NPCI
भारतीय राष्ट्रीय भुगतान निगम
NATIONAL PAYMENTS CORPORATION OF INDIA

GLOBAL FINTECH FEST

Conversational Payments on UPI: Unlocking new frontiers for next-generation payments

MSC
MicroSave Consulting

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EXECUTIVE SUMMARY

India has seen a paradigm shift in the way payments are conducted and processed, driven by technological advancements, innovations, and a burgeoning digital economy. Products such as Unified Payments Interface (UPI), Aadhaar-enabled Payment Systems (AePS), Bharat Bill Payment System (BBPS), and RuPay debit and credit cards, among others, have furthered India's journey of digital payments.

Yet, most payment solutions are not inclusive as they cater largely to digitally savvy users who own a smartphone and have Internet connectivity. This leaves out a large chunk of underserved users who lack access to smartphones. The report highlights one such solution — "Conversational Payments on UPI". The report talks about the potential of this solution in building pathways to a safe and user-centric payment experience.

Artificial Intelligence (AI) has experienced remarkable growth and transformation in recent years, becoming one of the most influential and rapidly evolving technologies across multiple industries. It has significantly transformed the financial services industry. Estimates suggest AI technologies can potentially deliver more than USD 1 trillion in additional value to financial services each year. Financial service providers (FSPs) in India have also been at the forefront of AI adoption—more than 83% of FSPs use it to enhance their product and service offerings.

The payments industry is poised for dramatic growth over the next five years, with digital payments as an emerging frontier. India stands at the forefront to develop AI capabilities in payment services—FSPs in India have invested more than USD 3.2 billion to develop AI-driven solutions. FSPs in India have harnessed AI and machine learning (ML) capabilities to enhance the accessibility, use, and overall quality of payment services for their customers.

Within the payments industry, AI has found numerous valuable use cases across the lifecycle, from payment initiation to confirmation. AI has helped businesses and financial institutions streamline operations, improve security, and deliver more personalized payment experiences to their customers.

Initiation of payment
- Chatbots and virtual assistants
- Personalization of customer experience

Payment verification
- AI-powered biometric authentication (facial recognition, voice recognition)
- Fraud detection

Payment processing
- Dynamic routing of payments
- Autonomous payments

Confirmation of payment
- Chatbots
- AI-powered systems for instant notifications

The successful implementation and widespread adoption of AI-powered payments rely on a collaborative effort between the government and industry stakeholders. The government, along with other players, such as FinTechs, banks, and quasi-government organizations, such as the National Payments Corporation of India (NPCI), have been crucial to the development, regulation, and promotion of AI-powered solutions. NPCI has been at the forefront in creating advanced models for facilitating AI-powered payments, by working with IIT Madras, AI4Bharat, Bhashini, and the ecosystem to strengthen the payments ecosystem.

With the RBI's support, NPCI is now launching "Conversational Payments on UPI" to improve customers' transaction experience and convenience and promote inclusivity further. The solution integrates the power of AI with UPI to allow users to transact through voice-based inputs. The AI-powered solution will ride along the lines of UPI 123Pay's solution but eliminates the need for text-based inputs and instead relies solely on voice-based inputs.

A user can use the solution either on a telecom call or any UPI app. The solution will guide the user through the process and offers a promising way to bring millions of underserved users into the folds of digital payments.

The solution's growth will depend on a few factors, such as technological advancements, digital literacy, industry adoption and competition, and changes in the regulatory environment, among others. However, how likely users will be to adopt a solution like this depends on various factors, such as product utility, cost of conducting payments, and convenience offered, among others. Their willingness to adopt it will also depend on the effective resolution of some concerns around the use of AI to make payments.

Keeping user concerns in mind, we have developed key design principles (LEADSS) for FSPs to consider when they design conversational AI-based solutions:
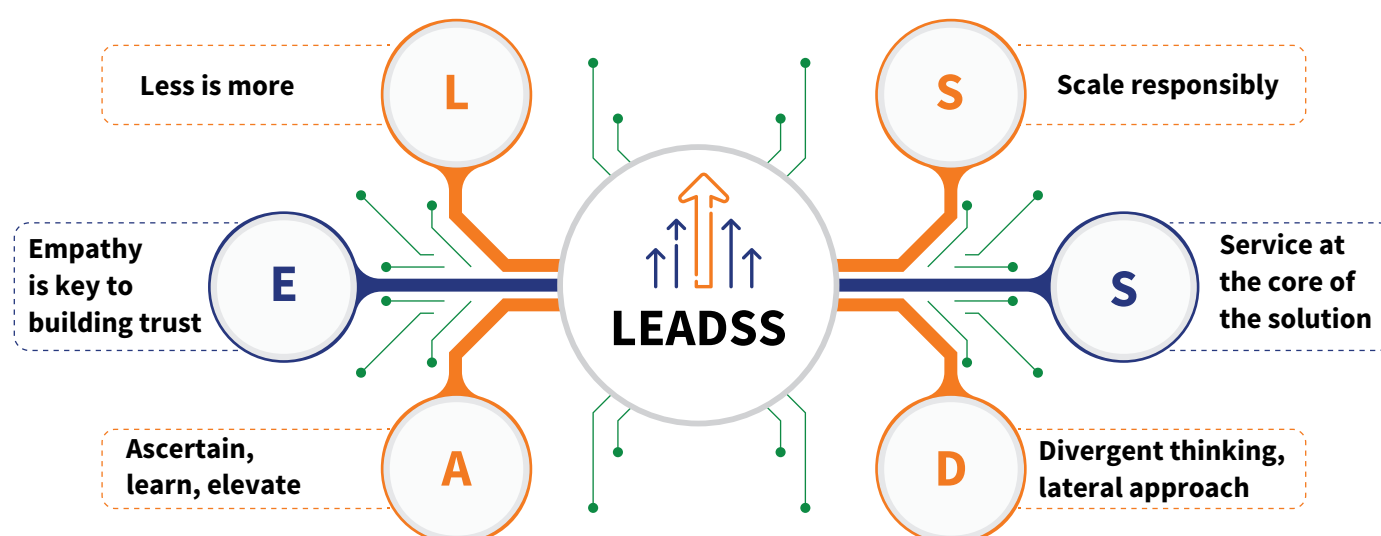
Less is more	**L**		**S**	Scale responsibly
Empathy is key to building trust	**E**	**LEADSS**	**S**	Service at the core of the solution
Ascertain, learn, elevate	**A**		**D**	Divergent thinking, lateral approach

The introduction of conversational payments is poised to strengthen India's leadership in the financial services sector. While concerns around security, accuracy, and adoption persist, the solution has enough potential to mitigate the existing pain points of customers and offer a seamless payment experience. "Conversational Payments on UPI" also offers a wide range of potential use cases in India because of the country's growing digital landscape and linguistic diversity. As people become more comfortable with voice and text interfaces for transactions, the volume of conversational payments could increase across various sectors, including retail, e-commerce, bill payments, and more. Stakeholders across the country must collaborate to realize the full potential of this solution, to ensure security, usability, and accessibility even as they embrace advancements that enhance the user experience.

1. State of play: AI and payments

Picture this: Rajesh is a 26-year-old working professional engaged in the formal sector. As he starts his day, he asks his AI-powered assistant to provide an overview of his finances. The virtual assistant provides details on his pending utility bills, credit card bills, and recent transactions. He uses a voice assistant to pay his bills. Once he leaves for work, he makes multiple payments assisted by AI tools. The toll fare is automatically deducted from his wallet as soon as he enters the highway, and the parking facility at his office complex deducts the parking fee.

At work, Rajesh receives updates from his AI-powered bank app on his monthly expenses that alert him when he exceeds the budget in some categories. He also receives recommendations on his bank app to manage and optimize his spending. Back home, his virtual assistant creates a detailed budgeting plan (using the banking apps' recommendations above) for Rajesh as per his directions and schedules constant reminders to ensure he can follow the plan rigorously.

While some of these AI-powered solutions may not currently seem plausible, they will soon become a reality in our lives. The rapid adoption of AI driven by the constant stream of innovations in the industry is soon expected to equip voice assistants, virtual assistants, chatbots, and other AI tools to handle complex tasks and requests efficiently, which would lead to disruptions in the next-generation payment solutions.

1.1. The growth of AI: From quiescent to inevitable

Early exploration

2011
IBM Watson wins Jeopardy
Watson beats former world champions using advanced NLP capabilities.

2012
Advances in image recognition
AlexNet performs image recognition tasks—an inflection point for deep learning.

2014
Introduction of GAN
Generative adversarial networks enable machines to generate content, including images, music, and speech.

Rise of deep learning and practical applications

2017
Deep learning-led transformer architecture
Transformer architecture emerges, and finds use in core algorithms to model languages, perform machine translations, and answer questions.

2018
Early foundational models
BERT introduces a transfer learning model that enables machines to understand the context of words.

Transformative integration across sectors

2020
Generative AI
GPT 3 sets new benchmarks in language modeling through generative AI.
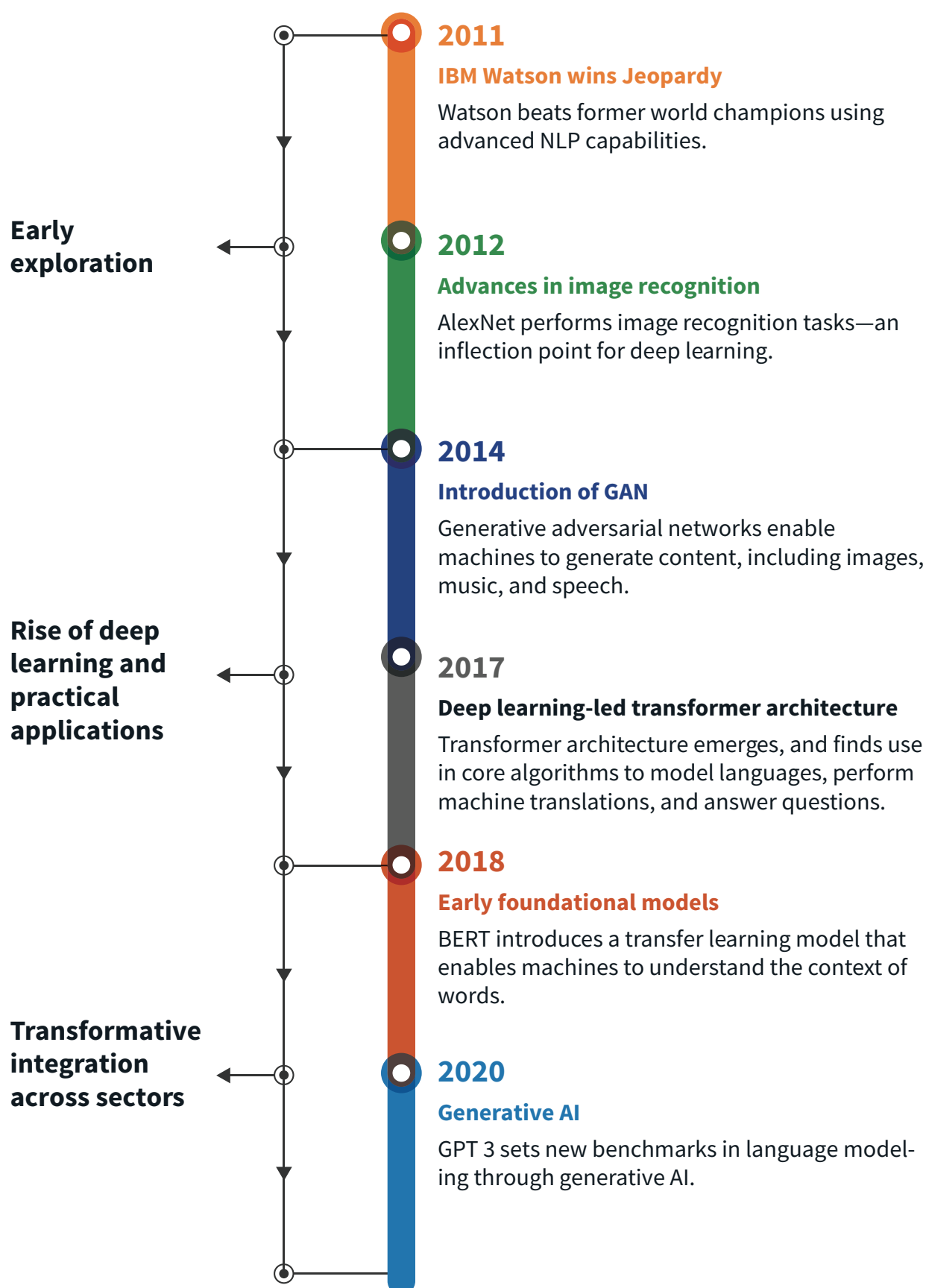
Figure 1: Evolution of AI over the past decade

AI has evolved remarkably since its genesis in 1950. The figure above depicts the critical milestones achieved in the AI space over the past decade. The early stages of AI witnessed limited uptake until the early 2000s due to inadequate data availability and a lack of breakthrough algorithms. Since 2010, advancements in deep learning have become prominent, which, among other things, have helped draw insights from unstructured data.

The introduction of Generative Adversarial Networks (GANs) in 2014 set the foundation for the generative AI movement and accelerated the use of deep learning. Today, the global AI market stands at USD 207.9 billion[1] and is expected to grow more than nine times by 2030. Organizations now deploy several branches and sub-branches of AI to solve real-world problems. Companies and individuals use AI to perform repetitive tasks, analyze information, and optimize other programs. While AI has several branches, some of the most common branches are as depicted below:
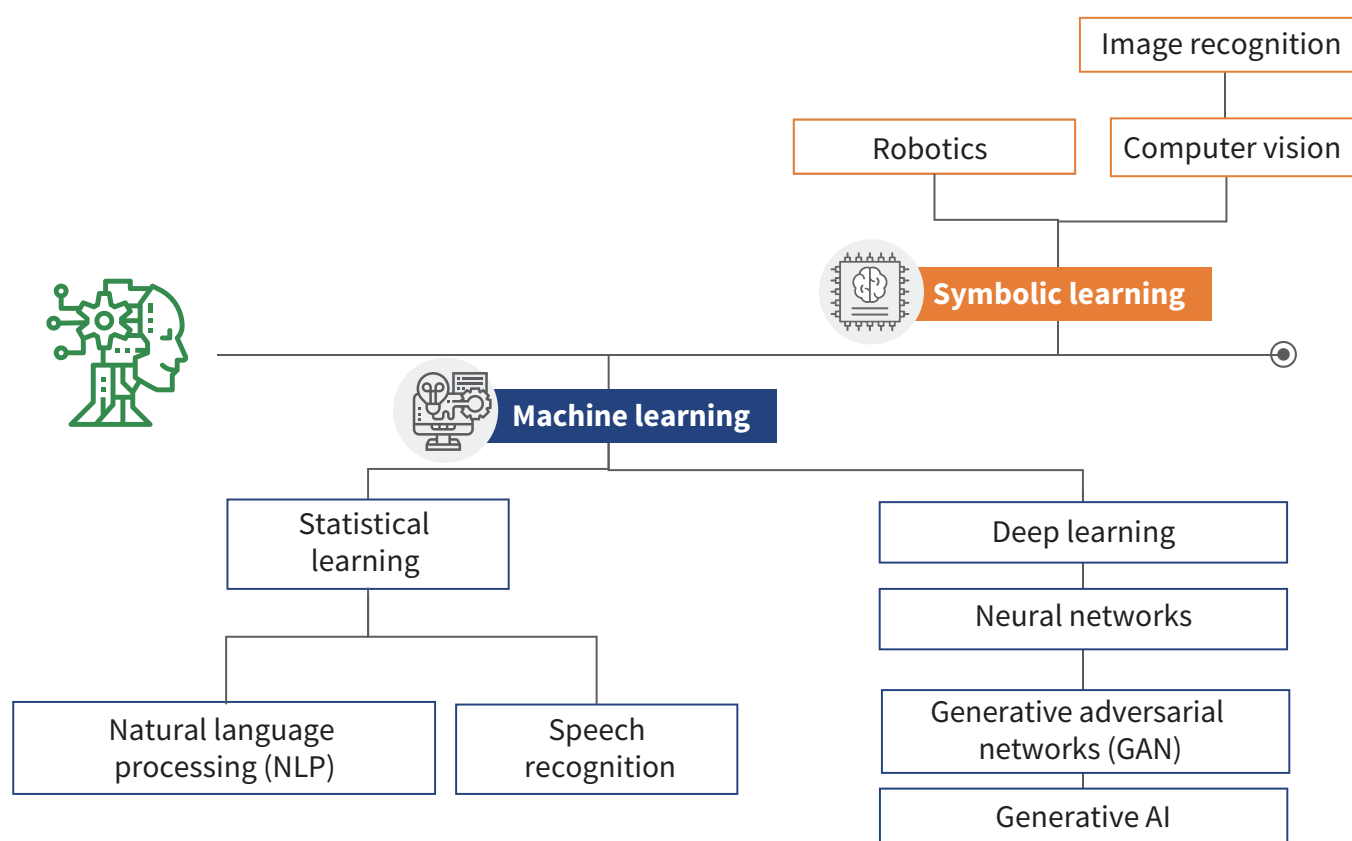

Figure 2: Key branches of AI

The early phase of AI emphasized general intKey branches of AI human intelligence that can be used for multiple activities. However, this limited AI's application across sectors as it lacked the diversity to be adapted to various contexts. The introduction of specialized intelligence (narrow AI) marked a pivotal shift as researchers and organizations focused on machine learning for specific tasks. The implementation of narrow AI accelerated since 2010, bolstered by the expansion of deep learning techniques particularly for image and speech recognition purposes.

AI and its branches are a rapidly growing field that has sprawled into dozens of industries. Industries, such as finance, healthcare, e-commerce, telecommunications, and entertainment have also started to use AI for practical applications, such as fraud detection, medical diagnosis, customer service, and content recommendation. The figure below showcases different use cases of AI across industries:

Healthcare

- Medical imaging analysis
- Virtual health assistants
- Personalized treatment plans
- Predictive analysis for disease progression

Financial services

- Fraud detection and prevention
- Customer relationship management
- Credit scoring
- Credit underwriting

Communication and media

- Targeted marketing and advertising
- Customized content creation
- Personalized content recommendations
- Sentiment analysis

Energy

- Predictive maintenance
- Energy demand forecasting
- Grid management and stability
- Energy consumption optimization

Supply chain management

- Demand forecast at the stock keeping unit (SKU) level
- Inventory and procurement planning
- Product quality assessment
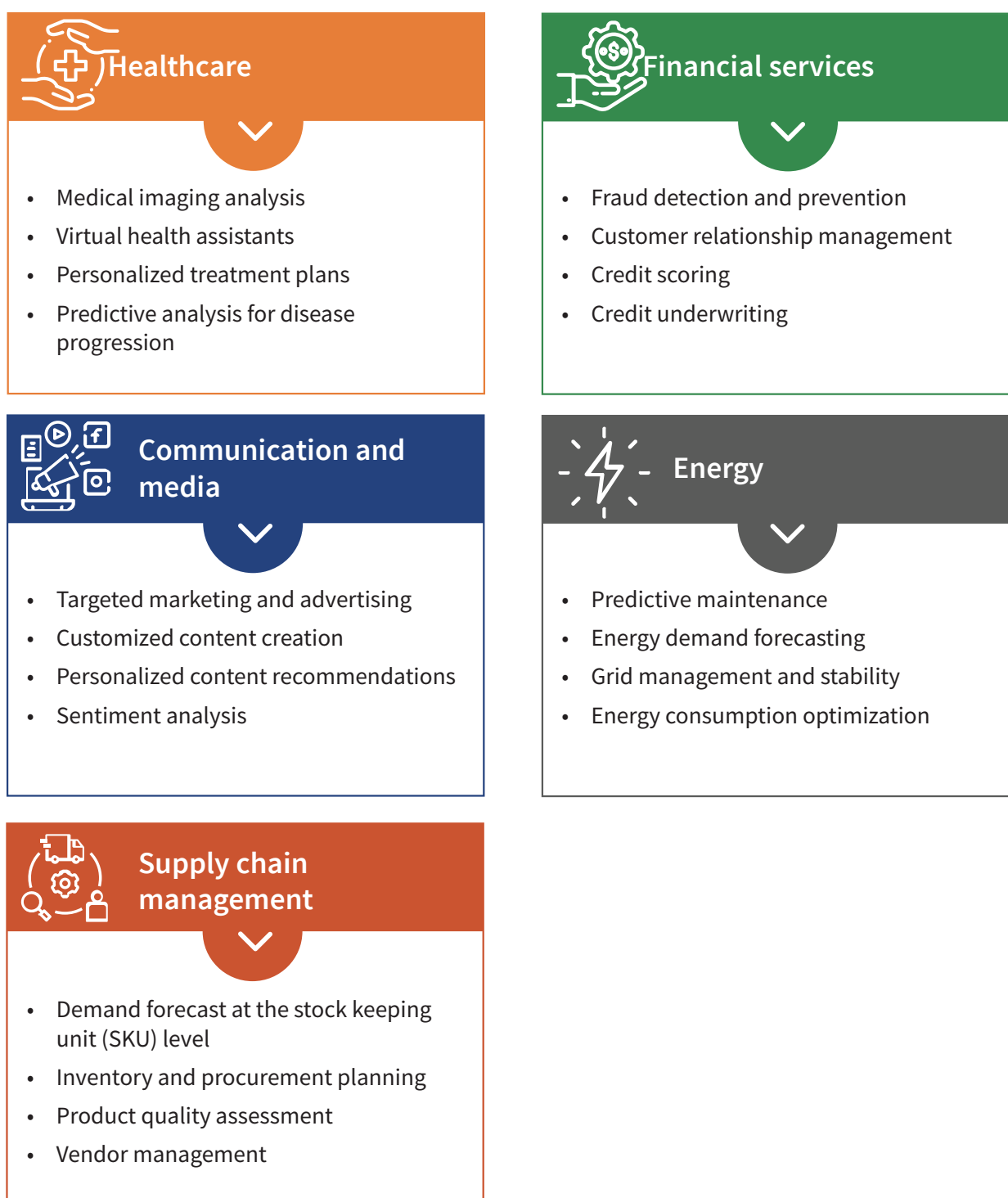- Vendor management

Figure 3: Key use cases of AI across sectors

Healthcare, financial services, communications, and media[2] are in the lead when it comes to AI adoption. Besides these industries, AI has endless use cases that span several other sectors, such as sales, marketing, education, consumer services, and manufacturing.

In recent years, the financial services industry has seen a high rate of AI adoption. It shows great potential in product enhancements and disruption through innovative solutions. AI's capacity to generate standardized information

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2 PwC, "Sizing the prize", PwC.in, Accessed September 04, 2023. https://www.pwc.com/gx/en/issues/data-and-analytics/publications/artificial-intelligence-study.html

from products and services provides the ideal groundwork for AI advancements. Market estimates show that 82%[2] of financial service providers (FSPs) globally have adopted AI tools. Estimates suggest AI technologies can potentially deliver more than USD 1 trillion[3] in additional value within financial services each year. FSPs in India have also been at the forefront of AI adoption—more than 83%[4] of FSPs use it to enhance their product and service offerings.

1.2. The strides of AI in the payments industry

AI has gained significant prominence to automate complex payment processes and improve customer service and value in the financial services industry. The payments industry is poised for dramatic growth over the next five years, with digital payments as an emerging frontier. It is expected to surpass the global long-term annual revenue growth trajectory of 6-7% and touch 9%[5].

Globally, the payments sector is evolving rapidly to cater to user needs with inclusivity at its core. This growth is bolstered by technological innovations that can make payments faster, easier, and seamless for users both locally and globally. The payments ecosystem has witnessed various customer-level and industry-level developments that have accelerated AI adoption in payments[6].

At the customer level, the adoption of digital payments has risen significantly, with more than USD 8 trillion[7] in digital transactions made globally in 2022. AI capabilities are expected to help route more than 40%[8] of the total payments conducted globally by 2025, thanks to technological advancements in payment systems coupled with greater adoption of digital payments among users. In the past decade, more than 93%[8] of financial institutions worldwide have deployed AI to enhance payment services for customers through machine learning, deep learning, computer vision, NLP, and generative AI. We see similar trends in India as well.

India is a frontrunner in the development of AI capabilities in payment services, with investments worth more than USD 3.2 billion[9] made to develop AI-led solutions by FSPs. Market estimates show that 60%[10] of FSPs in India have initiated medium-scale deployment of AI for payment custody, clearance, and settlement.

In India, digital payments have grown at a CAGR of 44%[11] by volume from FY 2017-18 to FY 2021-22. Customers' expectations from service providers[12] have evolved as they conduct a growing share of transactions through digital channels. Customers seek ease of access, convenience, speed, and personalization in payment services. In contrast,

3 McKinsey, "The state of AI in 2023; Generative AI breakout year", McKinsey.in, August 01, 2023, Accessed September 04, 2023, https://www.mckinsey.com/capabilities/quantumblack/our-insights/the-state-of-ai-in-2023-generative-ais-breakout-year

4 PwC, "Uncovering the ground truth; AI in Indian financial services", PwC.in, 02 February 2023. Accessed September 04, 2023, https://www.pwc.in/research-insights/2022/ai-adoption-in-indian-financial-services-and-related-challenges.html

5 McKinsey, "The chess board rearranged; Rethinking the next moves in global payments", McKinsey.in, October 07, 2022, Accessed September 04, 2023, https://www.mckinsey.com/industries/financial-services/our-insights/the-chessboard-rearranged-rethinking-the-next-moves-in-global-payments

6 PYMNTS, "Why AI's Early Adopters Are Laser-Focused On Credit Risk And Payments", April 24, 2020, Accessed September 04, 2023, https://www.pymnts.com/news/artificial-intelligence/2020/why-ais-early-adopters-are-laser-focused-on-credit-risk-and-payments/

7 Grand View Research, "Digital Payment Market Size, Share & Trends Analysis Report by Deployment", Accessed September 04, 2023, https://www.grandviewresearch.com/industry-analysis/digital-payment-solutions-market

8 PYMNTS and Brighterion collaboration, "The unlocking AI Playbook: Credit risks and payments edition" April 2020, Accessed September 04, 2023, https://www.pymnts.com/wp-content/uploads/2020/04/The-Unlocking-AI-Playbook-Credit-Risk-and-Payments-April-2020.pdf

9 Abhijit Ahaskar, "India ranks 5th in countries with most AI investment", Livemint.com 12 April 2023, Accessed September 04, 2023, https://www.livemint.com/companies/start-ups/india-ranks-fifth-in-ai-startup-investments-receives-3-24bn-in-2022-stanford-report-11681314138709.html

10 IRBDT, "AI in Banking; A primer" July 2022, Accessed September 04, 2023, https://www.idrbt.ac.in/wp-content/uploads/2022/07/AI_2020.pdf

11 Digidhan, "Digidhan dasboard" digipay.gov.in. Accessed September 04, 2023, https://digipay.gov.in/dashboard/default.aspx

12 McKinsey, "Building the AI bank of the future", McKinsey.in, May 2021, Accessed September 04, 2023, https://www.mckinsey.com/~/media/mckinsey/industries/financial%20services/our%20insights/building%20the%20ai%20bank%20of%20the%20future/building-the-ai-bank-of-the-future.pdf

at the industry level, FSPs have improved payment systems and developed infrastructure to ensure frictionless customer payments.

Most FSPs have deployed big data and cloud computing[13] to facilitate real-time payments for customers. This provides the necessary infrastructure for FSPs to use AI capabilities for payments. Moreover, the increased entry of non-traditional players in the payments space, such as Uber and Amazon, has led to a rise in competition among service providers. This competitive environment has nudged FSPs to invest in AI capabilities and use its various branches to meet customer needs and expectations.

1.3. Use of AI to ease the customer journey for payments

FSPs in India have been using AI and ML capabilities to improve access, usage, and quality of payment services for customers. Recent developments in the financial services industry indicate that AI will continue to be the cornerstone for technological innovations for FSPs in the country.

In this section, we discuss prominent use cases in AI adopted to ease the customer journey in payments across the stages of payment initiation, verification, processing, and confirmation:
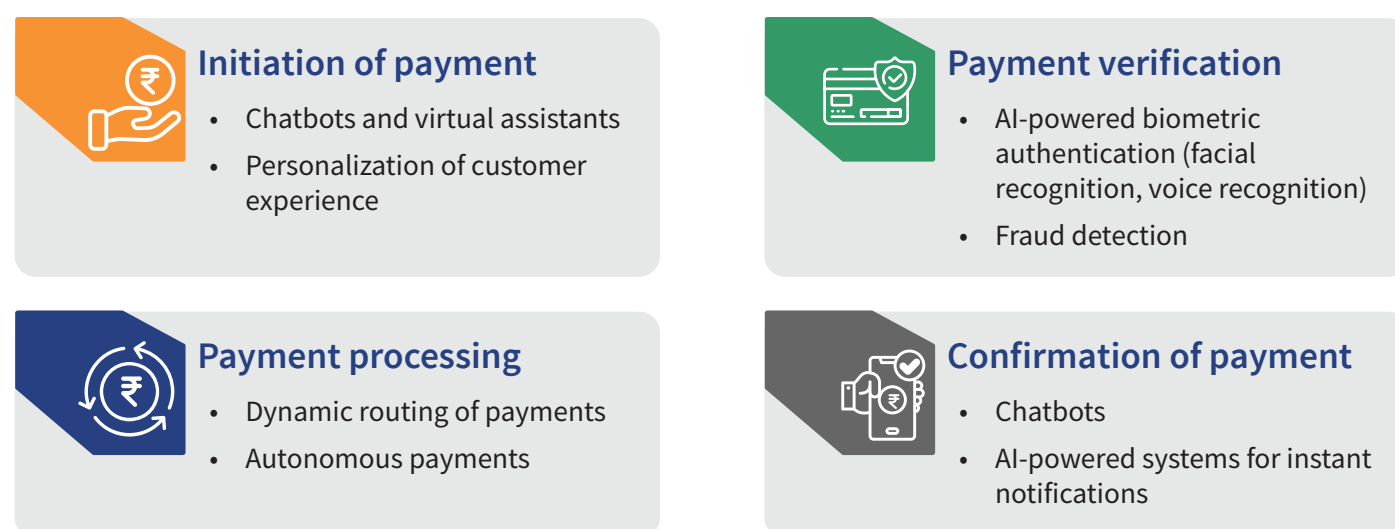
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Figure 4: Prominent use cases of AI to ease the customer journey in payments

1. **Payments initiation:**
   - **Chatbots and virtual assistants:** Financial service providers in India have increasingly deployed chatbots. More than 80%[14] of banks in India use chatbots and virtual assistants to ease customer experience. These include chatbots to resolve customer queries, such as balance inquiries, transaction history, and customer grievances in case of transaction failures.
   - **Personalization of customer experience:** AI capabilities are used to analyze transaction history and customer preferences to offer tailored payment services. This helps FSPs improve customer engagement and loyalty. Estimates suggest more than 43%[13] of payment service providers in India currently use AI to personalize customer services.

13 El Bachir Boukherouaa and others, "Powering the Digital Economy: Opportunities and Risks of Artificial Intelligence in Finance", elibrary. imf.org October 22, 2021, Accessed September 04, 2023, https://www.elibrary.imf.org/view/journals/087/2021/024/article-A001-en.xml

14 PwC, "Uncovering the ground truth; AI in Indian financial services", PwC.in, 02 February 2023. Accessed September 04, 2023, https://www.pwc.in/research-insights/2022/ai-adoption-in-indian-financial-services-and-related-challenges.html

2. Payment verification:

- **Fraud detection:** During FY 2022-23, 95,000[15] fraud cases were reported in India. FSPs use machine learning (ML) algorithms to analyze customers' transaction patterns to resolve these issues. The system alerts users based on the pattern identified through ML when it detects potential fraud. However, false positives[16] in fraud detection often affect customer experience due to declined transactions. Advanced machine learning algorithms use semantic and statistical analysis[17] to find nuanced patterns and accurately distinguish genuine transactions from potentially fraudulent ones. 62% of FSPs in India have adopted AI to detect and prevent fraud in payments.

- **Biometric authentication:** Financial service providers use biometric authentication[18] to authenticate payments made through self-initiated and assisted modes. Payment processes integrate biometric authentication methods, such as facial recognition, iris recognition, and fingerprint scanning, to help improve the safety and security of transactions and facilitate frictionless payments. Further, service providers have been developing innovative and cost-effective ways to authenticate transactions, such as voice recognition[19].

3. Payment processing:

- **Dynamic routing of payments:** Payment aggregators in India now use AI capabilities to route transactions[20] efficiently and prevent transaction failures. Dynamic routing of transactions uses AI-driven algorithms to analyze network traffic, transaction volumes, and server loads to select the most efficient and available payment mode to process transactions. This helps improve customer experience and reduces costs for merchants[21] and payment service providers.

4. Confirmation of payment:

- **Chatbots:** AI-powered chatbots have evolved with the implementation of NLP to facilitate payments and provide instant confirmation. When a user completes a payment using a chatbot, it eases the process to confirm the payment amount, recipient, and other transaction specifics. This is especially useful to provide payment services to underserved segments that have limited financial literacy. FSPs in India now use chatbots[22] to ease access and convenience in payment services.

While the use of AI capabilities for digital payments in India is still nascent, stakeholders have been working to develop innovative use cases and create an enabling environment to use AI in the payments industry.

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15 Shweta Mudaliar, Over 95,000 UPI fraud cases reported in 2022-23: Centre in Parliament, Hindustantime.com, March 23, 2023, Accessed September 04, 2023, https://www.hindustantimes.com/india-news/over-95-000-upi-fraud-cases-reported-in-2022-23-centre-in-parliament-101679541121388.html

16 Infosys, "Addressing false positive in the battle to prevent retail fraud" Infosys.com, 2022, Accessed September 04, 2023, https://www.infosysbpm.com/offerings/functions/bpm-analytics/insights/documents/addressing-false-positives-in-the-battle-to-prevent-retail-fraud.pdf

17 Comply Advantage, "How To Reduce False Positives In Machine Learning", Accessed September 04, 2023, https://complyadvantage.com/insights/reduce-false-positives-with-machine-learning/#:~:text=Importantly%2C%20machine%20learning%20systems%20are,or%20direction%20from%20compliance%20employees.

18 Transparency research, Biometric Payment Market Outlook 2031. Accessed September 04, 2023, https://www.transparencymarketresearch.com/biometric-payment-market.html

19 Monica Eaton, "Exploring biometrics within payments", Biometric update.com, February 27, 2023, Accessed September 04, 2023, https://www.biometricupdate.com/202302/exploring-biometrics-within-payments

20 Ramya Bygari, et.al, "An AI-powered Smart Routing Solution for Payment Systems", November 2021, Accessed September 04, 2023, https://ieeexplore.ieee.org/document/9671961

21 Juspay, "How we saved INR 2000 crore worth of GMV for our merchants — A sneak peek into Juspay payment router", medium.com, March 23, 2021, Accessed September 04, 2023, https://juspayproducts.medium.com/how-we-saved-inr-2000-crore-worth-of-gmv-for-our-merchants-a-sneak-peek-into-juspay-payment-989fbe72208e

22 PwC, "Chatbot: The intelligent banking assistant", PwC.in, Accessed September 04, 2023, https://www.pwc.in/industries/financial-services/fintech/fintech-insights/chatbot-the-intelligent-banking-assistant.html

1.4. Industry initiatives to build AI capabilities for payments

The rapid development in AI-powered payments has resulted from concerted efforts from various stakeholders, including the government, quasi-government bodies, regulators, and financial service providers. These stakeholders have collectively helped pave the path to India's digital highways**.**
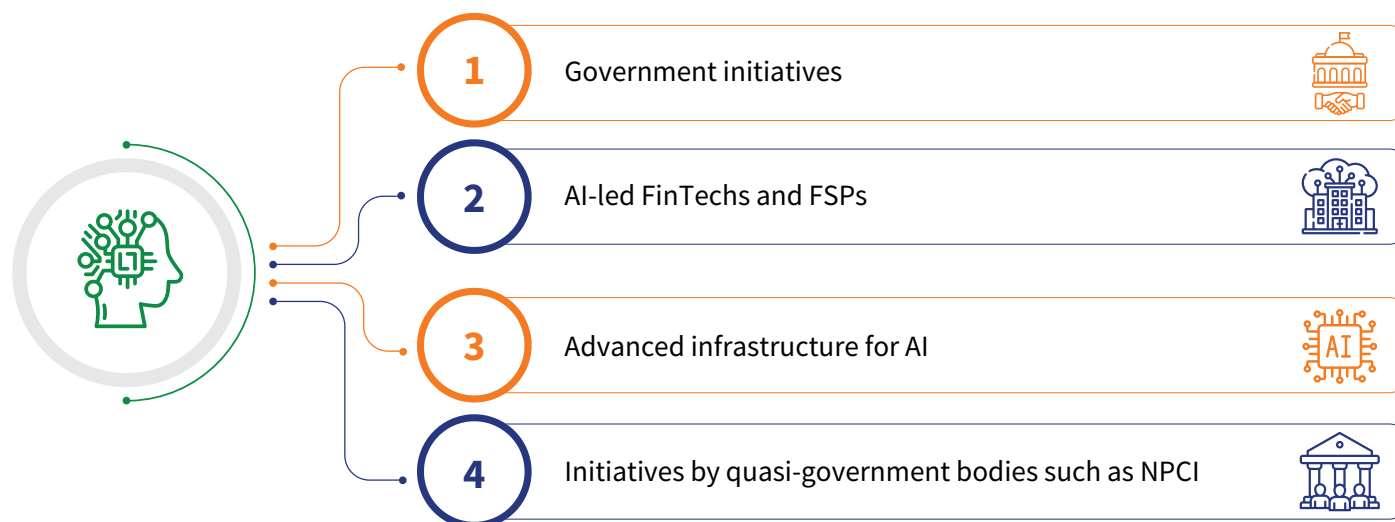
1	Government initiatives
2	AI-led FinTechs and FSPs
3	Advanced infrastructure for AI
4	Initiatives by quasi-government bodies such as NPCI

Fig 5: Key stakeholders and their initiatives to build AI capabilities for payments

Government initiatives:

Government and regulatory bodies have taken several initiatives to enable stakeholders to use AI capabilities. In 2018, the Ministry of Commerce and Industry set up an AI task force[23] that recognizes AI as a key tool to help expand the digitization of payments and enable financial inclusion. With the rise in digital payments, diverse stakeholders, including FinTechs and payment aggregators have entered the payments ecosystem. NITI Aayog has recognized the entry of these new players and has been developing a framework for the responsible use of AI[24] by FSPs in payments to ensure the protection of customer interests. Government initiatives to proliferate AI in payments are not limited to policy initiatives—they also include the development of a conducive acceptance infrastructure.

AI-led FinTechs and FSPs:

Tech-based conglomerates and FinTechs in India intend to use AI for different use cases. With the use of AI, they can improve customer convenience, boost operational efficiency, build customer stickiness, and create differentiated products, among others. Market estimates show that investors have funneled more than USD 3.2 billion[25] in FinTechs that work on AI-led solutions for financial services, including payments. The AI-backed innovation to develop products and designing services set precedence for other similar players. This would help maintain the momentum of constant innovation.

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23 DPIIT, "Report of Task Force on Artificial Intelligence" Accessed September 04, 2023, https://dpiit.gov.in/sites/default/files/Report_of_Task_Force_on_ArtificialIntelligence_20March2018_2.pdf

24 NITI Aayog, "National Strategy for Artificial Intelligence", July 21, 2020, Accessed September 04, 2023, https://niti.gov.in/sites/default/files/2020-07/Responsible-AI.pdf

25 India Stack, Accessed September 04, 2023, https://indiastack.org/

Advanced infrastructure for AI:

The acceptance infrastructure for payments in India serves as the foundational framework to develop AI solutions for payments. This includes key government initiatives, such as the IndiaStack[26] , which provides a base of identity, payments, and data-sharing pathways for payment service providers to develop innovative solutions. FinTechs, banks, and payment service providers have used AI capabilities along with IndiaStack[27] to reduce fraud in payments and enable frictionless payments for retail and business payments. As payment systems evolve, it underscores the need to develop data infrastructure[28] to encourage the adoption of AI in payments.

Artificial Intelligence for Bharat (AI4BHARAT) Lab:

AI4Bharat is a research lab at IIT Madras that seeks to develop open-source datasets, tools, models, and applications for Indian languages. The lab works to curate and create the largest public datasets and benchmarks across 22 scheduled languages of India. The lab works across a range of innovative areas that include translation, transliteration, speech recognition, language understanding, language generation, sign language, and text-to-speech conversion. So far, the lab has developed three main applications:

Shoonya: is an open-source platform to improve the efficiency of language work in Indian languages with AI tools and custom-built UI interfaces and features. It focuses on the translation of data types such as text, speech, images, and conversations.

Chitralekha: It is an open-source tool for AI-assisted video subtitles and translation with a focus on educational and media content.

Anuvaad: It is an open-source tool for document-level translation with neural machine translation (NMT) and transliteration support.

In 2022, MeitY launched Bhashini (Bhasha Interface for India)[29], a large open-source dataset and model that can evolve into a shared repository for multiple use cases across industries. Bhashini is part of one of India's most ambitious missions, the National Language Translation Mission (NLTM). Bhashini is an AI-enabled multi-language translation tool that can potentially provide the requisite infrastructure and datasets to ensure a seamless flow of payments.

The platform has a separate section called "Bhasadaan," which allows individuals to contribute to crowdsourcing languages in various ways. Some of the ways include Suno India, Likho India, Bolo India, and Dekho India. Users can select a language in which they are proficient and then they can type, speak, and validate texts transcribed or audio clips contributed by other users.

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26 India Stack, Accessed September 04, 2023, https://indiastack.org/

27 IRDBT, AI in Banking; A primer, July 2022, Accessed September 04, 2023, https://www.idrbt.ac.in/wp-content/uploads/2022/07/AI_2020.pdf

28 NASSCOM, "Unlocking value from data and AI", August 2020, Accessed September 04, 2023, https://nasscom.in/knowledge-center/publications/unlocking-value-data-and-ai-india-opportunity

29 MeitY, Press Information Bureau, Digital India BHASHINI - India's AI-led language translation platform, August 26, 2022, Accessed September 04, 2023, https://static.pib.gov.in/WriteReadData/specificdocs/documents/2022/aug/doc202282696201.pdf

Initiatives by quasi-government bodies such as NPCI:

The National Payments Corporation of India (NPCI) has been at the forefront to revolutionize retail payments and bring about a paradigm shift in how digital payment solutions reach the masses through efforts to build an open and secure digital infrastructure.

NPCI is also leading initiatives to bring AI-powered smart, frictionless, and convenient payment experiences to users. In 2020, NPCI launched the AI-powered chatbot PAi[30] to improve awareness of digital payment products and assist customers with their queries and concerns. It has also been working to develop[31] an AI-powered financial fraud detection model to empower millions of users to conduct digital transactions confidently without the fear of online phishing.

NPCI has been working with a range of industry stakeholders including IIT Madras, AI4BHARAT lab, and Bhashini, to offer a seamless payment experience to users in their preferred language.

In March 2022, NPCI launched UPI 123Pay[32] along with the RBI as part of its continuous endeavor to make digital payments inclusive. NPCI used Bhashini to develop UPI 123Pay, and it is the only payment product that allows self-initiated digital payments in a range of local languages, including English, Hindi, Bengali, Malayalam, and Tamil.

This disruptive solution allows feature phone users who lack Internet connectivity to use UPI and perform various financial and non-financial transactions through four channels: 1) Phone network or IVR, 2) STK toolkit (app embedded in the SIM on feature phone), 3) Proximity sound-based payments, 4) Missed call-based payments.

Through UPI 123Pay, users can easily initiate a range of payment use cases that include peer-to-peer (P2P), person-to-merchant (P2M), utility bill payments, mobile recharge, and loan repayments. The use cases under UPI 123Pay open vistas of opportunity for the digitally underserved segment to join the financial mainstream. While smartphone users can also use UPI 123Pay, its primary target market comprises the feature phone users who remain underserved.

While the product is still at a nascent stage and the road to scaling up is long, UPI 123Pay is a breakthrough that removes the underserved segment's prerequisite barriers to going digital. Moreover, with RBI's support, NPCI is now launching a solution on "Conversational Payments on UPI[33] to promote inclusivity of payments and improve convenience for the mass market through cutting-edge technology. The solution integrates the power of AI with UPI to allow users to conduct transactions through voice-based inputs.

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30 NPCI "UPI product statistics" NPCI.org.in. Accessed September 04, 2023, https://www.npci.org.in/what-we-do/upi/product-overview

31 NPCI "AePS product statistics" NPCI.org.in. Accessed September 04, 2023, https://www.npci.org.in/what-we-do/aeps/product-overview

32 NPCI "BAP product statistics" NPCI.org.in. Accessed September 04, 2023, https://www.npci.org.in/what-we-do/bhim-aadhaar/product-overview

33 NPCI "Bharat BillPay statistics" Bharatbillpay.com. Accessed September 04, 2023, https://www.bharatbillpay.com/

2. "Conversational Payments on UPI": Building inroads to next-generation payment solutions

Approximately 25 million villages[34] in India lack access to the Internet even today, and more than 370 million people countrywide use a feature phone. These users primarily rely on cash for payments and have limited avenues to transact digitally.

They depend mostly on physical access points, such as business correspondent (BC) agents or Lok Seva Kendra (LSKs) for basic financial services that include balance inquiry and money transfer. Users incur transaction costs for such assisted transactions. Those who live in remote areas and difficult geographical terrain may often incur additional costs on top of the transaction cost. This includes several tangible and intangible costs, such as waiting time, transaction charges, cost of transit, and the effort involved to access cash, among others.

Network connectivity is critical to most existing digital payment solutions in India. The quality of service in unserved and underserved areas for mobile Internet and broadband is patchier than urban areas. Low network quality is corroborated by the fact that a mere 20%[35] of the country's rural population can access the Internet for digital transactions compared to nearly 65% of urban users. Several studies[36] by MSC suggest that low- and moderate-income (LMI)[37] users are aware of digital modes and are willing to try them.

However, lack of access to enabling infrastructure, such as access to mobile phones and Internet connectivity, coupled with limited digital literacy, have limited digital payments largely to smartphone users. Further, the lack of safe and robust offline solutions to overcome this reliance on the Internet limits consumer adoption.

NPCI conceptualized the "Conversational Payments on UPI" solution to make digital payments easy, accessible, and safe for users. Conversations help initiate payments; they are crucial across each leg of the payment process. Every payment a user initiates including person-to-person or person-to-merchant starts with a conversation. The idea of imbibing one of the critical aspects of payments; conversation coupled with an AI-powered solution has opened gateways to democratize digital payments for millions of users. While the solution will ride along the lines of UPI 123Pay, it eliminates the need for text-based inputs and instead relies solely on voice-based inputs.

34 Sana Ali, "Over 25,000 villages lack mobile connectivity, govt data shows" businesstoday.in, February 03, 2022, Accessed September 04, 2023, https://www.businesstoday.in/industry/telecom/story/over-25000-villages-lack-mobile-connectivity-govt-data-shows-321376-2022-02-03

35 Rohit Kumar, "Why Bridging The Digital Gap In Rural India Is Extremely Important" Inc42.com, February 14, 2021, Accessed September 04, 2023, https://inc42.com/resources/why-bridging-the-digital-gap-in-rural-india-is-extremely-important/

36 Saloni Tandon et.al "What does it take to nudge low- and moderate-income (LMI) population segments to adopt DFS?" microsave.net, November 2020, Accessed September 04, 2023, https://www.microsave.net/2020/11/09/what-does-it-take-to-nudge-low-and-moderate-incomelmi-population-segments-to-adopt-dfs/

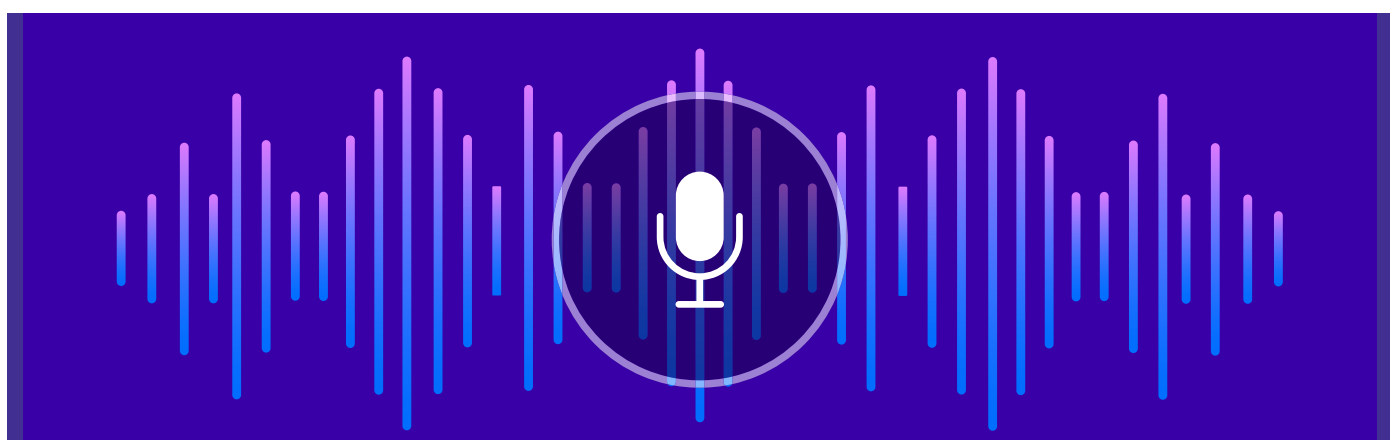37 MicroSave, "How digital payments drive financial inclusion in India" September 20, 2022, Accessed September 04, 2023, https://www.microsave.net/2022/09/20/how-digital-payments-drive-financial-inclusion-in-india/

2.1. Voice is the new data that empowers voices with conversational payments

Voice-enabled digital assistants have covered almost every aspect of mobile technology. People now use digital assistants to set reminders, check the weather, and make purchase decisions, among other uses. The voice technology industry in India has gained significant momentum as it has been growing at a CAGR of 41%[38], whereas voice search queries have grown at a rapid pace of 270%[39] per year. The use of voice search is on the rise in India, and platforms, such as Alexa[40], Google Assistant[41], and Hello Jio[42] search, have seen phenomenal growth. Jio Voice already allows feature phone users to use Jio voice assistant to set alarms, call, and type messages, among other functions. All this has been possible through NLP. Voice assistants such as Alexa, and Google Assistant work based on AI-enhanced voice recognition technology. Under this model, human speech is first converted from analog to digital form. The machine then receives, interprets, understands, and performs based on the intent suggested by a user in their speech (conversation).

The boom in AI and the growing need for multilingual voice-based assistance have created a huge demand for datasets—a collection of texts and voice data spoken and read by some of the poorest people in the world. The rising demand for datasets has empowered millions as they possess a newly valuable asset—their voice. Various language-as-a-service (LaaS) startups, such as Karya[43], Reverie[44], and Vokal[45], among others, are examples of players that have made strides in the voice and text data collection field.

NPCI intends to collaborate with several industry players to bring this voice-enabled convenience to the payments industry through its "Conversational Payments on UPI" solution. The solution will use NLP-driven voice recognition technology to process payments. In simple words, conversational payment is a process in which the user speaks to an AI-powered device, such as a smartphone, and requests it to conduct payments. The device understands users' intent through the voice recognition model, completes the payments, and responds with confirmation. NPCI is all set to redefine the future of inclusive payments through the solution that rides on the UPI architecture at the backend, coupled with technology components such as generative AI, machine learning, and NLP.

38 WAT Consult, "Voice technology in India; now and future", Accessed September 04, 2023 https://www.watconsult.com/watinsights/voice/#:~:text=Speech%20and%20voice%20recognition%20technology,a%20growth%20of%202.8x.

39 Saumya Tewari, "Voice search queries in India are growing at 270% per year: Report" Limemint.com, April 23, 2021, Accessed September 04, 2023, https://www.livemint.com/technology/tech-news/voice-search-queries-in-india-are-growing-at-270-per-year-report-11619166188074.html

40 Amazon, "Alexa" Accessed September 04, 2023, https://www.alexa.com/

41 Google, "Google Assistant" Accessed September 04, 2023, https://assistant.google.com/

42 Jio, "Hello Jio" Accessed September 04, 2023, https://www.jio.com/help/watch-and-learn/devices/jiophone/voice-assistant-feature-in-jiophone-next#/

43 Karya, Accessed September 04, 2023, https://www.karya.in/about.html

44 Reverie, Accessed September 04, 2023, https://reverieinc.com/

45 Vokal, Accessed September 04, 2023, https://www.vokal.in/

A user will no longer need to read or enter input manually to transact. They can instead speak to the AI-powered solution to complete payments. The solution will be available through two modes: on-call (through a voice call), and in-app (through any UPI app):

1. **On-call:** The on-call feature will let users dial a number where the user will be greeted and guided through IVR to complete the payment process.

2. **In-app:** The in-app facility will allow users to use their voice inputs on any UPI app to conduct a payment. This service will be layered on top of the current APK of UPI apps. Consequently, the device will recognize the verbal request, and respond to the request.

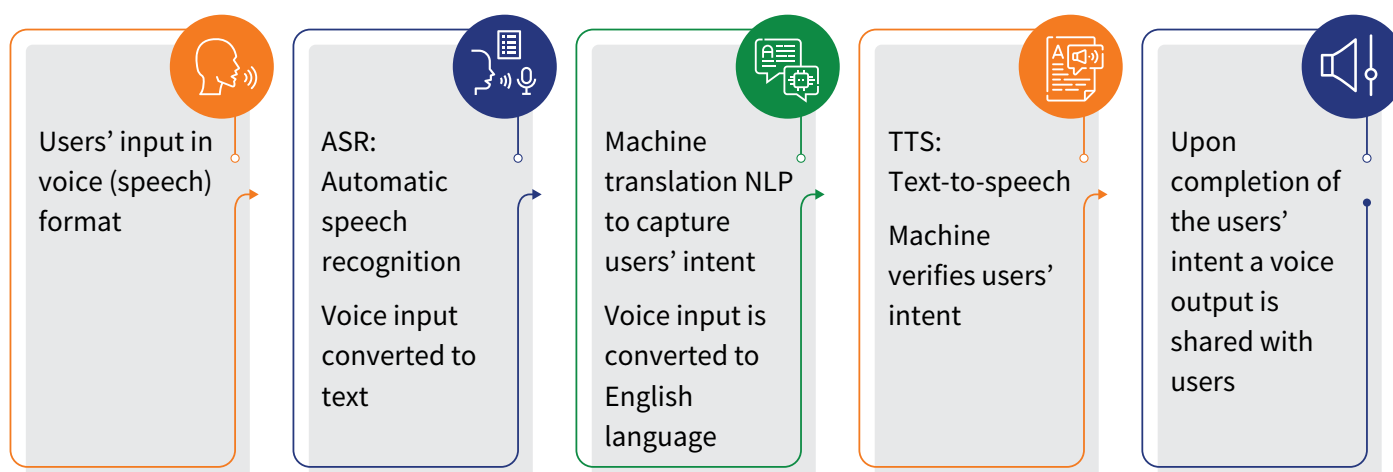| Users' input in voice (speech) format	ASR: Automatic speech recognition Voice input converted to text	Machine translation NLP to capture users' intent Voice input is converted to English language	TTS: Text-to-speech Machine verifies users' intent	Upon completion of the users' intent a voice output is shared with users

Fig 6: Workflow of the AI-based conversational payments

The assortment of voice datasets fed at the backend will fuel the efficacy of the system on which the solution is based. The more voice-based data is fed to the AI, the more it gains precision to comprehend the conversation leading to an improved customer experience. For instance, if a user converses with the solution to check their account balance, the AI identifies the user's intent through keywords, such as "balance" or "inquiry," cross-references it against the data at the backend, and runs an algorithm to complete the user's request. If the solution successfully fetches the user's account balance, the algorithm at the backend becomes a template for the solution. With each iteration, the AI learns independently and becomes better at completing the user's request.

For digitally proficient users who largely prefer quick payment modes, such as UPI, "Conversational Payments on UPI" will further improve convenience for them. On average, Google Assistant queries are 200 times[46] more conversational and 40 times more action-oriented than queries in the Google search bar. This indicates that the introduction of "Conversational Payments on UPI" will provide impetus to the growing preference for digital payments among users.

Moreover, "Conversational Payments on UPI" will bring into the fold of digital payments the next half billion users who are constrained by the lack of smartphones, Internet connectivity, and limited digital literacy. Most LMI users find digital interfaces overwhelming and consider themselves ill-equipped to understand digital processes. Voice-based handholding support in the preferred language will empower millions of users to conduct their first-ever digital transaction.

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46 MMA Global, "The Voice Playbook 2021, April 2021", Accessed September 04, 2023 https://www.mmaglobal.com/documents/voice-play-book-mma-ammp-voice-audio-initiative

2.2. Opportunities for the growth of "Conversational Payments on UPI" solution to disrupt the payment landscape

Globally, the usage of conversational AI has gained significant momentum. This is evident from the rising usage of voice assistants that help carry out day-to-day activities. The figure below highlights some global trends observed in voice assistants and conversational AI:

Every day ~ 7 billion voice messages are exchanged by WhatsApp users across the globe

Source: TechCrunch; People are sending 7 billion voice messages on WhatsApp

Globally, 500 million users use voice assistant. English is the most preferred language for using voice assistant closely followed by Hindi.

Source: Insider Intelligence; Conversational AI usage expand

In the USA alone, ~ 123 million users prefer to use voice assistant. Among these, over 66% of the users fall under the age bracket of 25-34 years.

Source: Insider intelligence; Voice Assistant: Growth & future of the AI
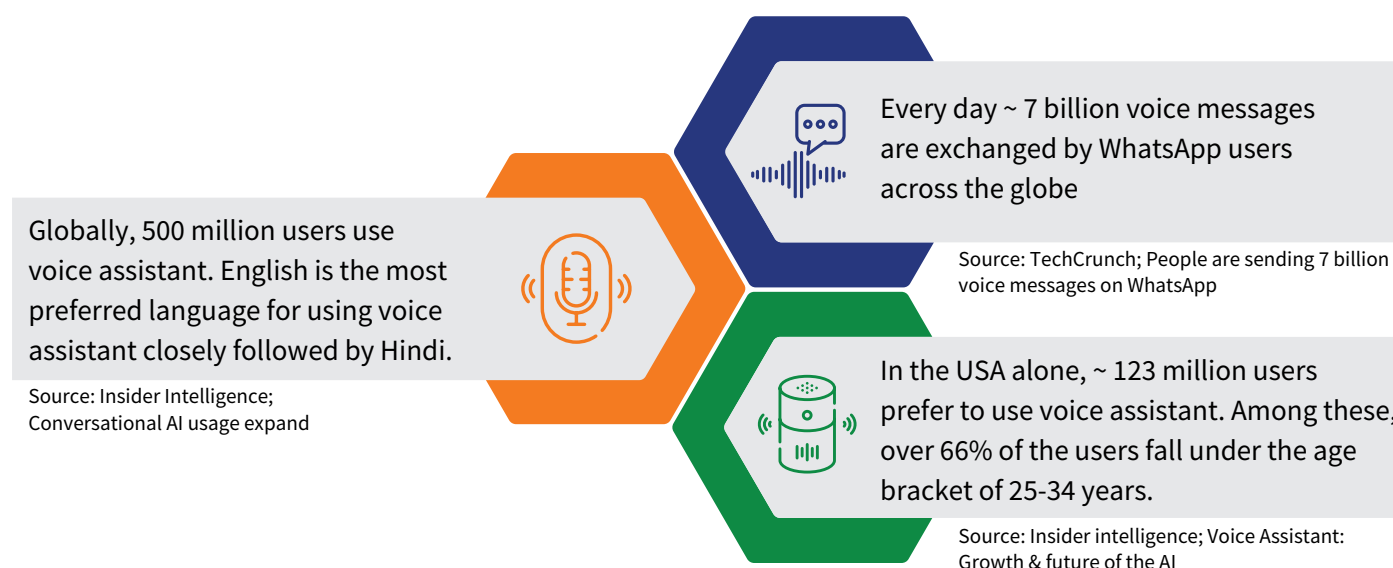
Fig 7: Global trends in the usage of conversational AI

The rise of voice assistants and conversational AI is observed in India as well highlighting the potential for the growth of conversational payments. However, demographically, India is a vastly heterogeneous country with different groups of people that each possess distinct characteristics. Each user is different, based on a combination of factors, such as socio-demographic influences, digital proficiency, and financial lives, among others.

The market currently has a variety of digital payment products available that intend to cater to different types of LMI users. However, a huge vacuum persists in stakeholders' understanding of LMI users' digital payment needs. Even LMI users have different user sub-groups, and for the same financial product, each user traverses a unique customer journey depending on these factors.

Consequently, some of the sub-groups have remained underserved for several decades now. These challenges allow FSPs to design need-based, safe, and robust payment solutions. The "Conversational Payments on UPI" solution offers a promising pathway to bring millions of underserved users into the folds of digital payments. The solution intends to bridge the digital payments gap for 114 million households in India at the bottom of the pyramid. These users largely reside in rural or peri-urban areas and earn less than INR 100,000 annually. Some sub-groups that can be financially included through this solution are:

"Oral" segments:

Despite the efforts undertaken by the government and other stakeholders to close the education gap in India, almost a fifth of the country's population (~287 million[47] adults) are still illiterate. Among them, some have basic numeracy, some have financial numeracy, while others have oral numeracy. Further, millions of neo-literate individuals find it challenging to read and write[48]. The users from this segment are not confident with digital payment modes to conduct transactions. The under-penetrated digital payments market presents a significant opportunity for FSPs to drive digital transactions based on a range of innovative and inclusive payment products that go beyond intuitive interfaces.

Users who speak specific dialects:

The Eighth schedule of the Indian Constitution officially identifies 22 languages[49]. India is home to 19,500 dialects and 121 languages. While languages have textual scripts, dialects exist merely in spoken form. Usually, dialects are spoken by a specific group of users in a specific region. For instance, Khasi is spoken by a group of tribals of Meghalaya, whereas Agnika is primarily spoken in the south-eastern part of Bihar. These users are part of a close-knit community located in remote parts of the country that speak and understand only a specific dialect. However, most digital payment apps are designed in English and Hindi, or at best in common regional languages that see prominent use[50]. This leaves out other less prominent languages. Moreover, oral dialects pose a challenge for developers to design interfaces in languages for which documented textual scripts do not exist.

Next half billion users:

While smartphone penetration has improved in India, a large chunk of the population still prefers to use a feature phone. Overall, India's rural areas have around 268 million feature phone users. For some users, the phone might be a secondary device, but for the majority, their feature phone is their only digital device. These users do not wish to transition to a smartphone[51] anytime soon. They prefer feature phones for various reasons, such as long battery life, lack of funds to buy a smartphone, and low utility for smartphones based on their personal needs. Limited exposure to digital interfaces and the low availability of convenient digital solutions compatible with feature phones are the key reasons for this segment's high preference for cash.

While these are a few sub-groups that could be identified and accounted for under the underserved category, India has many other sub-groups, such as the visually impaired and homemakers in rural areas for whom traditional digital payment products do not work. The "Conversational Payments on UPI" solution can potentially serve the mass market adequately. By keeping users' voices at the center, "Conversational payments" can unlock the digital ecosystem for underserved users.

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47 Know India, Accessed September 04, 2023, https://knowindia.india.gov.in/profile/literacy.php

48 Jignesh Parmar, "42,000 students of AMC schools can't read, write" Timesofindia.com, June 07, 2023, Accessed September 04, 2023, https://timesofindia.indiatimes.com/city/ahmedabad/42000-students-of-amc-schools-cant-read-write/articleshow/100806021.cms?-from=mdr

49 Department of Official Languages, "Languages Included in the Eighth Schedule of the Indian Constitution" Accessed September 04, 2023, https://rajbhasha.gov.in/en/languages-included-eighth-schedule-indian-constitution

50 Shikha Goyal, "10 Most Spoken Languages in India by Number of Speakers" JagramJosh.com June 03, 2021, Accessed September 04, 2023, https://www.jagranjosh.com/general-knowledge/most-spoken-languages-in-india-by-number-of-speakers-1541764100-1

51 "Smartphone sales plateau in rural areas; Nvidia nears $1 trillion market cap riding AI wave", economictimes.com, May 29, 2023, Accessed September 04, 2023, https://economictimes.indiatimes.com/tech/newsletters/tech-top-5/smartphone-sales-plateau-in-rural-areas-nvidia-nears-1-trillion-market-cap-riding-ai-wave/articleshow/100594792.cms?from=mdr

A scalable solution for this large, unpenetrated market can lead to the adoption of digital payments and technology for those at the bottom of the pyramid. However, FSPs must ensure the solution is inclusive and adequately caters to the underserved market alongside the digitally savvy users. FSPs must keep inclusivity as their cornerstone when they design solutions based on conversational AI.

3. The future of conversational payments in India

The introduction of conversational payments is poised to strengthen India's leadership in the financial services sector. The integration of AI into the Unified Payments Interface (UPI) ecosystem through conversational payments is expected to accelerate the adoption of digital payments in India. This solution is empowered by its remarkable proficiency to understand and engage in natural language and can cater to a multitude of languages and dialects in a nation as culturally diverse as India, where linguistic variations are plenty. It can expand the reach of digital transactions to a wider spectrum of users.

The launch of "Conversational Payments on UPI" by RBI and NPCI also aligns with RBI's commitment to foster financial inclusion and technological innovation. Through this innovative solution, the RBI seeks to streamline payments and broaden its reach to a more diverse audience.

Players, such as Google Pay[52], Paytm[53], and PhonePe[54], among others, have integrated components of conversational AI into their platforms. This integration enables users to perform tasks. They can send money, settle bills, and conduct purchases using natural language-based interactions. These interfaces are designed for ease of use and have played a significant role to drive the adoption of digital payments across diverse user groups. The ecosystem seems conducive for conversational payments to gain momentum, with the increasing prevalence of smartphones, expanding Internet accessibility, increasing technological advancements, and governmental focus on promoting digital transactions.

As people become more comfortable with voice and text interfaces for transactions, the volume of conversational payments could increase across various sectors, including retail, e-commerce, bill payments, and more. In India, since a significant portion of the population engages in small-value transactions, the aggregate value of transactions conducted through conversational payments could be substantial. With the potential integration of conversational payments into retail, bill payments, travel, and other areas, the cumulative value of these transactions could grow over time. Additionally, the adoption of conversational payments could receive a further boost from factors, such as the integration of value-added services, partnerships, and innovations in the payments ecosystem.

Besides these, a few other factors could influence the growth of conversational payments in India:

- Improved digital literacy: As digital literacy and familiarity with digital payment methods increase, more people may adopt conversational payments.
- Technological advancements: Improvements in natural language processing (NLP) and voice recognition technologies could enhance the user experience to drive higher adoption.
- Industry adoption and competition: The extent to which businesses and industries integrate conversational payment options into their services can significantly impact the growth of conversational payments. Moreover, strong competition among payment providers and technology companies could lead to further innovations in the solution to drive growth.
- Changes in the regulatory environment: Regulatory frameworks that encourage innovation while ensuring consumer protection and data privacy could impact the growth of conversational payments.
- Superior user experience: An intuitive and user-friendly conversational payment experience could drive repeat usage and larger transaction volumes.

52 Google Pay, "About Google Pay" Accessed September 04, 2023, https://pay.google.com/about/

53 Paytm, "About Paytm" Accessed September 04, 2023, https://paytm.com/

54 PhonePe, "About PhonePe" Accessed September 04, 2023, https://www.phonepe.com/

3.1 Potential applications for conversational payments in India

Conversational payments offer a wide range of potential use cases in India because of the country's growing digital landscape and linguistic diversity. AI-powered voice conversations can support a range of digital payments including card payments, cross-border remittances, and P2P and P2M payments in a frictionless manner. Integration of the conversational payments solution with other service platforms can significantly improve the transaction experience for users. Here are some key use cases where conversational payments could create a significant impact:

Entertainment and OTT services

Users can purchase movie tickets, access streaming services, and pay for event tickets just by using voice-based inputs

Financial transactions

Users can undertake P2P, P2M transactions, utility bill payments, mobile recharge, insurance premium payments, loan repayments, etc. through conversational payments

Wealth management

Users can inquire about their investment portfolios, make stock trades, or set up automated savings transfers through conversational interactions

E-commerce transactions

Integration into e-commerce platforms can allow users to browse products, add them to their carts, and make purchases through voice interactions

Merchant payments and accounting

Small business owners can use conversational payments to manage invoicing, process payments, and track financial transactions.

Healthcare services

Conversational payments can be used to schedule appointments, pay for medical services, and order prescription medications, to enhance the efficiency of healthcare services

Government services

Citizens can use conversational payments to pay taxes, fines, and fees for government services, which would save them time and effort.

Public transportation

Conversational payments can facilitate payments for public transportation services, such as buses, trains, and metro systems, to make commuting more seamless.
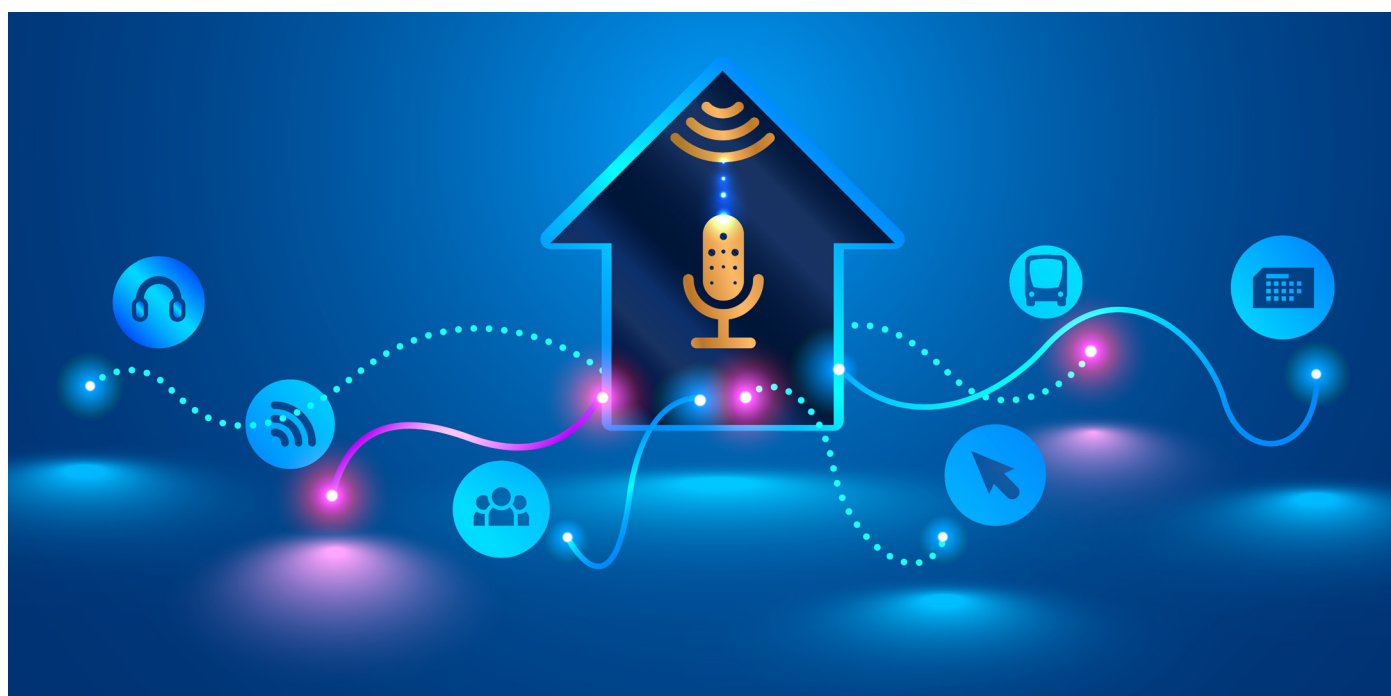
Fig 8: Potential use cases of conversational payments

Moreover, NPCI is also exploring the feasibility of using conversational payments for IoT devices such as Amazon Echo, Amazon Fire Stick, etc. This will allow users to use voice commands to conduct payments through these devices.

Despite the growing popularity of conversational AI, stakeholders need to be mindful of a few concerns around its use in payments:

a. Security concerns: Conversational payments involve sensitive financial data, which makes them susceptible to fraud, hacking, and data breaches. This is a big risk and user concern as is evident from KPMG's 2023 survey[55] on Generative AI. The survey results showed that the majority of respondents rate privacy concerns with personal data (63%), cybersecurity (62%), and legal, copyright, and intellectual property issues (61%) as the top three risk concerns around the implementation of AI capabilities in their business.

b. Misinterpretation of information: Misinterpretation of user intent by AI-powered systems can lead to incorrect transactions. Enhancing the accuracy of natural language processing to minimize errors is critical.

c. Limited user trust: Most users in rural areas lack trust in digital applications, especially self-initiated ones. They fear loss of money due to online fraud or their limited capability to understand the processes. Users must be educated about the potential risks, security protocols, and proper usage of conversational payment platforms to tackle this and prevent misuse and loss of funds through online and offline channels.

d. Handling complex conversations: Currently, most voice-based or virtual assistants struggle to handle complex conversations. The assistants cannot easily understand multiple conversations at the same time, accept multiple commands in a single sentence, handle multi-topic conversations, differentiate between who is speaking, and detect repetition to avoid recording duplicate data. Data redundancy and ghost identities[56] are likely to pollute the data in both singular and multiple languages.

55 KPMG, "KPMG Generative AI surve 2023" KPMG.in, 2023, Accessed September 04, 2023 https://advisory-marketing.us.kpmg.com/speed/genai2023.html#:~:text=Generative%20AI%20continues%20to%20be,the%20next%2012%2D18%20months.

56 Ricardo Baeza-Yates, "Challenges In Conversational AI And What We Can Do To Prevent Them", forbes.com, July 30, 2019, Accessed September 04, 2023, https://www.forbes.com/sites/forbestechcouncil/2019/07/30/challenges-in-conversational-ai-and-what-we-can-do-to-prevent-them/?sh=78bbf65c1fd1

3.2 Key design principles for developing solutions based on conversational AI

While stakeholders need to keep these challenges in mind while developing solutions integrated with conversational payments, how likely users are to adopt any new digital payment products depends on a lot of factors. These include product utility, cost of conducting payments, and convenience offered, among others. We have captured crucial design principles FSPs must consider when they design conversational AI-based products (based on our LEADSS principles, as outlined below). These design principles define the different aspects of product designing, marketing, and positioning that would affect users' motivation to kickstart their usage of digital payments and take a leap toward next-generation payments.
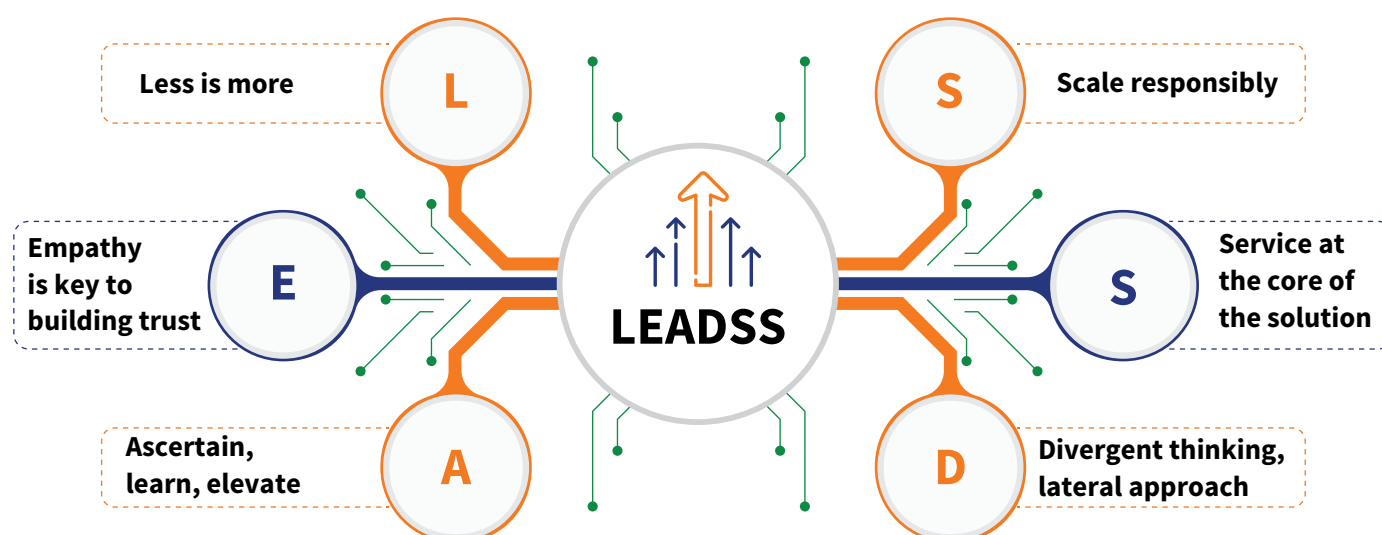

Fig 9: Design principle framework for conversational AI solutions

Principle 1: Less (L) is more

Creativity is subjective, which is why everyone interprets design differently. So, the users must be able to easily understand the FSP's solution as per its intended purpose. Every user traverses a unique customer journey based on a combination of factors, such as digital literacy, previous experience of using digital products, and cognitive abilities, among others. FSPs must ascribe to target users' perspectives to ensure inclusivity.

- The "Conversational payment" solution should be able to understand users who speak different dialects and not just mainstream languages.
- The solution should accept all types of user input in the choice of language. For instance, the solution should be able to capture numeric and colloquial words in the users' preferred language.
- The solution should provide users a preview of the entire payment, prerequisites to complete the transaction, the total number of steps involved, and where they currently are on their journey.
- The solution should avoid complex or nested communication flow. It should use colloquial terms. The conversation must be simple and action-seeking to help users easily understand the next steps they need to take to complete the payments. Illiterate or semi-literate users struggle to pronounce English words accurately. The solution should match the user's input with the existing data in the database. For accuracy, the solution may ask users to confirm: "Did you mean….?"
- The solution should confirm and reaffirm users' steps to build trust and confidence in the product. In case of any erroneous entry, it should provide more details about the error and the incorrect entry so that the user can refine or verify their input accordingly.
- The solution should provide contextual assistance through cues and prompts. For instance, if a user is inactive for a few seconds and cannot proceed, it should prompt relevant examples specific to that transaction stage to help users navigate the process.

Principle 2: Empathy (E) is key to building trust

Empathy means understanding the user's need and working toward it to build trust. Various studies[57] indicate that users who are not digitally savvy often find the digital ecosystem daunting. FSPs should attempt to reduce the effort required to understand the solution. Such efforts will motivate users to try the solution and potentially continue usage.

- The solution should provide evidence for their monetary action through transaction history, past five transactions, and transaction status confirmation messages.
- The solution should offer GRM support, communicate with them about the timelines for resolution, and define a standardized TAT for resolution. These will help build trust among users and ensure customer stickiness.

Principle 3: (A) Ascertain, learn, elevate

The solution should not consider users as a homogenous group of people. The inflection points for users to respond to awareness initiatives might vary. The solution should identify and use different awareness initiatives to build user awareness. It should ascertain which initiatives work for what type of users. FSPs should put their learning into use to build similar collaterals.

- The solution should improve awareness about the solution through a mix of content and channels. It should use Above the Line (ATL) marketing channels, such as Instagram, Facebook, and radio to improve awareness. It should work with ground-up financial and non-financial social institutions for better reach.
- The solution should develop collaterals in the regional language and use visual artifacts to build users' familiarity.
- The solution should highlight two key features across promotional collaterals—payments without Internet connectivity and the solution's payment compatibility, even on feature phones.
- The solution should partner with mobile networks, such as Jio, to pre-save the IVR number, especially on the feature phone. This will pique user interest and motivate them to try the solution.

57 Saloni Tandon Et al, "What does it take to nudge low- and moderate-income(LMI) population segments to adopt DFS" microsave.net, November 09, 2020, Accessed September 04, 2023, https://www.microsave.net/2020/11/09/what-does-it-take-to-nudge-low-and-moderate-incomelmi-population-segments-to-adopt-dfs/

Principle 4: (D) Divergent thinking, lateral approach

The solution should expand to include "out of the box" ideas. The idea of lateral thinking goes beyond pattern, color, and form; it is the act of planning to serve others. To serve better, it becomes imperative to understand users' perspectives about the product, associated biases, and conflicts. Acknowledging these biases is a potential first step to reduce the friction between users and product adoption. If the suggestions around the above four principles are implemented suitably, the concerns around users and biases will be resolved.

- The solution should position conversational payments as a trusted digital mode to conduct payments. It would subdue the biases, such as the lack of association of digital payments with feature phones and the notion that IVR-based payments are clunky and time-taking.

- The solution should position conversational payments as a step closer to the next generation of payments. FSPs should use words, such as voice, speaking, and payments during demonstration to help users better understand the solution. The solution name and its logo should reflect the Indianized context and convenient experience. It should use its "Made in India" credentials to position itself as a safe and secure mode of digital payments.

Principle 5: (S) Service at the solution's core

The conversational payment solution would be a first-of-its-kind experience for users. It may take users some time to get accustomed to the solution. FSPs should offer a robust support mechanism to offer users a seamless experience. If users face any challenges, timely responses and a quick resolution mechanism would also improve users' likelihood to try the solution again.

- The solution should Identify physical touchpoints where users usually reach out for assistance with financial transactions. Even though conversational payment products are self-assisted, FSPs should offer handholding support to users at these touch points through BC agents and bank branch officials. The double-layer support will further improve convenience for users and help build their awareness.

Principle 6: (S) Scale responsibly

- The exponential growth of digital payments has spurred the need to protect users' voice data and privacy to avoid associated risks. AI-backed voice payment solutions intend to cater to the underserved segment. However, this segment is also most vulnerable to financial risks and fraud. A few AI-powered voice assistant firms are already under scrutiny and face lawsuits amid invasive voice data collection and privacy breaches.

- Such incidents call for regulatory guidelines to safeguard users' privacy. Robust regulatory ecosystems are essential to ensure responsible innovation in the payments space. FSPs should monitor existing regulations closely to ensure the solution adheres to compliances and regulations and scale up responsibly.

- The solution should seek user consent before it stores personal information. The consent artifact must be inclusive. It should focus on designing an explicit, informed, and revocable consent management system that less digitally savvy users can understand and use with ease.

- The solution should provide users with a complete overview of how their voice data is processed and used. The data fiduciary will help to provide this information transparently.

If the solution needs to store users' data for future use, users should have control over the data. This means users should be allowed to erase data in case of financial phishing or when they no longer use the solution.

From conversing to engaging

Conversational payments in India are at a transformative juncture, driven by the convergence of digital payment adoption and AI technology. With technological improvements on the way, we must understand that success with conversational payments depends on more than technology. Good experience design, informed by behavioral science, is crucial.

While concerns around security, accuracy, and adoption persist, conversational payments have enough potential to revolutionize India's payments space even further.

As conversational AI technology continues to evolve and adapt to India's unique linguistic and cultural diversity, the potential use cases for conversational payments will likely expand further to revolutionize how people conduct financial transactions in the country. Stakeholders must collaborate to realize the full potential of conversational payments, to ensure security, usability, and accessibility while embracing advancements that enhance the user experience.

Abbreviations

Abbreviation	Full form
AePS	Aadhaar-enabled Payment Systems
AI	Artificial Intelligence
BAP	BHIM Aadhaar Pay
BBPS	Bharat Bill Payment System
BC	Business Correspondent
Bhashini	Bhasha Interface for India
CAGR	Compound Annual Growth Rate
FSP	Financial Service Providers
FY	Financial Year
GAN	Generative Adversarial Networks
IoT	Internet of Things
IVR	Interactive Voice Response
LaaS	Language-as-a-service
LMI	Low-and middle-income households
LSK	Lok Seva Kendra
MeitY	Ministry of electronics and information technology
ML	Machine Learning
NITI Aayog	National Institution for Transforming India
NLP	Natural language processing
NPCI	National Payments Corporation of India
P2M	Person-to-merchant payments
P2P	Person-to-person payments
RBI	Reserve Bank of India
STK	SIM Application Toolkit
UPI	Unified Payments Interface

Glossary

Term	Explanation
Machine learning	Machine learning algorithms use sample data to train computers and use the knowledge to recognize patterns and make predictions based on new, unseen data.
Deep learning	It is a subset of machine learning that uses multiple neural networks to learn from large datasets. It is inspired by the brain's structure to extract complex features and nuances from the input data.
Computer vision	This branch of AI equips computers to extract and interpret meaningful information from images or videos to recognize patterns, shapes, and objects.
Natural Language Processing	NLP combines computer science, linguistics, and machine learning to understand, analyze, and generate human language. It transforms text or speech into structured data that machines can process.
Generative AI	It enables machines to generate new content, such as images, music, and text. Inspired by deep learning, and neural networks, it learns from patterns and structures of large datasets to generate novel outputs, such as texts, images, sound, animation, and data models, among others.
Symbolic learning	It involves representing knowledge and relationships using symbols, enabling the system to manipulate and reason about these symbols to make intelligent decisions and solve complex problems. It focuses on logic, rules, and symbolic representations to mimic human-like reasoning.
Robotics	It is a field of AI applied to design, control, and enhance physical robots, enabling them to perceive their environment, make decisions, and perform tasks autonomously or with human guidance to bridge the gap between the digital and physical worlds.
Image recognition	It is the process of teaching machines to identify and categorize objects, patterns, or features within images, to enable applications, such as facial recognition, object detection, and medical image analysis.
Neural networks	It is a computational model inspired by the human brain, composed of interconnected nodes that process and learn from data to perform tasks, such as pattern recognition and decision-making.
Generative adversarial network (GAN)	It is a type of artificial neural network framework that involves two networks, a generator and a discriminator, which compete against each other to create and assess data, often used for generating realistic images or data.
Statistical learning	It uses statistical techniques to analyze and model data to enable machines to make predictions and decisions based on patterns and probabilities.
Speech recognition	It converts spoken language into text or commands to allow computers and devices to understand and respond to human speech.

Orality	"Orality" refers to the modes of thinking, speaking, and managing information in societies where technologies of literacy (especially writing and print) are unfamiliar to most people.
Translation	Under AI4BHARAT translation refers to open-source datasets and models for neural machine translation between English and 22 indigenous languages.
Transliteration	Under AI4BHARAT transliteration refers to open-source datasets and benchmarks (Aksharantar), models and applications for transliteration between Roman and scripts for 20+ indigenous languages.
Language understanding	Under AI4BHARAT language understanding refers to open-source language models (IndicBERT), benchmarks (IndicGLUE), and entity recognizers (IndicNER) for ten Indian languages.
Language generation	Under AI4BHARAT language generation refers to open-source language model (IndicBART) and benchmarks (IndicNLG Suite) for ten Indian languages.
Speech Recognition	Under AI4BHARAT speech recognition refers to open-source models (IndicWav2Vec) for speech recognition in nine Indian languages.
Sign language	Under AI4BHARAT sign language refers to open-source datasets (INCLUDE, SignCorpus) and models (OpenHands) for sign recognition for ten globally recognized sign languages.

List of figures

Notes

Notes

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