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# ARTIFICIAL INTELLIGENCE: IMPACT ON E-COMMERCE

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A tsunami of new technologies has hit the business ecosystem 2016 will see the next technological revolution reshaping Indian society, business and the government landscape. This paper addresses the challenges, opportunities, practical applications of using Artificial Intelligence in e-commerce and its impact on job market. Brands are creating more interactive shopping experiences to provide product recommendations based on natural conversation and cognitive data derived from AI. The intelligent shopping assistants are faster than humans, can analyze huge quantities of data in minimal time, and perform human-like interactions that have 'personalities' designed to reflect that brand's image. Virtual personal shoppers will become an entertaining and engaging point of contact for users. What AI is going to do is accelerate the pivot from simple clustering around inventory, to combining intelligence about individuals, behaviors, trends, and context. There is a fear that certain types of jobs will vanish because AI (software bots and machines) will do it more efficiently. Policy makers should prepare themselves for this, and proactively retrain and reskill the people who will be affected to help them cope better with the situation.

**Keywords:** Technology, Business Ecosystem, Artificial Intelligence, E-commerce, Retrain, Reskill

## INTRODUCTION

The most fundamental progress that technology has made over the past few decades is a dramatic increase in computing power coupled with a reduction in the cost of storage. Such progress has enabled us to run algorithms and code over swathes of data and at a fraction of the cost, thus yielding what some may consider

more insights. Consequently, we are able to find patterns in large amounts of data.

This, by some limited definition, is construed as intelligence and has been demonstrated in specific classes of activities such as detecting diabetes from retinal scans, driving cars, playing games, etc. In these cases, software can emulate human behaviour and perhaps even exceed

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Source: Photo: iStock

### 10 TECH TRENDS THAT ARE MATURING

- **100 million** consumers will shop in augmented reality (AR) by 2020
- **20%** of brands will abandon their mobile apps by 2019
- A blockchain-based business will be worth **\$10 billion** by 2022
- Through 2019, every \$1 enterprises invest in innovation will require an additional **\$7** in core execution.
- Through 2020, IoT will increase data centre storage demand by **less than 3%**
- By 2022, IoT will save consumers and businesses **\$1 trillion** a year in maintenance, services and consumables.
- **30%** of web browsing sessions will be done without a screen by 2020
- By 2020, algorithms will positively alter the behaviour of more than **1 billion** global workers.
- **20%** of all activities an individual engages in will involve at least one of the top-seven digital giants by 2021
- **40%** of employees can cut their health-care costs by wearing a fitness tracker by 2020

Source: Gartner, Inc.

human capabilities. But the fact is that we have not yet invented any new magic wand to make software “think” on its own or have any sense of “consciousness”, in the way humans do.

The limitation is grounded in the fact that software still operates, for the most part, on the paradigm of GIGO (garbage in garbage out), meaning it mostly only does whatever we tell it to and is biased, based on whatever data we train it with. Give it incorrect data and it will pick up incorrect patterns.

But the vision and aspiration of computer science has always been to build a machine that can “accurately” emulate human “intelligence”.

**Artificial intelligence (AI)** is intelligence exhibited by machines. In computer science, the

field of AI research defines itself as the study of “intelligent agents”: any device that perceives its environment and takes actions that maximize its chance of success at some goal.<sup>[1]</sup> Colloquially, the term “artificial intelligence” is applied when a machine mimics “cognitive” functions that humans associate with other human minds, such as “learning” and “problem solving”.<sup>[2]</sup> As machines become increasingly capable, mental facilities once thought to require intelligence are removed from the definition.

The term was coined only in 1956 in a workshop (Dartmouth Summer Research Project on Artificial Intelligence) put together by John McCarthy, Marvin Minsky, Claude Shannon and Nathaniel Rochester. So it is a branch of computer science but it is multidisciplinary: it has constant inputs from psychologists, linguists, roboticists, etc.

Antoine Blondeau, CEO of the world’s most funded AI company, Sentient Technologies, once said, “Five years from now, we’ll see AI take a bigger role in making decisions, creating pre-emptive solutions, and delivering insights. Society will become much more efficient as a result. Think logistics, ecommerce, healthcare, finance — in all these domains and others we will start to see massive gains from AI. We’ll be able to leverage AI systems to help get things to where they need to go faster and cheaper, we’ll be able to enable people to see and buy things they weren’t even aware existed or even knew they wanted.”

## AI’S POTENTIAL IN INDIA

The increasingly digital economy, fuelled by improving education and globalization, the Indian consumer has become unknowingly the country’s biggest beneficiary of recent advances in AI.

From utilizing various applications powered by AI to using a range of online services such as Amazon Marketplace and Netflix that learn from consumers’ online behaviour to make intelligent product and service recommendations, consumers are readily engaged with the proliferation of AI in India.

Policymakers, however, lag behind, not exploiting AI for national security, public services, or other priorities.

Indian academics, public researchers, labs, and entrepreneurs face a different challenge than the corporations that dominate the space—the infrastructure necessary for an AI revolution in India has been neglected by policymakers.

It is imperative that India view AI as a critical element of its national security strategy, recommends an August 2016 report titled *India and the Artificial Intelligence Revolution*. Authored by Shashi Shekhar Vempati of Carnegie Endowment for International Peace, the report advocates spurring AI-based innovation and establishing AI-ready infrastructure as prerequisites for preparing India’s jobs and skills markets for an AI-based future and securing its strategic interests.

While lack of physical infrastructure is certainly a major impediment, India’s AI development also suffers from the paucity of the necessary cultural infrastructure, which is key for recent advances from lab to marketplace in AI.

Fostering a culture of innovation and a commitment to research and, most important, nurturing an ecosystem beyond the four walls of the organization are all common to Google’s DeepMind, IBM’s Watson, and Baidu’s Institute of Deep Learning, the most successful AI projects of the past half decade.

While it must come as no surprise that Google, IBM, Microsoft, Facebook, and other global technology giants have invested significantly over the decades in machine intelligence, it is the story of Baidu that holds the most pertinent lessons for India.

The story of AI at Baidu is the story of Andrew Ng—an associate professor at Stanford University who teaches a popular course on machine learning (also available via Coursera, an online learning platform that he co-founded). Ng was hired away from the Google Brain project in 2014, following which Baidu invested heavily in physical infrastructure.

Baidu is investing in deep speech for voice-based searches that leverage speech recognition.

This intelligence is being built for understanding and interpreting queries in Mandarin rather than English; as such, Baidu is constructing a uniquely Chinese platform, independent of that which is used ubiquitously in the English-speaking West.

This version of AI thus offers the possibility for the development of AI in India, as an example of AI technology successfully developed in and employed by a non-Western nation.

Baidu's investment in AI research exposes the relative backwardness of India's technological infrastructure: China has recognized the importance of bridging the gap between the lab and the market while nurturing a research and innovation ecosystem unbounded by national borders and corporate firewalls. India, in contrast, boasts neither the material nor the cultural institutions required for such innovation.

Prime Minister Narendra Modi often challenges Indian IT entrepreneurs, asking when India will

give birth to the next Google or Microsoft. But until India attains the infrastructure omnipresent in the US, and increasingly existent in China, the deep-learning capabilities necessary to address the vast linguistic diversity across India using machine intelligence may prove elusive.

## IMPACT ON E-COMMERCE

Few industries are as competitive as ecommerce. Not only are online retailers competing with other online stores and brick-and-mortar locations, but also the overall noise that is the Internet. We live in a world where consumer attention span is getting shorter and shorter: 40 percent of people abandon a website that takes more than three seconds to load, and the average shopping cart is abandoned more than 68 percent of the time. I'm hard pressed to find an ecommerce site that is not constantly scrambling to engage more and drive more sales.

Technology is finally helping with those efforts in a big way. Artificial intelligence (AI), which has demonstrated its value in industries like marketing, healthcare and finance, is now making a splash in online commerce.

### Virtual Personal Shopper

Julie Bornstein, COO of the AI-enabled Stitch Fix, has said, "Traditional retailers work off the premise that consumers like to shop and that they have the time to shop. But there are people who are better at shopping and can save shoppers time."

So the dream of many consumers to have a personal shopper is more practical than ever before. Sure, there are subscription services like Stitch Fix, Trunk Club or Birchbox, but there are a growing number of ecommerce stores integrating sophisticated AI technologies specific

to their online store to shop on behalf of users. The North Face is an excellent example of this. The brand recently launched their AI technology to help you “find the perfect jacket for your next adventure.

Many retailers currently use collaborative filtering to provide customers with recommendations. These collaborative filters base their results on most viewed history, best sellers, evergreen trends and other general parameters. But collaborative filters are limited because they only gather data from one channel, be that the online store, the brick and mortar store, or the mobile application. AI brings a seamless customer experience across all of those channels.

“Personalization is a multi-dimensional problem,” says Bhatia. “A lot of information gathered on shopping habits is very subtle, requiring a lot of data to be analyzed for proper personalization. With deep learning algorithms, online retailers can continuously learn every new signal as it gets uncovered to showcase personalized products better.”

A study from the research firm J. Walter Thompson, reveals that consumers are interested in how AI will be used in retail: 70 percent of US millennials say they would appreciate a brand or retailer using AI technology to show more interesting products. And 72 percent believe that as the technology develops, brands using AI will be able to accurately predict what they want.

“The opportunity to leverage AI for superior customer service is there and for retailers to thrive they should be leveraging AI to make shopping experiences more personal for every user,” says Bhatia. The opportunity for *Personalization 3.0* is

exciting, and it is not just large online retailers that can take advantage of these tools. The options are growing for ecommerce brands of any scale to leverage AI to break down silos, create intellectual personalization capabilities, and monetize products.

According to Gartner by 2020, 85% of customer interactions will be managed without a human and at the close of 2018, customer digital assistants will recognize customers by face and voice across channels. Investment-wise, in 2014 there were more than \$300 million in venture capital invested in AI startups according to Bloomberg. Brands are on board and are using AI to build smarter platforms they hope will create a better online shopping experience for the consumer.

SiteZeus pegs itself as a location-intelligence platform. They use big data and machine learning to recommend the ideal retail location for brands.

“AI has had a great impact on the retail eCommerce customer experience. We’ve seen a large advancement in the past decade, but we’ve not even scratched the surface,” said Keenan Baldwin, co-founder, SiteZeus. “Online retailers are scrambling to partner with or adopt new AI technologies to help facilitate customer interaction to try and match and even surpass the typical in-store experience.”

It’s difficult to compare physical in-store interaction to eCommerce interaction because they’re extremely different. The in-store experience gives you things you can touch, hold, taste, try on. eCommerce is limited in the physical world, but AI in eCommerce could help change that experience.

Think about how different your in-store versus online experience is. In-store, you engage with

the sales person around conversation about your specific needs: do you have this in red or what size does this come in, etc. They help you find the right product based on what you told them you needed or were looking for. That same experience doesn't happen on-line, yet.

To make that happen AI has to be very good at natural language capabilities and understanding unstructured data very quickly. According to research firm Markets and Markets, the natural language processing marketing is expected to grow to \$13.4 Billion by 2020.

And this is where personal AI shopping assistants come into play like Mona. Mona was developed by former Amazon.com employees and the more you interact with her when you shop, the more she learns and applies that knowledge to your next shopping experience together.

Earlier this year in July, teamed with IBM Watson to make a personal mobile AI shopping assistant called Macy's On Call. The cognitive mobile tool, which uses Watson's Natural Language Classifier API, was designed to help shoppers get information in 10 of Macy's retail stores around the country as they navigate through each store.

Here are the ways AI will impact ecommerce in the coming years:

### **Visual Search**

Shoppers, say goodbye to impulse control. Software platforms that drive ecommerce websites are creating visual search capabilities which allow consumers to upload an image and find similar/complementary products. The visual search capabilities, particularly via mobile, "reads" the item for clues — color, shape, size, fabric and brand. This helps consumers to find exactly

what they are looking for right away.

"In the age of Snapchat, Instagram, and the rapidly reducing attention spans of the digital age, AI-driven platforms will be essential to ecommerce success," says Akash Bhatia, cofounder and CEO of Infinite Analytics, a deep machine learning and predictive analytics platform for retail.

A consumer doesn't even have to be shopping to see something they would like to purchase — a new pair of Nike's at the gym or a friend's new dress — to easily find similar items on your ecommerce store.

### **Offline to Online Worlds Merge**

These visual search capabilities can now create ties from online to offline like never before. As retailers redefine the way consumers engage with their brand, retail of the future will have more information about shoppers to improve their customer service, ultimately to create the opportunity to sell more items. The offline to online experience requires minimal steps to shop and purchase, providing a sense of autonomy to the consumer.

Shopping in the future will use AI to gather information you've posted on the website, such as a product review, to service you in their brick-and-mortar counterpart better and make suggestions accordingly.

### **Unlocking True Buying Intent**

The holy grail for commerce has always been deducing the buying intent of consumers — when they walk into stores, when they browse online, when they order on apps. Regardless of the platform, understanding what they want is the key to delivering a truly personal, contextual shopping experience.

eBay's approach to AI is informed by a history of research and development and decades of insights and data about consumer behavior.

To be clear, personalization isn't new – it has been a part of the playbook of every commerce company. But so far, it has largely focused on either inventory clustering or user behavior patterns. Crudely translated, this means that we know that people who buy soap generally also buy toothbrushes, and we make recommendations accordingly.

As consumers, you will find it is almost like having a personal shopper on hand - except it will get smarter, more attuned to your needs, every time you use it. Imagine you want to buy a scarf. Using AI, commerce platforms and tools will be able to predict whether you want a 7 rupee scarf or a 700 rupees scarf. They will know what color you want and whether you prefer natural fibers to manmade. And they will be able to anticipate the next thing you'll want to buy.

As the world's inventory becomes available online, AI will help consumers create order out of chaos.

### **Leaping Ahead to Conversational Commerce**

Deep learning has given us all the opportunity to deliver people-centric experiences that scale - deep commerce.

The possibilities for consumers are intriguing: If you see something you like, imagine being able to snap a picture with your phone, and buy it in seconds. As machines get better at decoding natural language, commerce should become increasingly conversational — eventually rendering the search box redundant.

However, we still have a long way to go before

we can build a software system that is functionally capable the same way a human is. Software "intelligence", though defined in academic circles, has been fairly misused (and misunderstood) in popular reporting, giving people the impression that software can do just about anything a human being can. This notion is fundamentally misguided. We are not there. Or at least not yet. The gap between software and the human mind is still massive.

Consequently such gaps do not necessarily support claims that artificial intelligence (AI) and automation will replace hordes of jobs in the Indian IT industry and ultimately lead to mass unemployment. This industry employs provides direct employment for a few million people in India, a significant fraction of whom belong to our expanding middle class. Therefore, as various commentators have begun to call out the "threat" of automation to this industry there is considerable (and reasonable) fear whether the rise of machines spells doom and gloom for a section of the Indian middle class.

But I do not believe we are there yet. Or at least not to the extent people fear. Automating away this labour force is not an easy task. Terms like "robotic" automation are not sufficient replacement for the complexity and range of tasks that this labour force performs. It is very tempting to prognosticate a future where silicon (computers) will rule supreme over carbon (humans). However, as a computer scientist, through my work and study over the past few years in the IT/technology industry and about how businesses consume technology, I have gained a genuine appreciation for the unique value and contributions human beings bring to the table in



building trust and enabling businesses the world over. Automating these unique attributes with machines will necessarily require emulating the same value humans deliver in businesses.

The role of professionals in the IT industry, the populace whose work is under threat from automation, has not yet been sufficiently understood nor has it been given its due credit. These professionals perform a range of activities, from understanding customers' business requirements to writing code, maintaining software systems and processing transactions. Working in teams, they perform a variety of different actions touching several information systems, coordinate with each other, navigate uncertain or changing scenarios, report to their managers, take bottomline responsibilities for their respective systems, are accountable and serve customers across the globe. All these activities engender a deep sense of trust and confidence among their customers the world over.

But this is also true for each individual. All humans, I argue, even in the most seemingly "robotic" tasks bring to bear abilities that do not make them merely "robotic". Conceptually every human being has a "brain stack" comprised of layers that include the ability to execute deterministic tasks, intuition, experience, handling (unexpected) variations, common sense, and an ability to identify and fix the unusual. These are fundamental traits that all humans share, though, admittedly, some more than others. No matter the task each human has the potential and ability to apply these traits in any situation without necessarily being to do so a priori. It is a combination of these traits inherent to each one of us that engenders trust and confidence in us among our colleagues.

All businesses run on such trust and confidence in their stakeholders — be they employees or vendors.

Therefore, attempting to replace any human with a "robotic" system is akin to trying to hire a human being who can only ever execute deterministic tasks but lacks intuition, common sense, experience, and an ability to handle unusual situations!

Hence, any attempt by "intelligent" software at automating all that work done by a single individual or an entire team of humans must involve recreating the same trust and confidence. This, in-turn, necessarily requires addressing the whole gamut of these activities that humans perform on a regular basis and with similar human traits, but in software.

Therefore, the next stage of innovation in computer science will be not just to make software run faster but also about how to get software to emulate more human-like traits and ultimately become truly trustworthy (like humans).

### **AI's Impact on Indian Jobs**

While India dreams of its own manufacturing revolution through Modi's Make in India programme, it is important for policymakers to closely examine how the advent of industrial robots and their impact on manufacturing transformed companies in other developing nations.

Consider the case of Foxconn—one of the world's largest contract manufacturers for electronics. In 2015, Foxconn made news when its chief executive, Terry Gou, predicted that 70% of all manufacturing in Foxconn's assembly lines would be automated with robots displacing humans. Some back-peddalling later, his estimate

was scaled down to 30%. Foxconn is among the top owners of robotics patents filed with the United States Patent and Trademark Office and produces thousands of industrial robots a year that in aggregate are capable of performing more than ten types of manufacturing tasks. This is expected to have a significant impact on the workforce: as many as 60,000 workers have been displaced by robots in one Foxconn factory alone in the Kunshan region of China.

China was projected to have more installed industrial robots by the end of 2016 than any other country, with more than 30 robots for every 10,000 industrial workers. If China were to increase that density, employment would be further damaged.

While the dire predictions of a robot takeover of manufacturing have not come to pass, the reality of automation is that manufacturing is unlikely to create jobs at the scale that it did in the past. Quoting the US Bureau of Labor Statistics in 2013 on future employment projections, Darrell M. West of the Center for Technology Innovation at Brookings highlights how jobs will decline over the next decade in manufacturing and information technology among other sectors.

Writing in *Pacific Standard* magazine, Frank Levy, professor emeritus at the Massachusetts Institute of Technology, places jobs dislocation on account of AI in perspective when he dismisses the dire projections of a robot takeover.

According to Levy, the greatest area of concern for policymakers ought to be the impact of AI on jobs in the middle-skill category—assembly line workers, clerical workers, and the like. Levy also warns of significant dislocation caused by automation leading to a reduction in an individual's potential for upward mobility. He emphasizes that a good education will be critical

to acquire the necessary skills and to be competitive in this evolved labour market.

In their book *The Second Machine Age*, Erik Brynjolfsson and Andrew McAfee make several specific policy recommendations for coping with the job crisis likely to be spurred by AI. A key recommendation of particular importance for India, given Modi's Startup India initiative, is the need to "restart startups". Brynjolfsson and McAfee view creative destruction inherent within the start-up economy as the best bet for experimenting with the new jobs and industries that can thrive in an AI-driven economy.

The authors provide examples of start-ups such as TaskRabbit and Airbnb that contrive previously non-existent economic opportunities for ordinary people with spare time and assets, thus creating economically productive work.

### **Skill Development for Future Jobs**

Not everyone is as sanguine as Brynjolfsson and McAfee about the coming AI revolution. The recent victory of AlphaGo (a computer program developed by Google DeepMind) over the world champion in Go has prompted fears of the threat posed by intelligent machines that are capable of superhuman tasks.

The direst warning comes from noted physicist Stephen Hawking, who apocalyptically predicts the end of the human race with the development of "full artificial intelligence".

In the provocative book *Humans Need Not Apply*, Jerry Kaplan, an American computer scientist and futurist, explores this and several other questions while attempting to paint a picture of an apocalyptic future and what it might look like if and when machines take over. Specifically, Kaplan raises two issues that should be of interest

to policymakers in India. The first is the education system and the second involves skills and jobs. While discussing the likely impact of AI on labour markets, Kaplan poses the radical question: Is the current system of sequential education and work outdated, and does it require an overhaul?

In his book, Kaplan also proposes a so-called “job mortgage” as a new type of financial instrument through which employers, vocational schools and colleges would have an incentive to collaborate in a new way. In this proposed job mortgage market, Kaplan attempts to use free market mechanisms to match current skills acquisition to future job opportunities. He proposes to accomplish this by compelling employers to commit to an intent to employ an individual in the future if that person commits to acquire a specific set of skills over a certain time frame.

India will have to experiment with the kind of innovative instruments that Kaplan proposes if it is to prepare itself for the challenges from a machine intelligence-driven economy in the near future.

## CONCLUSION

Most people in the AI community subscribe to the view that it does not really matter if machines are exactly replicating what human beings can

do, as long as we do things that are intelligent and of value. We as an industry are on the cusp of a new revolution in the next few years, we’ll witness an unprecedented convergence of technology with the use of AI, commerce and consumer expectations. And I believe the outcome will be a smarter, more frictionless, more accessible, more contextual shopping experience — an experience powered by technology, with consumers at its heart. there is a move to develop specialized hardware using a neural architecture as opposed to the traditional Von Neumann architecture. If this becomes a reality a decade from now, we will be able to do a lot more with neural networks than we can now.

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