

AI technologies: A key to unlock the door of Omni-channel capabilities

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ABSTRACT

The purpose of this paper is to identify the drivers and enablers of using AI technologies in three important areas of Omni-channel retailing- customer experience, data management and supply chain efficiency. This paper also explores the different AI technologies which can be used by retailer to manage the supply chain, data and their engagement with customers. In this era of digitalization, online and offline retailers must come up with unique ways to get people to shop. AI technologies can provide better experience to customers while shopping and in turn improve the efficiency of retailers.

KEYWORDS: AI technologies, Omni-channel retailing, Supply chain management, Customer experience, Data Management

INTRODUCTION

In this digital era, generation is becoming more tech-savvy due to which every sector has to compete with this digitalization challenge. AI technologies are proving to be a game changer when it comes to digitalizing shopping experience. This technology has been effectively used by retailers to provide a seamless shopping experience to their customers. With the emergence of technologies, customers are changing their shopping behaviour. In order to retain the customers, retailers should become customer oriented rather than product oriented. In providing the better customer experience, retailers are facing a big challenge in determining the technology and strategy.

Now-a-days customers are becoming Omni-channel customers which create the need of understanding the Omni-channel concept. For retailers the initial step is to understand

the Omni-channel initiatives and the technology to create this environment. Retailers are more dependent on technologies in order to provide a true Omni-channel services, which will increase customer engagement, loyalty and ultimately sales. In Omni-channel approach, multiple channels (Online and offline) have been integrated to offer customers a seamless shopping experience. AI technologies helps both online and offline retailers to increase their capability to create and optimize customer centric retail experience.

"AI technology is a key to differentiate you from your competitors"

Brendan Witcher, principal analyst at Forrester in his presentation "Hot or not- The (Actual) Top Tech Investments For 2019" defined Omni-channel commerce has three specific segments which are

customer engagement and connected Journey, product and price, and fulfillment capabilities which provides the customer what they want where they want it. [1]

“If you know your customers well, you can easily create Omni-channel environment”

Advanced data analytics and data analysis is needed to provide better customer experience. A retailer can do it more effectively by hiring a data team and by knowing what is going on with their customers. By analyzing the critical data and developing predictive insights, retailer can provide the seamless experience to the customers.

REVIEW OF LITERATURE

A. Omni-channel Concept

Omni-channel retail model integrates all existing channels to offer customers a seamless shopping experience.

This retail strategy blurs the distinction between physical and digital channels by empowering the centralized data management. As a result, customers can simultaneously use different channels for shopping. They can start their journey by searching at a channel and finish the purchase in another one.

B. Navigating towards AI technology

AI technology is the path to automate the business intelligence, reduce manual work and foster cost efficiency which will ultimately impact the customer experience. Retailers can move to the next level with personalization, automation, and increased efficiency by using AI technologies.

C. Omni-channel capabilities can be improved by Artificial Intelligence

AI and machine learning are enhancing Omni-channel strategies by providing insights about the changing need and preference of customers, creating customer journeys and delivering consistent experiences. This retail model will be successful when each touchpoint provides highly personalized experience to the customer. In order to provide better customer experience in real time, AI technologies proves to be beneficial for both retailer as well as to the customers. [2]

- a. This technology defines customer profile, their buying preferences and journeys more precisely.
- b. Brands can manage Omni-channel pricing by channel preferences, purchase history and price sensitivity.
- c. IT infrastructure can be redesigned and integrated to scale customer experiences by Omni-channel retailers.
- d. Supply chain can be digitized.
- e. On-time performance and faster revenue growth can be enabled using AI.
- f. It predicts content which will lead a customer to buy.

D. Artificial Intelligence used by Brands [3]

a. Tommy Hilfiger’s design inspiration

Tommy Hilfiger collaborated with IBM and FIT for a project called REIMAGINE RETAIL. This project is done to explore how AI can enhance design inspiration and improve manufacturing and marketing

b. Macy’s On Call application

IBM Watson has prepared a shopping assistant powered by AI for in-store shoppers of Macy’s. This technology helps customers to get answer to their queries like location of a particular product and stock status etc.

c. Walmart: Anticipating Customer Needs

Walmart has tested facial recognition software as an anti-theft mechanism in 2015 to anticipate customer needs and optimize operations. This technology has the ability to recognize the frustration level of customers at checkout. A customer service representative will get an alarm to speak with the frustrated customer.

d. North Face: Robot Sales Associates

North Face has been using artificial intelligence and machine learning to provide a highly personalized shopping experience. IBM Watson has prepared an application called “Shop with IBM Watson” where shoppers speak into their phone to access the Watson. This technology helps in turning the data information into meaningful customer insights that will enhance digital shopping experience.

METHODOLOGY

This study adopts an exploratory approach to explore and identify the AI technologies which will enhance the Omni-channel experience.

Data collection and analysis-

A pilot study has been conducted through survey using questionnaire to identify the awareness of Omni-channel concept and AI technologies. Also, area where this technology will prove to be beneficial for smooth working of Omni-channel retail model has been identified. A sample of 10 retailers has been used for response collection. Secondary data has been collected by analysis of documents, case studies, reports and published articles. Percentage has been used as analysis technique.

RESULTS AND DISCUSSIONS

In general, the study showed that retailers are aware of Omni-channel concept and AI technologies. However, due to some limitation, they are not using this technology.

Omni-channel concept

Q1. Which channels do you currently use for product selling? (Check all that apply)

Retailers are using different channels for product selling. However, 90% of retailers sell products through **Brick & Mortar store**.

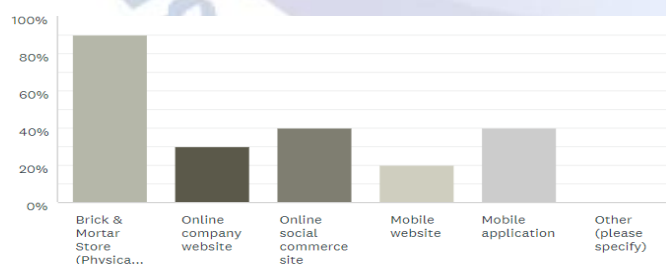


Fig. 1. Channels used by retailers

Q2. Are you aware of Omni-channel retailing?

80% of retailers are aware of Omni-channel retailing.

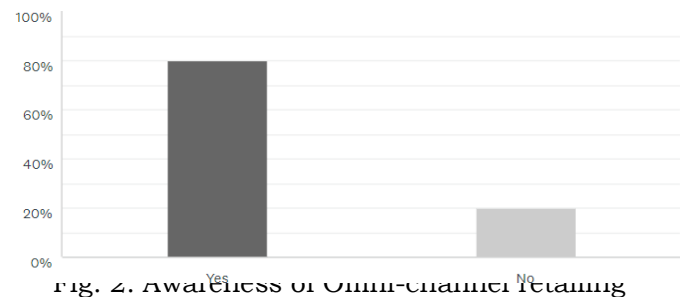


Fig. 2. Awareness of Omni-channel Retailing

Q3. What are the most important objectives of your organization's Omni-channel strategy? (Check top three)

90% of retailers say **creating a seamless customer experience across all channels** is the most important objective of their organization's Omni-channel strategy.



Fig. 3. Objective of Omni-channel strategy

Q4. What challenges are you facing in implementing Omni-channel strategy? (Check top three)

70% of retailers say **customer experience and data management** and 60% retailers say **supply chain management** are the major challenges they are facing in implementing Omni-channel strategy.

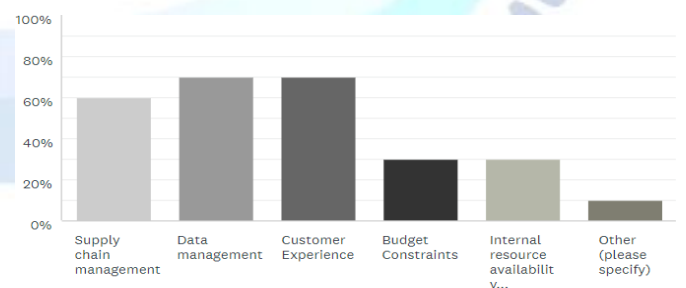


Fig. 4. Challenges of Omni-channel strategy

AI Technology

Q5. Have you ever used any AI technology? If yes, then please specify

10% of retailers say **they have used Google as AI technology**. This shows that exposure to different AI technologies is must for retailers.

Fig.7.ReasonsfornotimplementingAItechnologies

Table I. Use of AI Technology

Yes	10%
No	90%
No, but plan to add	0%

Q6. Which technologies will be beneficial for Omni-channel strategy? (Check all that apply)

80% of retailers say **Sensors/Internet of things**, 70% of retailers say **Virtual personal assistants** and 60% of retailers say **Speech/Audio analytics and Image analytics** are the most important technology which will be beneficial for Omni-channel strategy.

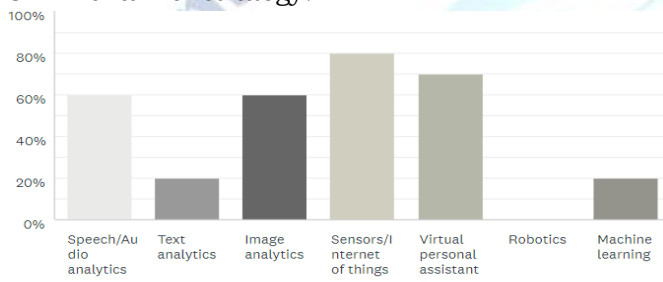


Fig. 5. AI Technologies for Omni-channel strategy

Q7. What reasons drive your organization to invest in AI technologies? (Check all that apply)

80% of retailers say **more personalized customer experience**, 60% of retailers say **data management** and 50% of retailers say **Supply chain efficiency and customer analytics** are the major reasons to invest in AI technologies.



Fig. 6. Reasons to invest in AI Technologies

Q8. What reasons have been holding you back from implementing AI technologies? (Check all that apply)

70% of retailers say **concerns about integration into existing system** is the major reason which have been holding them back from implementing AI technologies.

This survey showed that retailers are facing difficulties in customer experience, supply chain and data management. Hence, a 3-dimensional structure has been prepared for retailers to overcome these challenges. This structure will provide benefits of using AI technologies in these three important areas of Omni-channel retailing.

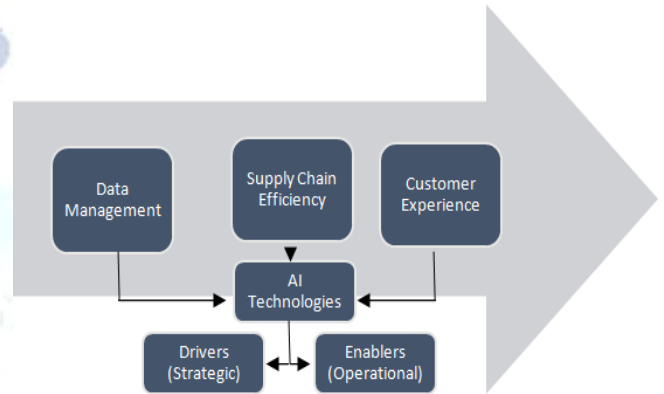


Fig.8.3-Dimensional Structure of Omni-channel strategy

E. Customer Experience

Customer Experience is a key competitive differentiator for retailers. It is difficult for many retailers to maintain the rising and changing customer expectations. Hence, AI technologies help them to meet and exceed customer's expectation through highly personalized experience.

a) AI Technologies:

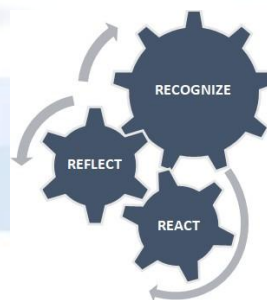


Fig. 9. AI Technologies used for Customer Experience

Retailers can use AI technologies to provide consistent and personalized experience to customer in order to enhance satisfaction, engagement and conversions. In this study, three parameters have been used to define the AI technologies which are beneficial for Customer Experience.

3R's of AI technology:

Various AI technologies have been identified for providing better customer experience and divided under three areas- Recognize, Reflect and React.

1) *Recognize:*

Facial Recognition: This technology is used to identify or verify the identity of a person using their face. Process of facial recognition includes face detection, capture and match.

Detection: Locates and detects human faces in images and videos.

Capture: Conversion of analog information (a face) into digital information (data) based on the person's facial features takes place.

Match: If two faces belong to the same human being is verified in the matching process. [4]

This technology offers insights into the consumer's buying decision process by identifying individuals and their buying habits which will in turn build customized experience for them. [5]

Table II. Positive and Negative of Facial Recognition Technology [6]

Positive	Negative
Improved security levels	Data processing and storing is difficult
Integration is easy	Problems with image size and quality
Accuracy avoids false identification	Camera angle should be correct

Alibaba x Guess pop-up in Hong Kong use gyro-sensors which scans the customer's face to observe customer behaviour like what garments, colours and patterns they touched the most. [7]

Speech Recognition: This technology is used to

Positive	Negative
Recognize image through a camera system	Huge availability of data makes it difficult to process
Identify what customer likes the most and what not	Difficult in interpreting the model
Helps in predicting the customer behaviour while buying the product	Development takes longer time which will in turn reduce the flexibility of the technology

identify words and phrases in spoken language

and convert them to a machine-readable format. This technology works on algorithms produced by acoustic and language modeling.

Acoustic Modeling: Presents the relation between linguistic units of speech and audio signals.

Language Modeling: Verifies sounds with word sequences in order to differentiate words that sound similar.

This technology is used in call routing, speech-to-text processing, voice dialing and voice search. Siri and Alexa are the two speech recognition technologies used in India. [8]

Table III. Positive and Negative of Speech Recognition Technology

Positive	Negative
Easy to use and readily available	Due to variations of pronunciation, this technology is unable to capture words
Act as time saver for those who are not good at typing	Unable to sort through background noise
Easily installed in computer and mobile devices	Lead to inaccuracies

Image Recognition: This technology identifies and detects an object in a digital image or video. Process of Image recognition includes gather and organize data, build a predictive model and use it to recognize images.

Gather and organize data: Computer interprets the image as raster or vector based then identifies the important data in the image and break down into distinct objects to be analyzed and retained.

Build a predictive model: Learning algorithms processes the object and collected images and then sort them into separate classes of similar image types.

Use it to recognize images: Image data has been collected, organized and recognized which will in turn identify different classes of image and similar objects in the new images. [9]

This is used to verify and analyze customers and their opinions.

Table IV. Positive and Negative of Image Recognition Technology [10]

2) *Reflect:*

Machine Learning Platforms: This platform is a kind of algorithm which can receive input data and convert it into output data through statistical analysis. Process of machine learning includes various types of automated algorithms which learn to model functions and predict future actions from data.

Virtual assistant is an example of machine learning platform which combine deep learning models to interpret natural speech, bring in relevant context and take an action. This technology is used for prediction and classification. [11]

Table V. Positive and Negative of Machine Learning Platforms

Positive	Negative
Identify the available data and solve the problems	Take time and resources to bring results
Learn complex decision system, find patterns and anomalies in data as well as raise alerts if needed [12]	High level of error susceptibility [13]
Identify trends and patterns	Interpretation of results [14]

Deep Learning Platforms: This technology can imitate the human brain, processing data and create patterns for decision making. This is used to recognize patterns and classify applications. [15]

Table VI. Positive and Negative of Deep Learning Platforms

Positive	Negative
Create more personalized e-learning experiences	Requires human to monitor it
Allow system to process, learn and handle large amount of data	Systems that relies on deep learning platforms can inherit and perpetuate covert and overt biases
Due to increase demand of this technology, costs are anticipated to decrease.	Requires human to initiate it

3) *React:*

Natural Language Generation: This technology converts the audio signals into text and uses that

data to deliver benefits like interpreting multiple

Positive	Negative
Helps in improving customer satisfaction	Works only if you have system that can support full speech recognition and interaction
Helps in understanding customer needs	Define sentence in a parsed way in different ways
Automatic text produced from structured data	Refer something using pronouns only

languages and dialects [12]. This enables computers to communicate ideas with more accuracy. Process of Natural language generation includes text realization, text and sentence planning.

Text Planning: Order of content in structured data

Sentence Planning: Combine sentences to present the flow of information

Text Realization: Represent text

This technique is used in generating customer service reports and market summaries. [17]

Table VII. Positive and Negative of Natural Language Generation

Driver and Enabler of Customer Experience:

Table VIII. Driver and Enabler of Customer Experience

Driver	Enabler
Predicts experiences	Anticipate future needs of customer Analyze behavioral patterns, market trends and user experiences for proactive measures to secure a personalized experience across multiple channels [18]
Convert surveys into conversations	Modern surveys allow customers to give feedback in new, robust and intuitive ways through enhancing audio comments or image or video upload Organization can engage in a dialogue, using follow-up questions, apologies or information
Measure how customers	AI detects emotions which strongly affect the customer loyalty

feel	Measure emotion signals like neurophysiological reactions and social-expressive behaviors[19]
Provide insights from images and videos	Customers use images and videos to interact with the brand.
Deliver seamless experience	Provide more pertinent information/offers that are more relevant for the customers. Enhance engagement which will in turn provide more accurate data
Opens new route of personalized experience	Build a more interactive and personalized customer experience through recognition technologies to place orders and access
Enhance service environments	Reduce human interaction and streamline services
Connects customer touchpoints	Centralize the data and insights and build a holistic picture of customer. Anticipate needs and proactively intervene to keep the customer loyal
Optimizes data	Use data for insights about customer preferences. Use technologies like chatbots to provide personal and truly exceptional experience
Supports product discovery	Adopt intelligent AI based technologies to engage more effectively with their customers. AI powered strategies like visual search, discovery and recommendations help consumers search more efficiently for relevant products and uplifting conversion

F. Supply Chain Efficiency

Right product, in the right place, at the right time has always been challenging to achieve. AI technologies have been used in this direction to provide a unified brand experience and frictionless fulfillment across all channels which in turn fulfill the objective of Omni-channel strategy.

AI Technologies:



Fig. 10. AI Technologies used for Supply Chain Efficiency

Retailers can improve forecasting, visibility across all channels and predictive capabilities through AI technologies which will in turn enhance the supply chain efficiency. In this study, three parameters have been used to define the AI technologies which are beneficial for Supply Chain Efficiency.

3P's of AI technology:

Various AI technologies have been identified for effective and efficient supply chain and divided under three areas- Procurement, Planning and Processing.

1) Procurement:

Chatbot: This technology can simulate a conversation with a user in natural language through messaging applications, website, mobile applications or phone. Automation and augmentation of Chatbot capability helps in streamline procurement related tasks. Process of Chatbot includes user request analysis and returning the response.

This is used for conversation with supplier, place purchasing requests, answer questions related to procurement functionalities and documentation. [20]

Table IX. Positive and Negative of Chatbot Technology

Positive	Negative
Streamline interactions between people and services	Limited responses
Improve operational efficiency	Limited database
Improve customer engagement process	Complex chatbots are expensive

2) *Planning:*

Machine Learning:

- *Supply chain planning:* This technology helps in forecasting within inventory, demand and supply. Revolutionize agility and automation of supply chain decision- making. It helps in optimizing the delivery of goods while balancing supply and demand.
- *Warehouse management:* This technology reshapes the warehouse management through constantlyself- improvingoutput.

Machine learning and Predictive Analytics:

- *Supplier selection and Supplier relationship management:* Machine learning and predictive analytics are used for supplier selection and relationship management. Predictive analytics create models which are used to examine existing data and trends to understand customers and products while identifying future opportunities and risks.

Machine learning and predictive analytics make the supplier selection more intelligible. It helps in selection and sourcing from the right supplier. With the help of machine learning andintelligible algorithms, gathered data would provide better outputs.

3) *Processing:*

Natural language processing: This technology streamline large amount of data, build data setsregarding suppliers information for auditing and compliance actions.

b) *Driver and Enabler of Supply ChainEfficiency:*

Table X. Driver and Enabler of Supply Chain Efficiency

Driver	Enabler
Contextual Intelligence	Reduce the operating costs and manageinventory Identify damage and carry out needed actions through AI powered visualinspection Sort palletized shipments, parcels and letters through Intelligent Robotic Sorting[22]
Offers insights to	Combines the capabilities of different technologies like machine

enhance productivity	learning and reinforcement learning tofind the factors and issues which affects the performance of the supply chain
Demand forecasting	Measure and track all the factors which can work towards offering accuracy in demandforecasting Provide continuous forecasts based on real time sales and otherfactors
Establish end- to-end visibility	Capture, process and utilize structured and unstructured data to provide real time visibility [23]
Inventory management	Create control towers to centralize data and decision-making Enhance the computer vision capabilities of ERP systems and machines which enables more accurate inventorymanagement
Create new performance engines	These engines automate the execution of supply chain functions, as well as optimizetransactions Determine the impact on key performance indicators (KPIs) and make immediate supply chain decisionstooptimize financial results
Managing through agile decision-making	Collaborative, data driven and platform based management model share qualitative information and real time data from the supply chain systems, review reports and discussimplications Create resolution options, share with stakeholders, discuss on the collaborative platform andtake immediate action
Develop personalized and flexible approach	Create segmentation strategies which indicate consumers' personalized needs by channel, service level andlocality Real-time visibility will produce greater insight, variation, and urgency of understanding and meeting demand requirements Develop multiple supply chain models for a single, integrated network to empower the supplychain organizations

Unify performance management	Advanced analytics enable a way to measure and manage performance Develop new end-to-end metrics to measure performance and cost across multiple functions like procure-to-pay and order-to-cash
Attainment of goals	Machine learning enables supply chains to handle more complexity, making them more dynamic, flexible, adaptive and efficient Automation can resolve exceptions in realtime Machine learning based algorithms can predict these exceptions and supply chain outcomes

G. Data Management

Data management is a time consuming task. With the help of AI technologies, retailers can save the time of their employees and engage them in other tasks. It is possible for machines to learn from experience, adjust to new inputs and perform human-like tasks through AI.

a) AI Technologies:



Fig. 11. AI Technologies used for Data Management

3A's of AI Technology:

Various AI technologies have been identified for managing data and divided under three areas- Analyze, Access and Act.

1) Analyze:

Augmented Analytics: This technology use AI and machine learning to transform how analytics content is developed, consumed and shared.

NLP/Conversation Analytics: This technology is used to analyze complex combination of data and to make analytics accessible to everyone in the organization.

2) Access:

Data Fabric: This technology enables frictionless access and sharing of data in a distributed data environment. It enables a single and consistent data management framework. Seamless data access will be allowed while using this technology.

3) Act:

Continuous Intelligence: This technology use real time context data to improve decisions. It is a design pattern in which real time analytics are integrated which process current and historical data to prescribe actions. It provides decision automation and decision support. [24]

b) Driver and Enabler of Data Management[25]:

Table XI. Driver and Enabler of Data Management

Driver	Enabler
Automate routine data processing	Automate routine data management tasks like data integration Create automated rules for processing data
Discover data quality issues	Check data for quality issues Make correction automatically
Include legacy data	Process legacy data which presently exists in offline format through NLP and AI image recognition Convert images of old documents to machine readable text and accumulate these in data stores for further processing
Develop new data rules	Analyze data usage patterns and recommend the optimal strategies for collection and retention
Prioritizing and securing data	Collect data and put it to good use Secure the data properly
Sorting	Machine learning and algorithms sort and handle different types of emails, documents and images etc.

CONCLUSION

Retailers may have different perspective and motivation to move towards Omni-channel retailing. However, they are facing various difficulties in implementation of this strategy. As a theoretical contribution, this study identifies a set of drivers and enablers for Omni-channel retailing and classifies them under three areas- Customer

Experience, Supply chain efficiency and Data management. This study explores the AI technologies which will help the retailer for providing better customer experience, data management and supply chain efficiency.

In light of the findings, the following recommendations for retailers to adopt Omni-channel retailing are made:

- Retailers should focus more on customer engagement as they interact with your brand through a number of platforms like website, application, physical store, kiosk etc. They expect to start their journey on one platform and continue it on another seamlessly. Consumers are becoming Omnipresent, you need to adopt new technologies to enhance engagement strategies.
- Retailers should develop a centralized and integrated supply chain process with proper demand forecasting in order to prevent the overstock and understock problem. With the help of various analytics, retailers can improve their supply chain efficiency.
- Data management is a time consuming task and it is difficult for analytics team to do it in a real time. Hence, various AI technologies can be used to manage the data effectively which will in turn become base for making different strategies.

This study provides a three dimensional structure to retailers which they can refer before implementing AI technologies for their Omni-channel strategy. However, this study has few limitations. Future research could test the findings in a broader research context with a bigger and diversified sample. The scope of this study is primarily confined to discover the driver and enablers for retailers for adopting AI technologies. Further studies could explore the barriers and inhibitors of AI technologies.

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