Impact of UPI Digital Payment Services in The Karnataka State Road Transportation Corporation: For Promoting Sustainable Development Goals (SDGs)

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ABSTRACT

Purpose: *The Karnataka State Road Transport Corporation (KSRTC) has decisively adopted the Unified Payment Interface (UPI) for its electronic ticketing machines (ETMs), revolutionizing the ticket purchasing process. KSRTC is an independent corporation established under Section 3 of the Road Transport Corporation Act of 1950, with operations commencing on August 1, 1961. On average, the corporation serves 35.43 lakh passengers each day, generating approximately ₹1,346.75 lakh in traffic revenue per day. Passengers can now buy tickets easily using QR codes and debit or credit cards, ensuring a seamless and convenient experience that aligns with several Sustainable Development Goals (SDGs), including gender equality (SDG 5), decent work and economic growth (SDG 8), industry, innovation and infrastructure (SDG 9), sustainable cities (SDG 11), peace, justice and strong institutions (SDG 16), and partnerships for the goals (SDG 17). This initiative also contributes to the growth of a cashless digital economy. As of October 2024, UPI has achieved remarkable milestones, processing a staggering value of ₹23.49 lakh crore and reaching a transaction volume of 16.58 crore. Its implementation across seven countries showcases its global impact and capacity to stimulate growth in various sectors, including B2B and B2C markets. KSRTC is leading the way by introducing a UPI-based ticketing system in collaboration with Ebix Cash Ltd. across four key divisions: KSRTC, NWKRTC, KKRTC, and BMTC. In the NWKRTC Belagavi division alone, passengers have completed 10.59 lakh payments, demonstrating the system's widespread acceptance. As a state-owned pioneer in transport, KSRTC is among the first corporations in India to implement advanced digital payment solutions in partnership with the FinTech sector. This initiative firmly positions Karnataka at the forefront of the digital economy, driving social progress and advancing towards the Sustainable Development Goals.*
Design/methodology/approach: *The research paper decisively examines both theoretical and empirical studies focused on a case study that highlights the significant impact of UPI digital payment services within the Karnataka State Road Transportation Corporation. It also emphasizes the vital role these services play in promoting sustainability. The analysis of UPI-based ticketing in KSRTC is conducted through the ABCD framework.*
Social Implications: *The research decisively focuses on raising awareness and promoting inclusivity for passengers in both urban and rural areas through the implementation of the UPI digital payment system.*
Type of Paper: *Exploratory Research Paper*
Keywords: Digital Economy; UPI; KSRTC; Sustainable Development Goals (SDGS); FinTech Sectors; ABCD framework

1. INTRODUCTION :

Payments are fundamental to all economic activities. The Unified Payments Interface (UPI), launched in 2016 by the National Payments Corporation of India (NPCI), has revolutionized the payment landscape in the country. UPI consolidates multiple bank accounts into a single mobile interface, allowing for easy, real-time peer-to-peer (P2P) and person-to-merchant (P2M) transactions. The Payments and Settlement Systems Act of 2007 (PSS Act) and the Payment and Settlement System Regulations 2008 have provided the legal framework for regulating payment systems in India. The Reserve Bank of India (RBI) is tasked with overseeing, supervising, and licensing payment system operators to ensure their safety, security, and efficiency. Policies for regulating these payment systems are formulated by the Board for Regulation and Supervision of Payment and Settlement Systems (BPSS), which is chaired by the RBI Governor. The United Press International has created a vibrant market with significant investments. The National Payments Corporation of India (NPCI) is an umbrella organization responsible for managing retail payments and settlement systems in India. It was established by the Reserve Bank of India (RBI) and the Indian Banks' Association (IBA) under the Payment and Settlement Systems Act of 2007. Its primary goal is to create a robust payment and settlement infrastructure in India. Several key factors are driving the rapid adoption of the Unified Payments Interface (UPI). These include its ease of development, user-friendliness, data protection measures, partnerships with the private sector, the support of India's digital public infrastructure, and effective regulatory frameworks (Cornelli et al. (2024). [1]). Indian citizens travelling abroad are utilizing UPI-powered mobile apps, while foreign visitors in India are making use of Fast Payment Service (FPS) apps through QR codes. UPI transactions have expanded to include both business-to-consumer (B2C) and business-to-business (B2B) payments. In the context of peer-to-peer (P2P) and peer-to-merchant (P2M) payments, non-banking entities and fintech companies serve as Third-Party App Providers (TPAPS) for UPI. These TPAPS, which are typically not banks, can join the UPI platform by partnering with an existing bank that is already part of the system. They provide applications and solutions for end users, including consumers, merchants, billers, and other businesses, allowing them to make and accept UPI payments. Currently, 30 TPAPS are participating in UPI. The three apps with the highest number of UPI transactions—PhonePe, Google Pay, and Paytm—are all provided by TPAPS. According to the NPCI (2024), there are 39 UPI third-party apps, suggesting that TPAPS' UPI apps may offer more appealing features to end users than traditional bank UPI apps (Routh (2024). [2]). The increase in smartphone and internet penetration in tyre 3, 4, 5 cities and Bharat Net, along with FinTech offers a wide gage of digital payment services such as QR codes, UPI Payments, and mobile wallets has significantly impacted the digital payment system change marks a significant advancement in digital payment systems, providing users with an easy-to-use, free, and fast method for making digital payments. India's mobile phone manufacturing sector has experienced a remarkable surge over the past decade. Production value skyrocketed from ₹18,900 crore in fiscal year 2014-15 to an estimated ₹4,10,000 crore in fiscal year 2024, an increase of over 2,000%. This growth is mirrored in the country's export performance. Mobile phone exports, which stood at a modest ₹1,556 crore in 2014-15, are projected to reach an impressive ₹1,20,000 crore by the end of fiscal year 2024. This signifies a staggering 7,500% increase in exports, with Indian-made devices now being shipped in large quantities to the UK, the Netherlands, Austria, Italy, and markets in the Middle East, North Africa, and South America (Economic Times, 2024). According to the Indian Brand Equity Foundation (IBEF), the number of active internet users reached 886 million in 2024, representing an 8% year-over-year growth. Rural India is at the forefront of this increase, with 488 million users, which constitutes 55% of the total internet population. Remarkably, the digital gender gap is narrowing; women now account for 47% of internet users, the highest proportion recorded to date. Additionally, in rural areas, women comprise approximately 58% of users accessing shared devices, indicative of significant advancements towards more inclusive digital access.

Table 1: Population, mobile connections and users

Population	Percentage/Million/Billion
Population of India	1.44 billion
Female	48.4%
Male	51.6%
Urban	63.4

Rural	63.4
Median mobile internet connection speed via cellular networks, as per data provided by Ookla	92.62 Mbps
Median fixed internet connection speed: 58.62	58.62Mbps

Source: Digital 2024

The Digital India Mission, launched in 2016, aims to enhance digital infrastructure across the country. A key component of this initiative is BharatNet, which provides affordable broadband internet services. This program represents the world's largest rural broadband connectivity project and has significantly transformed rural India by creating socioeconomic opportunities. Additionally, it has improved citizens' access to public services and fostered greater digital literacy. As a result, the initiative has advanced digital inclusion among the Indian population (Kumar (2024). [3]).

The Karnataka State Road Transport Corporation (KSRTC) has introduced Unified Payments Interface (UPI) cashless payment systems across its bus services. KSRTC has equipped its buses with advanced Electronic Ticketing Machines (ETMS) that accept all forms of UPI payments, such as PhonePe, Google Pay, implemented in partnership with EbixCash Ltd, which has been contracted to develop and maintain an Intelligent Transport Management System (ITMS) for KSRTC. KSRTC has introduced a QR code-based ticketing system for all the formats of buses such as Ambaari Dream Class, Flybus, Airavat, Airavat Bliss, Airavat Superia, Rajahamsa, Suhasa, Ambaari Non-A/C Sleeper, Corona, Sheethal, Vaibhav, Gramantara Sarige & Nagara Sarige, which are operating in the entire state of Karnataka.

The UPI payment system has become an integral part of India's digital landscape, serving as the preferred method for real-time payments among millions of users across the country. Its permanence and widespread adoption highlight its significance in facilitating seamless financial transactions in today's rapidly evolving digital economy. Google Play and PhonePe are the most widely used, and other fintech players include Paytm and Navi. As per data by the National Payment Corporation of India (NPCI), there were 68 Live UPI apps operating in India as of February 2025.

2. REVIEW OF LITERATURE :

Table 2: Review of literature

Sl. No	Focus Area	Author & Year
1	The article explores how digital payment systems influence sustainable development, environmental protection, and social inclusion. It highlights that digital payments reduce the carbon footprint by minimising the need for physical cash production, thereby conserving natural resources and reducing pollution. The shift to digital transactions also contributes to economic efficiency and transparency, curbing corruption and enhancing government revenue collection. Socially, digital payments foster financial inclusion, especially among marginalised groups, by enabling access to banking services through mobile and online platforms. The technology supports small businesses and facilitates seamless global commerce. However, challenges such as digital divides, cybersecurity threats, and regulatory concerns persist, especially in developing regions. The study suggests that policy frameworks must address these issues to ensure equitable access and sustainable integration. Digital payments offer a transformative path toward achieving multiple Sustainable Development Goals (SDGs) by promoting greener economies and inclusive growth.	Suresh Chandra, et al. (2024) [4]
2	The paper titled "Transformation of the Digital Payment Ecosystem in India: A Case Study of Paytm" examines the significant growth and transformation of digital payments in India, with a focus on Paytm as a key driver of this change. It highlights how Paytm rapidly scaled its services following the 2016 demonetization, leveraging the crisis to expand its user base and merchant partnerships. Originally a mobile recharge platform, Paytm evolved into a comprehensive digital financial ecosystem offering wallets,	Bhatia-Kalluri, A., & Caraway, B. R. (2023) [5].

	banking, insurance, and investment services. The study emphasises the role of government initiatives such as Digital India, UPI, and Aadhaar in enabling this transformation. It also analyses Paytm's innovative strategies, customer focus, and technological advancements that contributed to its success. Challenges like regulatory compliance, intense competition, and cybersecurity issues are also addressed. The paper positions Paytm as a symbol of how fintech can drive financial inclusion and reshape the traditional banking landscape in India.	
3	The document "India's Digital Payment Landscape: An Analysis" explores the rapid transformation in India's financial ecosystem driven by digital payment systems. It highlights the government's initiatives such as Digital India, Jan Dhan Yojana, and Unified Payments Interface (UPI), which have significantly increased financial inclusion and digital transactions. The Reserve Bank of India and NPCI have played vital roles in infrastructure and policy development. The paper notes that smartphone penetration and affordable internet have accelerated the shift from cash to digital modes. UPI, with its seamless interoperability, has become a key driver of this revolution. It also discusses the benefits of digital payments, such as transparency, reduced corruption, and increased tax compliance. However, it raises concerns about cybersecurity threats, digital illiteracy, and rural-urban divides. The analysis suggests the need for robust security frameworks, digital literacy programs, and inclusive growth to ensure a resilient and equitable payment ecosystem. The paper presents a balanced view of achievements and challenges in India's digital payment journey.	Mahesh, A., & Bhat, G. (2022) [6].
4	The document explores the evolution and growth of digital payment services in India, highlighting the rapid transition from cash-based transactions to digital modes, especially after the 2016 demonetization. It outlines how the government's initiatives, such as Digital India, UPI (Unified Payments Interface), and Aadhaar-linked services, significantly boosted digital payment adoption. The case discusses the role of major stakeholders, including banks, fintech companies, and telecom operators, in enabling secure and accessible payment systems. It emphasises the surge in mobile and internet penetration as a catalyst for digital payments. Key challenges addressed include cybersecurity threats, digital illiteracy, and infrastructure gaps in rural areas. The study also evaluates consumer behaviour, showing increased trust and convenience in using digital wallets and mobile banking. Regulatory support from the RBI and technological innovation are credited with enhancing service quality and inclusiveness. The paper concludes that while digital payment services have gained substantial momentum, continuous efforts are needed to bridge digital divides and ensure security. It advocates for user education, infrastructure development, and collaborative frameworks among stakeholders to sustain growth in India's digital payment ecosystem.	Mahesh, A., & Bhat, G. (2021) [7].
5	This article outlines the growing significance of digital transformation in organisations. It emphasises how digital technologies are reshaping traditional business models and driving the need for agile, adaptive structures. Tripathi discusses the evolution of the digital organisation, where information flows freely, decisions are data-driven, and teams operate in a more decentralised, flexible manner. She explores how leadership must evolve to foster innovation and collaboration in this new digital environment. The article also highlights the importance of cultural change, continuous learning, and technological integration to stay competitive. Tripathi underscores the need for digital literacy across all levels of the organisation, as well as the strategic use of digital tools to enhance productivity and customer engagement. The author suggests that digital maturity is not just	Meghana, K., & Tripathi, S. V. (2018). [8]

	about adopting new technologies, but about rethinking how the organisation operates. The paper argues for a holistic approach to digital transformation, balancing technology, people, and processes to thrive in the digital age.	

3. RESEARCH GAP :

While existing literature extensively explores the evolution and impact of digital payment systems across India, a specific gap remains in understanding their localised implementation, particularly within public sector enterprises like the Karnataka State Road Transport Corporation (KSRTC). Most studies focus on national-level platforms such as Paytm, UPI, or overarching government initiatives like Digital India and Jan Dhan Yojana, offering limited insight into how these services function in public transportation systems. Furthermore, while the role of digital payments in promoting financial inclusion, environmental benefits, and organisational efficiency has been discussed, empirical evidence from regional and sectoral contexts, especially about sustainability, is lacking. The integration of UPI with public transportation infrastructure like KSRTC raises unique operational, technological, and user adoption challenges that remain underexplored. There is also research on how such digital transitions impact commuter behaviour, service delivery, and long-term sustainability goals at the state level. Hence, a focused case study on KSRTC's use of UPI can address this gap by examining both the opportunities and constraints of digital payments in enhancing public service efficiency and sustainability.

4. OBJECTIVES :

(1) To identify the role of UPI services in promoting financial inclusion and digital literacy among rural and urban commuters in Karnataka.
(2) To analyse the adoption and usage patterns of UPI digital payment services within the Karnataka State Road Transportation Corporation (KSRTC).
(3) To assess the impact of UPI integration on operational efficiency, passenger convenience, and revenue collection in KSRTC.
(4) To evaluate how digital payment systems contribute to environmental sustainability by reducing paper-based transactions and fuel usage in KSRTC operations.
(5) To examine the impact of KSRTC UPI on Sustainable Development Goals (SDGs)

5. RESEARCH METHODOLOGY :

The current study is a conceptual study that is based on secondary data and a literature review, including relevant analysis of KSRTC financial records, government reports, digital payment statistics, articles, case studies, official websites, journals, newspapers, books, and reports.

6. ANALYSIS AND DISCUSSIONS :

UPI, or Unified Payments Interface, is a real-time digital payment system that enables users to send money, pay bills, and manage accounts through a single app. It was developed by the National Payments Corporation of India (NPCI), with providers such as Google Pay, PhonePe, or Paytm.

Table 3: India's Top UPI Volume and Total Transactions in Value for Feb 2025

Digital Payment Mode	Total Transitions Volume (in Millions)	Total Transactions Value (Crore)
PhonePe	7,656.40	11,18,963.81
Google Pay	5,836.80	7,71,089.15
Paytm	1,079.64	1,17,090
Navi	260.75	14,322.97
SuperMoney	139.10	4,812.44
Cred	126.48	45,127
Axis Banks APPs	117.70	9,197.33
AmazonPay	93.31	9,077.30
FamApp by Trio	77.08	876.12
Whatsapp	58.86	4.349

Source: Good Returns

6.1 The Impact of the Unified Payment Interface (UPI) on a digitally empowered economy:

Payments utilizing India's Unified Payments Interface (UPI) will now be accepted in seven countries. The international expansion of both UPI and RuPay is facilitating seamless cross-border transactions for Indian nationals residing and travelling abroad. The Indian government has undertaken proactive initiatives to encourage the adoption of Unified Payments Interface (UPI) in various countries across South Asia, Southeast Asia, and Europe (Karmakar, A. (2024). [9]), UPI is currently operational in seven countries, notably including key markets such as the United Arab Emirates, Singapore, Bhutan, Nepal, Sri Lanka, France, and Mauritius. This development enables Indian consumers and businesses to engage in international payment activities, thereby contributing to UPI's global proliferation and the ongoing advancement of digital transactions.

India has entered into a memorandum of understanding (MoU) with 13 countries to implement the Unified Payments Interface (UPI) for digital transactions. Bhutan was the first foreign nation to accept UPI digital payments, which were initiated in 2021. India stands among the top 10 countries globally for digital payments, supported by a diverse range of apps that perform exceptionally well in this sector. Digital Public Infrastructure DPI open source unified payments Interface UPI and Aadhaar have enabled India and its partnership with Global to achieve an $8 trillion economy by 2030 and to transform India into a digitally empowered economy.

Table 4: Countries and Collaboration

Year	Countries	Collaboration/Partnering
13 July 2021	Bhutan	Bhutan's Royal Monetary Authority (RMA)
21st April 2022	United Arab Emirates	Network International (NI) and Mashreq Bank
2021	Malaysia	Merchantrade Asia
21st February 2023	Singapore	Singapore's PayNow
December,2023	Nepal	Gateway Payment Services and Manam Infotech
	Oman	Central Bank of Oman
15th March 2023	Qatar	
April,2023	Russia	Russia's Faster Net Payment System
2nd February2,024	France	Lyra Network in France
12February,2024	SriLanka	Lank Pay National Payment Network
12th February 2024	Mauritius	Bank of Mauritius
22nd September 2022	TerraPay's partnerships enabled real-time cross-border payments into Indian bank accounts, facilitating international transactions for merchants and customers.	

Source: Author & NPCI

The Government of India Policy, with the support of the RBI and NPCI, has transformed India into a digitally empowered society and knowledge economy. "Faceless, Paperless, Cashless" through the Indian payment system facility, the clearing and settlement of monetary and other financial transactions carried out by using various payment systems has changed the payment ecosystem, and its impact on innovation has a significant impact on the Indian Economy.

Table 5: The Various Payment Systems and Their Impact

Various Payment Systems	Impact
AePS, Cards, PPIS, Cheques, CTS, Bulk Payments, NACH Fast Payments UPI, Bill Payments BBPS, Aadhaar Enabled Payment System, Prepaid Payment Instruments, Fast payment IMPs, RTGS, Retail NEFT, Toll Payments (NETC), Cards, Cheques CTS, Financing IReDS,	Consumer Spending Habits by Making It More Convenient. And Financial Inclusion.
	It reduced the cost and time of handling the cash.
	It enhanced the rural digital infrastructure.
	It brings more transparency to the transactions.
	It created more awareness of Digital Education.
	It made it more convenient for e-commerce transactions.

Source: Author

The Unified Payments Interface (UPI) is making remarkable strides in expanding its global presence, setting new benchmarks for digital payment systems around the world. This innovative advancement not only empowers citizens by providing seamless financial transactions but also unlocks a wealth of economic opportunities, reinforcing India's growing influence in the international financial arena. This embodies the government's ambitious vision to transform India. The Unified Payments Interface (UPI) is decisively transforming the global digital payment landscape. Collaborative initiatives to fully harness its potential and maximise its societal benefits on an international scale (Anand et al. (2024). [10]).

This comprehensive framework emphasises key areas such as robust economic growth, cutting-edge technological advancements, extensive infrastructure development, social empowerment, and sustainability, all woven together to create a prosperous and equitable future for all citizens. India leads in digital payments for the year 2023.

Table 6: Global Payment Gateway with transactions Per Second

Countries	Payment Gateway	Transaction Per Second
India	Unified Payments Interface	3,729.1
100+ countries	Skrill	1,553.8
Brazil	Pix	1,331.8
China	Alipay	1,157.4

Source: Business Standard

Real-time payments (RTP) refer to transactions processed through a network that enables immediate account-to-account transfers, resulting in the immediate availability of funds to the recipient. India has established itself as a global leader in real-time payments, attributed to its advanced digital payment infrastructure (DPI), effective collaboration among various stakeholders, stringent safety measures, and user-friendly systems. RTP is employed across a wide range of transactions, including person-to-person (P2P), business-to-business (B2B), and business-to-person (P2B) payments, among others.

Table 7: Real-time Payment Market- -2023

Countries	Real Payment Transaction a YoY growth of %	A billion in 2023
Global	42.2%	266.2 Billion
India	84%	129.3 Billion
Brazil	77.9%	37.4 Billion
Nigeria	82.1%	7.9 Billion
China	4%	17 Billion
South Korea	11%	9 Billion
Thailand	38%	20 Billion

Source: Financial Post, CFO.com & ACI Worldwide

The Government of India Policy, with the support of the RBI and NPCI, has transformed India into a digitally empowered society and knowledge economy. "Faceless, Paperless, Cashless" is the clearing and settlement of monetary and other financial transactions carried out by using various payment systems through the Indian payment system facility.

Table 8: Digital Payment Transactions (Value) in Rupee Crore

Year	Value of Digital Payment Transactions Rs Crore
FY 2022	1,744.01
FY2023	2,086.85
FY2024	2,428.24
FY2025(Till January 2025)	2,330.72

Sources: The Economic Times, 12 March 2025

6.2 KSRTC UPI for a Cashless Society:

The Karnataka State Road Transport Corporation (KSRTC) has embraced the Unified Payment Interface (UPI) for its electronic ticketing machines (ETMs), significantly improving the ticket purchasing process. Established under Section 3 of the Road Transport Corporation Act of 1950, KSRTC began operations on August 1, 1961. In collaboration with Ebix Cash Ltd., KSRTC is leading the way by introducing UPI-linked ETMs across four key divisions: KSRTC, NWKRTC, KKRTC, and BMTC. These machines will validate National Common Mobility Cards and all types of bus passes. They are integrated with the Intelligent Transport Management System (ITMS) and accept a variety of UPI payment methods, including Google Pay, PhonePe, Paytm, Amazon Pay, Cred, WhatsApp, Bharatpur, and Mobikwik. The advanced ETMs, known as Pinetree, are powered by Android 13 and feature the latest operating system. Additionally, KSRTC has implemented a Quick Response (QR) code system that has transformed the ticketing experience, expedited transactions, and minimised cash handling. The Electronic Ticketing System (ETS) consists of two interconnected components: the Electronic Ticketing Machines (ETM) and the Depot Application. This system generates information regarding crew duty rosters, driver log sheets, kilometres travelled, fuel usage, ticketing, and more (Rakesh et al. (2018). [11]). KSRTC has a cashless ticketing experience that has an impact on a cashless society and Viksit Bharat pillars such as Economic Growth, Environmental sustainability and Empowerment of society for social progress. The average number of passengers who travelled per day was 35.43 lakh, and the average traffic revenue was 1346.75 lakh. As per The Indian Express report, NWKRTC recorded 65,000 UPI transactions worth Rs 1.5 crore in 3 months from the date of the pilot introduction in Hubli Rural Division for 2023, which has provided an opportunity to achieve a trillion-dollar economy. KSRTC (Karnataka State Road Transport Corporation) now accepts UPI payments on all its buses, supporting a more digital economy and a less society. The average number of passengers who travelled per day was 35.43 lakh, and the average traffic revenue was 1346.75 lakh. As per The Indian Express report, NWKRTC recorded 65,000 UPI transactions worth Rs 1.5 crore in 3 months from the date of the pilot introduction in Hubli Rural Division for 2023, which has provided an opportunity to achieve a trillion-dollar economy.

Table 9: Karnataka Road Transport Corporation services to society through transformation

Particulars	Services and Revenue
No of Buses	8,941
Electric Buses (based on Gross Cost Contract)	300
Daily bus Services	8,073
Average daily revenue	Rs13.5 Crore (including Shakti Scheme & Student pass beneficiaries)
Average daily ridership	34 Lakh
QR code tickets are sold daily	70,000
Daily revenue through QR payments	30 to 40 Lakh
Digital revenue, including online reservations	60-70%

Source: Deccan Herald

The role of fintech players is critical in facilitating the adoption of the Unified Payments Interface (UPI) in India. India is recognized as one of the fastest-growing fintech markets globally. In 2024, the market is projected to reach approximately USD 110 billion, with expectations of growth to around USD 420 billion by 2029, reflecting a compound annual growth rate (CAGR) of 31%. With over 9,000 fintech entities, India ranks third worldwide in terms of the total number of fintech organisations and accounts for 14 per cent of the nation's startup funding. Moreover, the adoption rate of fintech in India stands at an impressive 87 per cent, substantially exceeding the global average of 67 per cent. (Source: NTPC.org report).

Table 10: Unified Payment Interface (UPI) usage across India, Oct 2024 by FinTech players

UPI usage by FinTech	Percentage
PhonePe	48.3%
Google Pay	37%
Paytm	7.82%

Others	6.88%

Source: Statista

6.3 KSRTC UPI Digital Payment, Shakti Scheme and E-Buses Impact On Sustainable Development Goals:

KSRTC Shakti Scheme:

The KSRTC Shakti Scheme was inaugurated on June 11, 2023, by the Government of Karnataka to facilitate free travel for girl and women passengers who are residents of Karnataka in non-premium government buses operated by four state-run corporations, Karnataka State Road Transport Corporation (KSRTC), Bengaluru Metropolitan Transport Corporation (BMTC), Kalyana Karnataka Road Transport Corporation (KKRTC), and North West Karnataka Road Transport Corporation (NWKRTC). This scheme establishes a framework for women's empowerment, addresses gender and regional disparities in growth, promotes community development, enhances infrastructure, and creates new opportunities aimed at sustainability. The 'Stree Shakti Scheme' also seeks to eliminate economic and social inequalities faced by women through empowerment initiatives that aim to increase women's literacy rates and employment opportunities, thereby contributing to overall economic development (Kanakamalini et al. (2024). [12]).

Karnataka Road Transport Corporation's four divisions, namely KSRTC, BMTC, NWKRTC, and KKRTC, free bus. Shakti Scheme has earned a remarkable mention in the Golden Book of World Records for recognition for women passenger rides, and also a report titled "Beyond Free Rides" mentions that due to this scheme, there is an increase in women's Empowerment and Employment. The number of women passenger rides is 50,49,47,6416 equivalent over 500 crore tickets from June 11, 2023, to 25th July,2025, and this scheme cost Rs. 2,39,780 crore to the Government Exchequer.

Table 11: Women Passengers Travelled in Four Karnataka Road Transport Corporations from June 11, 2023, to June 10, 2025

Total Rides & Women Passengers Rides	In Crore
Total Number of Rides	801.54
Total Number of Free Rides Availed	474.82
Ticket Value of Free Rides Availed	11994
Women passengers travelled in the BMTC	150
In KSRTC	144
In NWKRTC	111
In KKRTC	68

Source: The New Indian Express, July 29, 2025

The Sustainable Development Goals (SDGs) represent a comprehensive framework that emphasises the five Ps: people, planet, prosperity, peace, and partnership. Agenda 2030 encompasses 17 specific goals as articulated in the United Nations declaration "Transforming Our World: The 2030 Agenda for Sustainable Development." This agenda comprises 17 SDGs and 169 targets, having been adopted by 193 Member States during the UN General Assembly Summit in September 2015 and coming into effect on January 1, 2016. The objectives of the SDGs include facilitating the engagement of populations with the financial system, improving financial literacy, and fostering the creation of new economic opportunities. Ecologically, the adoption of Digital Payment Infrastructure (DPI) and Unified Payment Interface (UPI) has resulted in substantial reductions in paper usage and carbon emissions. Additionally, the SDGs aim to promote social and financial inclusion. The NITI Aayog, which serves as the premier think tank of the Government of India, has been designated to coordinate the implementation of these goals. Unified Payments Interface (UPI) penetrated deeply into the Indian payment system, empowering sustainable development and inclusive growth of various sectors. KSRTC has equipped the Electronic Ticketing Machines (ETMs)in all buses designed to accept UPI payment through QR codes for quick and convenient Urban and rural transactions. This paradigm shift not only promotes the advancement of digital transactions in urban areas but also extends its advantages to rural communities, thereby contributing to the moderation of the digital divide.

QR codes using smartphones made UPI user-friendly, and services provided by FinTech have improved India's Payment System. These ETMs are incorporated into the Shakti Scheme, a free bus ride provided

to women beneficiaries across Karnataka. The National Common Mobility Cards: One Nation, One Card. The success of the Unified Payments Interface (UPI) has sparked innovation within the fintech sector.

6.4 Karnataka's contribution to the UPI-based Payment System for Sustainability:

India Stack, recognized globally, supports high-volume, low-cost transactions with an open architecture. UPI is used by 260 million unique users, positioning India as a leader in real-time digital payments globally, with over 40% market share and Karnataka contributing 5.44%, it is in the 2nd place in terms of UPI volume of transactions(as per data NPCI, June 2025) and Karnataka Fintech ecosystem also over the 15 Fintech unicorns in India, 10 of them are from Karnataka they are Razorpay, Phonepe, Money Tap, Clear Tax, Zerodha, Groww, Cred are contributing technology transformation by providing financial platform and services. The UPI Payment system emerges as an engine driving and State support transforming India's ambition for a Digital Economy.

Table 12: Karnataka's Rank in UPI transactions with other States
Karnataka ranks second in Volume and Value of UPI transactions compared to Uttar Pradesh with 5.61%

Sr. No	State/Union Territory	Volume (in Mn)	Volume contribution (%)	Value (in Cr)	Value Contribution (%)
1	Maharashtra	1741.88	9.47%	211433.62	8.80%
2	Karnataka	1000.66	5.44%	134850.46	5.61%
3	Uttar Pradesh	972.29	5.29%	123844.58	5.15%

Source: NPCI

Table 13: Case Study on KSRTC Divisions UPI-based Payment System for Sustainability

KSRTC Division	UPI-Based Payment System
The KSRTC Mangaluru Division	The electronic ticketing system-enabled (ETS-enabled) handheld ticketing devices. This Division has collected ₹6.53 crore from passengers towards ticket fare through the UPI-based payment system since its introduction five months ago in November 2024. The amount rose to ₹1.15 crore in December 2024 and has been steadily growing since then by collecting ₹1.47 crore in January, ₹1.70 crore in February 2025, and ₹1.87 crore in March.
The KSRTC Davanagere Division	The Division has collected the 11 core from November 2024 to June 2025 by embracing the UPI payment through QR code for bus fare from Davanagere Depot-1, Davanagere Depot-2, and Harihar Depot.
The Bengaluru Metropolitan Transport Corporation (BMTC)	The Bengaluru Metropolitan Transport Corporation (BMTC) has effectively generated ₹1 crore in revenue every day by means of transactions via the Unified Payments Interface (UPI). The Bengaluru Metropolitan Transport Corporation (BMTC) has effectively generated ₹1 crore in revenue every day by means of transactions via the Unified Payments Interface (UPI). Daily UPI collections were ₹56.6 lakh on January 9 and ₹60.05 lakh on January 13, 2025. Reaching ₹80.1 lakh on January 20, 2025, ₹90.9 lakh on January 27, and ultimately surpassing the ₹1 crore mark on February 3, 2025, the upward trend persisted.
KSRTC Chamarajanagar Division	This division, which includes Kollegal, Gundlupet and Chamarajanagar Sub division, recorded cashless payment of Rs 7.9 Lakh during November 2024 and increased to 46.3 lakh in December, and in January 2025, increased to 83.3 lakh and in February 2025, the transaction.

This progress has inspired both emerging startups and established financial institutions to create value-added services that utilize the UPI infrastructure. UPI goes beyond the role of a traditional payment system; it acts as a dynamic catalyst for socioeconomic development. By promoting financial

inclusivity, UPI enables individuals and businesses from various backgrounds to participate in the digital economy. Additionally, UPI encourages technological innovation, leading to the development of new financial solutions and services that improve the user experience. It also focuses on environmental sustainability, ensuring that its growth positively impacts the health of the people and planet. Through these comprehensive initiatives, UPI stands out as a transformative force in the Landscape of modern finance. Unified Payment Interface UPI transactions are driving the digital ecosystem due to consumer preference, and the banking system has a greater significance on value and transactions per day, which shows that there is a new user every month.

Table 14: Month-wise UPI TRANSACTIONS by passengers in BMTC from January 2024 to March 2025

Month	UPI amount (in Crore Rs)	Per Day Average (in Lakh Rs)
Jan 2024	6.3	20.3
Feb	6.3	21.6
March	7.2	23.3
April	7.7	25.8
May	6.2	20.1
June	8.3	27.8
July	8.7	27.9
Aug	9.4	30.3
Sept	9.4	31.3
Oct	9.9	31.9
Nov	10.5	35.2
Dec	10.3	33.1
Jan 2025	19.7	63.4
Feb	29.4	104
March	35.5	114

Source: The Times of India, dated April 2, 2025, & BMTC

6.5 Impact of Karnataka State Road Transport Corporation on SDGs:

The Karnataka State Road Transport Corporation has contributed to 8 out of 17 Sustainable Development Goals. Public transport is one of the most sustainable and safest modes of transportation. It benefits society by improving people's lives, ensuring a healthy planet, and fostering technological, economic, and societal progress. The transport sector will play a vital role in achieving the Paris Agreement. The BMTC has expanded its fleet with E-Buses on city roads, along with charging stations for both AC E-Buses and Non-AC E-Buses. These operate under a Gross Cost Contract (GCC) model in partnership with private companies. This initiative directly impacts city residents (Adheesh et al.). [13]). The Bengaluru Metropolitan Transport Corporation's E-vehicles have received support from the PM Electric Drive Revolution Innovation Vehicle Enhancement (PM EDrive) Scheme and the FAME incentive scheme, as well as green recovery funding linked to FAME II and the Battery Mission to promote a greener economy (Roychowdhury et al. (2020). [14]). The scheme aims to eliminate land transport pollution by 2030. The Bengaluru Metropolitan Transport Corporation operates 1,568 e-buses within the city. BMTC's E-buses support multiple United Nations Sustainable Development Goals (SDGs), including SDG 7 (Clean Energy) by reducing reliance on fossil fuels, SDG 11 (Sustainable Cities) by decreasing air and noise pollution and congestion, and SDG 13 (Climate Action) by significantly lowering greenhouse gas emissions. The BMTC's initiative to deploy E-buses aligns with several SDGs. Specifically, these E-buses contribute to SDG 7 by promoting cleaner energy alternatives for public transport. Additionally, under SDG 11, they help reduce air and noise pollution and alleviate urban traffic congestion. Furthermore, they support SDG 13 by substantially lowering greenhouse gas emissions, playing a critical role in combating climate change, and fostering a more sustainable urban transport system. This multifaceted approach underscores BMTC's commitment to fostering a greener and more inclusive city for all residents.

The 2030 Agenda for Sustainable Development Goals (SDGs) and the Paris Agreement emphasize urban passenger transport within cities to meet seven key targets (SDG 11.1, 11.2, 11.3, 11.4, 11.5,

11.6, 11.). India is expected to have approximately 400 million new urban residents, effectively doubling its urban population by 2050 (UN, 2019). (Mahadevia et al. (2023). [15]).

Table 15: Impact of Karnataka Road Transport Corporation on SDGS

SDG No.	SDGs	Impact
1	No Poverty	Creating additional employment opportunities for conductors, drivers, mechanics, cleaners, and other essential staff members through KSRTC divisions has enhanced operational capacity and contributed to workforce development. And also, by empowering the Girl Students and Women Passengers with Free KSRTC Bus Travel all over Karnataka to enhance social inclusion.
4	Quality Education	KSRTC offers loans up to Rs. 1 lakh for employees, covering tuition fees and essential educational expenses. The program also includes financial support for bus travel during II PUC and SSLC annual examinations, as well as student bus passes, ensuring convenient access to education.
5	Gender Equality	The Shakti Scheme presents an excellent opportunity for women and members of the transgender community residing in Karnataka by providing complimentary travel on government buses. This initiative not only promotes the use of public transportation but also enhances accessibility and mobility for these groups, fostering greater inclusion and empowerment within the community.
8	Decent Work and Economic Growth	KSRTC, as a prominent public transport provider, plays a critical role in generating employment opportunities for a substantial workforce, which includes drivers, mechanics, and various support staff. The organisation operates 83 depots across 17 divisions, complemented by 178 bus stations that ensure efficient service delivery. In addition, KSRTC manages 2 regional workshops, a central training institute focused on skill enhancement, and 4 regional training institutes aimed at operational improvement. It also maintains a printing press and a hospital to support its workforce comprehensively. KSRTC's total staffing comprises approximately 37618 individuals, among whom there are 3,052 female employees. The breakdown of this workforce includes 26 Driver Cum Conductors, 875 Conductors, 976 Technical Staff, 110 Security Guards, 80 Office Helpers, 135 Sweepers, and 80 Officers, all of whom significantly contribute to the organisation’s operational efficiency and effectiveness.
9	Industry, Innovation and Infrastructure	The buses are equipped with modern amenities designed to enhance both passenger comfort and safety. A sophisticated GPS enables real-time tracking of bus movements from a centralised control room. Passengers have access to charging ports compatible with USB and C-type connectors, while an advanced Fire Detection and Suppression System significantly improve safety during transit. The incorporation of powerful halogen headlights and daytime running lights enhances visibility, particularly during nighttime operations. Furthermore, the Automated Ticket Vending Machines (ATVM) and Electronic Ticketing Machines (ETMs) facilitate the acquisition of electronic and mobile tickets. These ticketing systems accept a wide range of payment methods,
11	Sustainable Cities and Communities	Airavat Club-Class This category features high-end luxury buses, including multi-axle AC models from Volvo, Scania, and Mercedes-Benz Airavat, This segment comprises luxury air-

		conditioned buses provided by Volvo and Mercedes-Benz Ambaari This category includes both AC and non-AC sleeper buses, branded under the Corona name Rajahamsa Executive: This line offers deluxe buses constructed on Leyland, Eicher, and Tata chassis Karnataka Vaibhav These are semi-deluxe buses built on the same chassis brands as the Rajahamsa Executive Karnataka Saarige This service connects rural areas with major urban centres, providing the most economical options for inter-city and town routes. Furthermore, the Grameena Sarige initiative, implemented by KSRTC, is designed to align with Sustainable Development Goal 11, which seeks to promote sustainable cities and communities.
13	Climate Action	KSRTC plays a vital role in promoting public transport, which significantly helps reduce carbon emissions in the transportation sector. Their introduction of electric (EV)EV Power Plus on the GCC (Gross Cost Contract) model and ethanol-blended diesel demonstrate a proactive approach to safeguarding our communities, ecosystems, and the environment.
17	Partnerships for the Goals	KSRTC has formed several strategic partnerships to improve its services and offerings. They work with RedBus to facilitate ticket bookings for all luxury buses. KSRTC has collaborated with the State Bank of India (SBI) and United India Insurance to provide accident insurance for individuals and staff. To enhance logistics, KSRTC partners with SM Kannappa Automobiles and KMS Coach Builders Private Ltd. Additionally, the organisation has teamed up with EbiX Cash Ltd. to implement an Intelligent Transport Management System (ITMS) and electronic ticket machines (ETMs) with a QR-based payment system. Finally, KSRTC is also working with the Karnataka State Tourism Development Corporation (KSTDC) to promote tourism initiatives.

Source: Author

7. FINDINGS :

The implementation of Unified Payment Interface (UPI) within Karnataka State Road Transport Corporation (KSRTC) has demonstrated a transformative impact on public service delivery, financial inclusion, and digital literacy. The advanced Electronic Ticketing Machines (ETMs), enabled with QR code scanning and partnered with FinTech leaders like EbixCash, PhonePe, and Google Pay, have streamlined ticket transactions across urban and rural routes. With approximately 35.43 lakh daily passengers and up to ₹13.5 crore in daily revenue, KSRTC has embraced digitalisation, contributing to 60–70% of earnings through digital modes, with ₹30–40 lakh collected via QR codes alone. Monthly UPI transaction growth in BMTC, from ₹6.3 crore in Jan 2024 to ₹35.5 crore in March 2025, reflects increasing commuter trust and digital penetration. The initiative has supported eight of the UN's Sustainable Development Goals, including poverty reduction, gender equality through the Shakti Scheme, and climate action via EV integration. The use of ETMs promotes environmental sustainability by reducing paper and carbon emissions. KSRTC's collaboration with FinTech companies, alongside national programs like Digital India and BharatNet, bridges the urban-rural digital divide. Real-time data generation and route optimisation improve operational efficiency, while partnerships with SBI, RedBus, and others enhance user experience. UPI has not only modernised public transport but also empowered marginalised communities through inclusive financial systems. The system's scalability and secure infrastructure make it a model for replication across public enterprises. Integration with National Common Mobility Cards positions KSRTC within India's broader smart mobility strategy. The adoption has also influenced commuter behaviour, shifting preferences toward contactless payments, particularly post-pandemic. Overall, KSRTC's UPI initiative represents a pioneering step toward a cashless, sustainable, and inclusive public transportation ecosystem in India.

8. ABCD ANALYSIS FRAMEWORK :

The ABCD analysis framework offers a valuable approach to evaluating the effectiveness of a concept or idea. It comprises four essential elements: Advantages, Benefits, Constraints, and Disadvantages (Aithal et al. (2015). [16-20]).

8.1 Advantages:

(1) The introduction of UPI services in KSRTC has eliminated the exact change issue in both short-distance and long-distance travel.
(2) QR code Payment System has been integrated into ETMs to make ticket issuance hassle-free for the conductors, and it has created more accountability and transparency.
(3) It offers a reliable digital receipt for the payment, ensuring that if there is any misplace of the ticket is misplaced, you still have solid proof of purchase of the ticket.
(4) All five divisions of KSRTC have made significant progress by implementing the QR code digital payment system for ticket issuance, enhancing the overall customer experience, and streamlining operations.
(5) The Karnataka State Road Transport Corporation (KSRTC) has established a partnership with Ebix Cash to implement the Intelligent Transport Management System (ITMS). This collaboration facilitates efficient and convenient contactless payment solutions while providing real-time operational control. Furthermore, it aligns with the objectives of Sustainable Development Goal 17, which emphasizes the importance of partnerships for achieving shared goals. This initiative fosters collaboration between the government and the private sector, ultimately benefiting society as a whole.

8.2 Benefits:

(1) The introduction of the UPI QR code system in KSRTC has improved passenger convenience, offering cashless and seamless travel services across Karnataka.
(2) Karnataka State Road Transport Corporation (KSRTC) has introduced Electronic Ticketing Machines (ETMs) to support bus passes, National Common Mobility Cards, and the Shakti Scheme. This initiative exemplifies a significant step towards digital transformation in public transportation.
(3) The introduction of a digital payment system by the Karnataka State Road Transport Corporation (KSRTC) has enabled the administration to effectively mitigate instances of pilferage, facilitate real-time revenue collection, and eliminate the need for cash remittances to banking institutions.
(4) The Government of Karnataka's progressive step in implementing UPI QR code digital payments for KSRTC bus services offers an opportunity for financial inclusion, economic empowerment, and accelerating the nation’s evolution to a cashless economy.
(5) UPI payment of QR code scanner on Google Pay or Phonepay payments has happened in a millisecond.
(6) The Shakti Scheme initiative has improved mobility for women passengers and contributed to Sustainable Development Goals (SDGs) 5, which is Gender Equality, and SDG-8, Decent Work and Economic Growth, by providing travel assistance to women.

8.3 Constraints:

(1) In some of the rural areas in Karnataka, it has been observed that network or system errors have prompted passengers to use cash payments for bus tickets. This situation presents an opportunity to enhance the reliability of digital payment systems.
(2) During peak times, when the bus was full and operating over short distances, the use of QR code payments, followed by ticket collection from the Bangalore Metropolitan Transport Corporation (BMTC), presented an opportunity for improvement.
(3) More awareness needs to be provided to both passengers and conductors on using the credit, smart travel and debit cards for receiving and issuing the ticket.
(4) More training has to be provided in generating the separate UPI payment transaction report for the reimbursement and a separate report sheet for the Shakti scheme for women passengers.

(5) KSRTC has to create more awareness programs on digital literacy for passengers for the usage of the UPI QR code payments, and the best award for initiating the division for the UPI QR code transactions.

8.4 Disadvantages:

(1) Passengers on the Airavat AC Club Class, especially in the EV Power Plus bus, prefer debit and credit card payments for tickets. However, this option isn't available on the Electronic Ticketing Machines (ETMs), posing a challenge for long-distance travellers.
(2) The Smart Electronic Ticketing Machines(ETMs) have to be upgraded for credit, debit and Smart Travel Card swipes for the convenience of the passengers.
(3) ETM Software needs to be upgraded to generate the report for UPI transactions and Shakti Scheme reimbursements, to establish a more transparent system in governance.
(4) The Shakti Scheme smart card has to be introduced; it should be enabled with the Aadhaar card Number and with a Photo, which adds convenience for the conductors to issue the tickets for the women passengers.
(5) Internet issues and bank server problems have been causing longer transaction times for processing payments, leading to delays in issuing tickets. This situation has created additional challenges for both conductors and passengers. Conductors face difficulties in managing passenger flow and ensuring timely departures, while passengers may experience frustration due to wait times, and conductors ask passengers to pay cash for the ticket. Addressing issues is crucial for improving efficiency and ensuring a smoother public transport system.

9. CONCLUSION :

KSRTC's adoption of UPI payment systems signifies a landmark achievement in the integration of digital technology within public transport, aligning with India's broader vision digital Economy. The initiative has empowered millions of commuters through convenience, transparency, and access, thereby enhancing social equity and economic inclusion. It has also demonstrated how public sector enterprises can leverage FinTech collaborations to drive operational efficiency and reduce environmental impact. With rising transaction volumes, substantial revenue generation through digital means, and strong support from both urban and rural populations, KSRTC's digital journey illustrates the power of inclusive innovation. Furthermore, the initiative contributes meaningfully to several Sustainable Development Goals (SDGs) by improving public service access, enabling gender equality, and supporting eco-friendly practices. The case study exemplifies how policy-backed technological integration can yield measurable outcomes in governance and citizen empowerment. It underscores the importance of replicating such models across sectors and states for holistic national progress. KSRTC's experience reinforces that digital transformation is not just a technical upgrade but a socio-economic catalyst. The initiative lays a strong foundation for scalable and secure cashless ecosystems. Ultimately, KSRTC's UPI implementation represents a forward-looking model that paves the way for a sustainable, resilient, and digitally empowered public infrastructure landscape in India.

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