertising campaign. Another important metric is frequency which refers to the number of times a person is exposed to an advertising campaign. There can be different reasons for advertisers to focus on either of these metrics. The philosophy behind them is really quite straightforward. Reach depicts how many unique people have seen the advertisement. However, in our uber busy lives, it is very easy for us to forget stuff we see only once. This is where frequency comes in. To make sure that the brand recall aspect of the advertisement is at an optimum level, frequency signifies how many times we expect each individual to have seen that particular advertisement. There are a lot of third party data sources that the OOH industry relies on for coming up with these metrics. Here we will talk about 2 such data sources and how they are leveraged in the OOH industry to come up with targeted advertisements. Some of the most popular third party datasets that are leveraged for coming up with valuable insights are based on banking and telecom data. By further partnering with retail stores, there are further segments that are created to ensure that the advertisements are displayed at relevant locations.

Based on these datasets, the best results are obtained by using both the datasets for their strengths. While the banking based data has the segmentation information based on share of wallet spend analysis, where it is found lacking is in its recency. However, the strength of the telecom data is usually in its recency and (anonymised) tracking accuracy. The best way in this case is to combine both the results from both of these datasets using techniques like conflation.

Optimization challenges and Problems

At a very broad level, clients for OOH assets make 2 kinds of request- location based or fixed metric based advertisement.

The location based requests are usually limited to clients who have physical stores and need to advertise for their product/offerings in the vicinity of the specified locations. For instance, if we are talking about KFC, they might want to advertise at 100 billboards close to all of their stores in Sydney. The key challenge here is the overlap factor. In this example, if there are 500 KFC stores, how do we select the 100 panels from the 1000 available panels within a 2 km radius of all of these stores. We need to ensure that not only we maximise the total reach but also achieve a frequency factor which is at an optimum level.

Fixed metric based advertisements are an altogether different challenge. In this case, the clients request for maximising their reach, frequency, number of panels etc. A lot of times, there are clear budget restrictions in place as well. In this scenario it becomes more important to leverage the reach and frequency data to be able to come up with the best selection of billboards.

While making the selection of the billboards, there are two kinds of effects that we need to keep in mind. The first effect is what we call 'incremental' effect. This is the phenomenon where we see a decline of the reach as we keep the advertisement going in a particular location. To illustrate this further, imagine a billboard X on your way to the workplace. The first day you see the advertisement, the reach increases by 1. However, because of the way the reach is defined, any more views are not going to increase the reach. So theoretically, it is in the best interest of the advertiser to advertise at a different (albeit similar in terms of footfall) location on the next day. However, due to the nature of the business and the costs associated with putting up an advertisement, there is a minimum period for which the booking can be made. As such, when we calculate the reach, we ensure that we keep this effect in mind.

The second one is what we call the 'interactive' effect. If a client buys 2 advertisements right next to each other, we expect the same people to see both the ads. As such, even though on an individual level, the panels might have a good reach, it might be counterproductive since the total reach for both the panels combined will not be cumulative but rather a function of other factors like how close the panels are to each other or what direction they are facing etc.

Most of the third parties I have highlighted above provide their own proprietary api that we can use to get the total reach based on a given panel combination. These third parties have various studies and models that they use to come up with these numbers. For instance, every year they take a small number of carefully curated collections of shopping centres. They do a study to come up with the number of views and use this data to extrapolate the same for similar shopping centres (Note: It is expected that over time various IoT devices might be deployed at various locations to make this process a lot more streamlined). However, there are multiple concerns when using these APIs. The first one is the time factor. If we have a collection of 1000 panels and we wish to select 100 from it, we will have to go through all the 1000C100 combinations and run them through the api to see which combination came up with the best reach or frequency. Also, using these api comes with a cost. Selecting these panels is a very iterative process with a lot of cancellations, swaps etc.

Another major challenge is the optimization process itself. If we continue with our 1000C100 assumption, our optimization will select the best 100 in the first stage. However, it is imperative that for the second client who is looking for the next 100 sets of panels, the remaining selection will not be as lucrative as it needs to be. While it might seem like the first come, first serve rule is applicable here- in this case, it is very highly likely to turn off prospective clients which is a major drawback of this technique. In this case, there needs to be a fine toothed balance between the selection that is done now while keeping the options open for any requests that are likely to arrive in the future.

Food for thought

There are various ways these issues can be overcome. For instance, instead of selling for panels, we sell for reach. What that means is that we promise to sell a specific number of reach to our prospective clients when we take the bookings. This way any adjustment that needs to happen remains a backend process.

However, this will come with its own set of unique challenges. Moving from selling panels to selling reach is a very unique shift in the way the business has been done traditionally. Also, this approach is very heavily reliant on a transparent communication of the campaign performance to inspire confidence in the clients that they are indeed getting the results that they paid for. It will need a very tech heavy paradigm shift in the way that the OOH industry operates.

With the increasing competition from online advertising and other forms of digital marketing, the OOH is geared towards overcoming these challenges by increasingly leveraging the power of data to improve targeting and personalization of advertising campaigns.

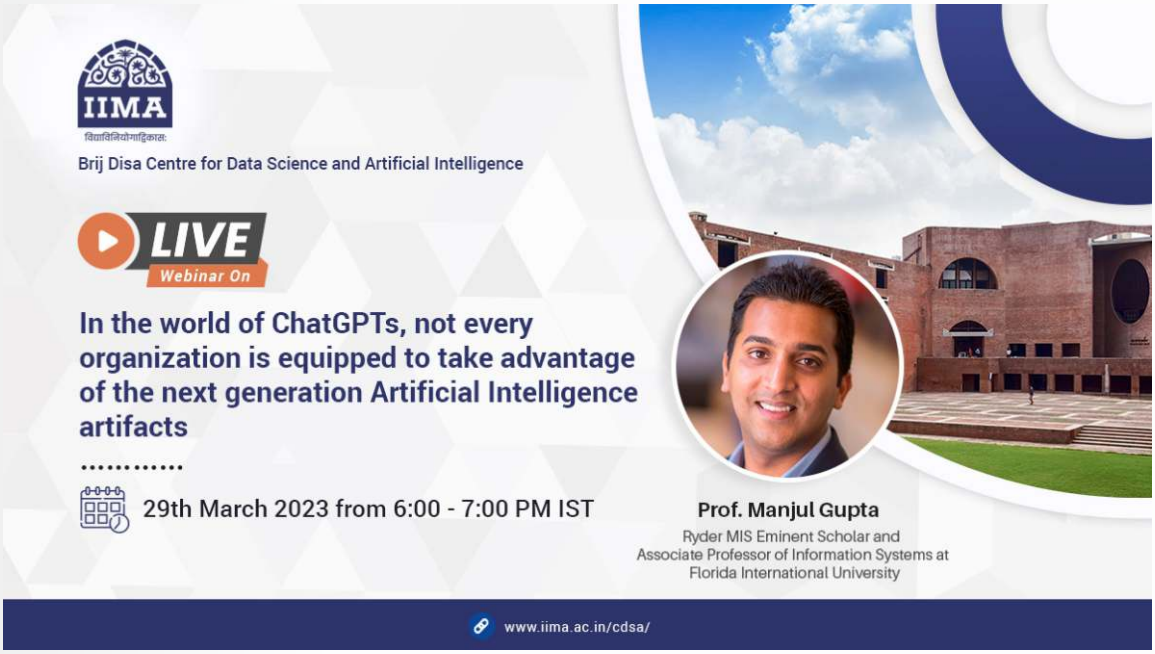
R&P Seminar in collaboration with Brij Disa Centre:

What will happen to Y if we do A : Some perspectives from causal inference

The Centre with Research & Publications invited Prof. Devavrat Shah for a seminar recently on “What will happen to Y if we do A : Some perspectives from causal inference”. He is Andrew (1956) and Erna Viterbi Professor of Electrical Engineering and Computer Science at MIT, where he has been teaching since 2005. He is currently the faculty director of the Deshpande Centre for Tech Innovation. He was the founding director of the Statistics and Data Science Centre at MIT between 2016 to 2020. His current research interests include algorithms for causal inference, social data processing, and stochastic networks. He is a distinguished alumnus of his alma mater, IIT Bombay.

Data-driven decision-making fundamentally requires answering counterfactual questions of the form: What will happen to Y if we do A? Examples abound: What will happen to a data centre's latency if a new congestion control protocol is used? What will happen to the probability of a power outage if a new transmission line is introduced in the electric grid? What will happen to a patient's health if they are given a new therapy? Answering such counterfactual questions requires thinking carefully about the causal relationship between A and Y. The key challenge in doing so is tackling confounding, i.e., the hidden correlation between A and Y that might be present in observed data – colloquially, we refer to this challenge as ``correlation does not imply causation”. In addition, modern datasets are inherently high-dimensional, noisy, and sparse, which adds to the challenge of building reliable causal models. The purpose of this talk is to provide a brief introduction to causal inference and do a survey of the rapidly growing modern statistical toolkit to learn causal relationships from data. We will introduce some of the canonical frameworks to define and learn causal relationships such as the Neyman-Rubin potential outcomes model, randomized control trials, instrumental variables and synthetic controls. We would conclude with a unified modern lens to view these various frameworks that we have introduced in our recent works: causal tensor completion. We will describe its application through empirical case-studies.

Conducted Webinar / seminar in January to May 2023



In the world of ChatGPTs, not every organization is equipped to take advantage of the next generation Artificial Intelligence artifacts – March 29, 2023 Prof. Manjul Gupta(Ryder MIS Eminent Scholar and associate professor of information systems at Florida International University)

A Theory-Based Explainable Deep Learning Architecture for Music Emotion – April 17, 2023 Prof. Hortense Fong (Assistant Professor in Quantitative Marketing at Columbia Business School.)

AI and AI-Human Based Salesforce Hiring Using Interview Videos (joint with K. Chiong, H.Dover and K. Sudhir) - January 12, 2022 Prof. Ishita Chakraborty (Wisconsin Business School)

Disintermediation in Online Platforms: The Role of Information Quality and Pricing - March 02, 2023 Prof. Shreyas Sekar (Assistant Professor of Operations and Analytics at the Rotman School of Management, University of Toronto)

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