Artificial intelligence AI contribution for Technological push and demand pull in the Indian market

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Abstract: *Technology push and pull are two different approaches to innovation and product development that can be observed in the Indian market as well as in many other markets around the world. These approaches reflect how new technologies and products are introduced and adopted based on different factors and drivers. Technologists, engineers, marketers and business leaders are well versed in with the continuous development of "technology push" and "market pull". The "market pull" approach attempts to deliver products that the market demands. The "technology-driven" approach attempts to attract market interest in new products based on new solution. This paper addresses the transformation that is being made in the Market using Artificial Intelligence AI and its contribution in the technology push and demand in the Indian market.*

Key Words: *Market Pull, Technology Push, Artificial Intelligence AI, Market Demand, Market Pull*

1. MARKET PULL:

"Market pull" is a situation in which the market demands a product (or service) or identify a problem and the manufacturer responds by producing and distributing that product. Market desires are well calculated. The manufacturer's activity is to provide products to fill a gap identified by the market. In short, developing products for the market is based on the perception of the product or service desired by the customer, with the customer have a big say in product development. The customer determines the solutions and manufacturer training. "Technology push", side by side, is the scenario in which the producer sees a benefits to the consumer that he does not see, creating a product and also demand for this product. The producer's duty is to perform the functions to consumers and use unique methods, technologies or approaches to better respond works in a way that even the original consumer doesn't realize. Research and understand customer problems. In short, a technology product developed on the belief that suppliers recognize market needs even before the market does the same.

Benefits of Market Pull :

- Can lead to breakthrough innovations that transform industries.
- Can give businesses a competitive advantage in the global market.
- Have a desire for creativity and innovation.

2. DEMAND:

On the contrary, demand is determined by market demand and customer demand. Companies identify specific market or consumer needs and then develop technology or products to meet those needs. For example In the Indian context, the growth of e-commerce, ride-hailing services and mobile payment solutions is often demand-driven. Businesses have recognized the growing demand for convenient and digital services and have developed technologies and platforms to meet these needs. Benefits of Demand :

- More market-oriented, increasing the chances of successful adoption.
- Reduce the risk of creating a product or technology with limited market appeal.
- Customer-focused innovation can deliver faster return on investment.

3. TECHNOLOGY PUSH:

Indian IT companies such as Tata Consultancy Services (TCS) and Infosys are known for their technology promotion strategies. They invest heavily in research and development to create cutting-edge software solutions and services, then commercialize these innovations globally. Companies like Paytm, Ola and Flipkart mainly follow a

demand pull strategy. They identified the growing demand for digital payment solutions, ride-hailing services and e-commerce platforms and adapted their offerings to meet these market needs. It should be noted that these approaches are not mutually exclusive, and successful companies often incorporate technology push and pull elements into their innovation strategies, depending on the specific sector and   market conditions. Additionally, the Indian market is dynamic and growing, with many different industries, so the strategies companies adopt can vary significantly from industry to industry.

Tech Push vs Demand Pull

Tech Push vs Demand Pull in India Artificial Intelligence (AI) plays a vital role in helping to drive technology forward in the enterprise market by facilitating innovation, enhancing product development and improve decision making. Here are a few ways AI is contributing to technological advancement in the enterprise market:

Predictive analytics: AI can analyze large amounts of data to identify trends and patterns that humans might miss. This helps businesses explore new opportunities and areas where technology can be effectively applied. Predictive analytics using AI is a powerful approach to predicting future outcomes and trends based on historical data and machine learning algorithms. It involves using artificial intelligence techniques to analyze large data sets and make predictions about future events or trends. Here's how predictive analytics using AI works:

 - The process begins with the collection of relevant data. This data can come from a variety of sources, such as customer records, transaction logs, sensors, social media, and more. - Data must be cleaned and prepared for analysis. This includes handling missing values, outliers, and converting data into a format suitable for machine learning.

 - Feature selection involves selecting the most relevant variables (features) from the data set to create a prediction model. Feature engineering can involve creating new features or transforming existing features to improve model performance.

 - The selected AI model will be trained based on historical data. During training, the model learns patterns and relationships in the data to make predictions.

- Training involves iteratively adjusting model parameters to minimize prediction error.

- After successful validation and testing, the model can be deployed to make predictions on new, unseen data. In business applications, forecasting can be used for a variety of purposes, such as demand forecasting, fraud detection, predicting customer churn, etc. Predictive models must be continuously monitored to ensure they are always accurate and relevant. Data drift or changes in the business environment may require retraining or updating the model. AI models will provide insight into why specific predictions are made, helping stakeholders understand the driving factors.

 - Feedback from model predictions can be used to improve business processes or strategies. For example, insights from customer churn predictions can lead to targeted customer retention efforts. Predictive analytics using AI has many applications across industries, including finance, healthcare, marketing, and supply chain management. It enables organizations to make data-driven decisions, optimize operations and gain competitive advantage by predicting future trends and behavior.

4. Applications:

 Chatbot and virtual assistant: NLP Natural language processing powers chat bots and virtual assistants, giving them the ability to initiate conversations, answer questions, and assist users with tasks.

Search engine: Search engines like Google use NLP to understand user queries and provide relevant search results.

Language Translation: Machine translation services like Google Translate use NLP techniques to translate text between languages.

Synopsis: NLP can automatically create concise summaries of long documents or articles.

Voice Recognition: NLP is used in speech recognition systems to convert spoken language into text, facilitating voice command and transcription services.

5. Challenges:

NLP faces challenges such as handling ambiguity, cultural and contextual differences, as well as the need for large, labelled data sets to train powerful models. Recent advances in deep learning, especially with models such as

Transformer-based architectures (e.g. BERT, GPT), have greatly improved NLP tasks, achieving cutting edge results in many different applications. NLP raises ethical concerns regarding language model bias, privacy, and the responsible use of AI in text generation and manipulation.

6. Future orientation:

AI-based NLP continues to evolve, with ongoing research in areas such as multilingual modeling, low-resource languages, and more ethical and understandable AI. AI algorithms can sift through large datasets to extract valuable insights about market dynamics, customer preferences, and competitors' strategies. This information can inform the development of new technologies and products. Data mining is a crucial process for extracting valuable insights and knowledge from large and complex datasets. It plays a vital role in decision-making, problem-solving, and improving various aspects of business and research. Data mining has numerous applications across various domains, including business and marketing (customer segmentation, market basket analysis), healthcare (disease prediction, patient monitoring), finance (fraud detection, stock market analysis), and scientific research (genomics, climate modelling). AI can analyse social media and online content to gauge public sentiment about certain technologies or products, helping businesses assess market demand. Sentiment analysis, also known as opinion mining, is a natural language processing (NLP) technique that involves the use of algorithms and computational methods to identify and extract information or Sentiment feelings from text data. The main goal of sentiment analysis is to understand emotions, opinions, attitudes, and emotions expressed in textual content, such as reviews, social media posts, customer comments, and articles. AI-driven generative design tools can create multiple design iterations based on specified parameters, speeding up the product development process and exploring novel designs that may not have been considered otherwise. Generative design is an innovative approach to product or architectural design that leverages computer algorithms, artificial intelligence, and parametric modeling to explore a vast array of design possibilities automatically. It represents a shift from traditional, human-centric design processes to a more data-driven and algorithmic approach.

These AI-based tools can collect valuable data about user interactions and preferences. Companies can use this data to refine their products, identify areas for improvement, and adapt their technology to market needs. Even in markets with emerging technology, customer engagement is still important. Chatbots and virtual assistants can interact with potential customers, answer their questions, and provide information that can spark interest in innovative products and services.

7. Risk Prediction:

AI can assess potential risks associated with new technology or products, helping companies make informed decisions about their growth and market entry. AI can analyze data from a variety of sources to support strategic decisions, such as market entry strategies or investments in specific technologies. In short, AI supports technological advancements in business markets by providing data-driven insights, driving innovation, improving product development, and improving decision-making processes. By harnessing the power of AI, businesses can better identify and address market opportunities and challenges, driving technological advancement and growth.

Technology push vs demand pull in Indian agriculture and food market

India's agriculture and food market is one of the largest and most important sectors of the economy, employing a large proportion of the population and contributing significantly to GDP. The dynamics of this market are influenced by a combination of technology-based innovation (technological push) and consumer demand (demand-pull). Understanding the interaction between these two forces is essential for sustainable agricultural growth and food security in India.

Promoting technology into the Indian agriculture and food market:

Technology promotion in agriculture refers to the introduction and promotion of new agricultural technologies and practices, often driven by research and innovation. In India, several factors are contributing to the technology push:

Government initiatives: The Indian government has played a leading role in technological advancement in agriculture. Programs such as the Green Revolution in the 1960s and more recent initiatives such as the National Mission for Sustainable Agriculture (NMSA) and the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) aim to promote industrial progress.

Research and development: Public and private research institutes in India are investing in the development of new crop varieties, agricultural techniques and pest control methods. For example, the Indian Council of Agricultural Research (ICAR) has played an important role in developing high-yielding crop varieties.

Innovation in Agriculture Technology: The emergence of agricultural technology (AgTech) start-ups has brought innovative solutions to the market. These companies provide tools like precision farming, IoT-based monitoring, and data analytics to improve agricultural productivity.

Biotechnology: The introduction of genetically modified (GM) crops, such as Bt cotton, has been a significant technological advancement in Indian agriculture. Genetically modified crops have the potential to increase yields and reduce damage caused by pests. However, technological advances in Indian agriculture also face challenges, such as resistance by traditional farmers to new technology, concerns about the environmental impact of some methods certain practices and the need for widespread adoption of sustainable agricultural methods.

Drawing demand in the Indian food and agriculture market: Demand in the agriculture and food sector in India is driven by consumer preferences, market trends and changing demographics. Several factors contribute to this strength:

1. Change in food preferences: As incomes increase, consumer preferences shift to higher value-added crops, such as fruits, vegetables and protein-rich foods. This need influences crop selection and production practices.

2. Food Quality and Safety: Increased consumer awareness of food safety and quality has led to demand for safer and more traceable food products. This has led to changes in agricultural practices, including the adoption of organic farming and certification systems.

 3. Export opportunities: Growing global demand for Indian agricultural products, such as basmati rice, spices and organic produce, has pushed farmers and exporters to meet safety and quality standards.

 4. E-commerce and retail: The rise of modern retail and e-commerce platforms has created new distribution channels for agricultural products. Farmers are increasingly motivated to produce crops that meet the needs of these markets.

 5. Government programs: Government policies and programs that promote production of specific crops, such as minimum support prices (MSP) for wheat and rice, create demand by ensuring markets and prices stability for farmers.

8. Suggestions:

 Balancing technology push and demand pull: Achieving a harmonious balance between technology and demand drives is essential for the sustainable development of the Indian food and agriculture market. Here are some key considerations:

Technology customization: Technological innovation must be tailored to meet specific consumer needs and preferences. For example, developing new crop varieties requires attention to nutritional value and taste.

Sustainability: Technology pushes and pulls demand so sustainable agricultural practices should be prioritized. This includes promoting organic farming, reducing chemical inputs and improving water use efficiency.

 Market Access: Efforts should be made to ensure that farmers have access to markets, especially for products that consumers demand. This includes improving infrastructure, transportation and storage facilities.

 Education and Awareness: Farmers should be aware of the benefits of adopting new technologies that align with consumer preferences, such as organic farming methods or low-pesticide crops.

 Government support: Government policies need to be designed to encourage the adoption of technologies that benefit both farmers and consumers. This may involve grants, incentives and support for research and development.

9. Limitations:

While artificial intelligence (AI) has great potential to stimulate innovation in technologically disruptive scenarios, it also has limitations that can affect its effectiveness in this context.

1. Data Dependency: AI algorithms, especially machine learning models, require large amounts of high-quality training data. In technology-driven situations where innovative concepts are being explored, relevant data may be limited or even non-existent, making it difficult to apply AI effectively.

 2. Bias and fairness: AI systems can inherit biases present in training data, which can lead to biased results in technology-driven initiatives. Ensuring fairness and addressing bias in AI models is a complex and ongoing challenge.

 3. Ability to interpret: Many AI models, especially deep learning models, lack interpretability. Understanding how to make AI-based decisions is critical in technology-driven scenarios where new and innovative solutions are developed.

4. Resource intensity: AI development and implementation often requires significant IT resources, infrastructure, and expertise. Small organizations or start-ups with limited resources may find it difficult to leverage AI for technology advancement efforts.

5. Over equipped: Over fitting occurs when AI models perform well on training data but fail to generalize to new, unseen data. This can be especially problematic in technology-driven situations where the focus is on creating new, untested solutions.

To overcome these limitations, organizations engaged in technology-advancing initiatives must carefully plan their AI strategy, taking into account data collection, AI development practices that ethics and continuous evaluation. Collaboration with experts, continuous monitoring, and a willingness to adapt and iterate are essential to effectively leveraging AI in the pursuit of innovation.

10. Conclusion:

In short, the agricultural and food markets in India are shaped by both technological forces and demand forces. While technological thrusts drive innovation and improve productivity, demand forces reflect shifts in consumer preferences. A balanced approach, with a focus on sustainability and meeting market needs, is critical to the nation's long-term success and food security. By aligning technological advances with consumer needs using the latest technologies like Artificial Intelligence (AI), India can ensure a prosperous and resilient agricultural sector.

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