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Artificial intelligence adoption and its impact on working capital management and profitability: A comparative pre- and post-covid analysis of select FMCG companies in India

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Abstract
The COVID-19 pandemic accelerated the adoption of Artificial Intelligence (AI) in India's Fast-Moving Consumer Goods (FMCG) sector as companies sought to enhance operational resilience, efficiency, and growth. This study examines the impact of AI-driven technologies on Working Capital Management (WCM), profitability, and operational growth across five leading FMCG companies namely Hindustan Unilever Limited (HUL), ITC Limited (ITCL), Britannia Industries Limited (BIL), Godrej Consumer Products Limited (GCPL), and Tata Consumer Products Limited (TCPL) using a pre- and post-COVID comparative framework. Secondary data from the years 2014-15 to 2023-24 were analysed through ratio analysis and paired sample t-tests, focusing on inventory turnover, current ratio, cash conversion cycle, Net Operating Profit After Tax (NOPAT), Economic Value Added (EVA), Return on Invested Capital (ROIC), and core operational revenue.
The findings indicated that AI adoption significantly enhanced operational growth in four of the five companies, particularly where AI tools were integrated into forecasting, supply chain, and procurement functions. TCPL and HUL recorded notable improvements in working capital efficiency, while HUL and Britannia achieved significant gains in NOPAT and EVA margins. However, all companies experienced declines in ROIC, suggesting a time lag between operational efficiency gains and capital returns. The study concluded that strategic AI integration can enhance both operational and financial performance, though long-term benefits depend on scaling adoption, improving data maturity, and strengthening talent capabilities.

Keywords: Artificial Intelligence**,** FMCG sector, COVID-19 pandemic

Introduction
The FMCG sector comprises low-cost, high-volume products such as packaged foods, beverages, personal care items, and over-the-counter medications. These goods are characterised by short shelf lives and frequent consumer purchases, making efficient supply chain and inventory management essential. The Indian FMCG industry ranks as the fourth-largest contributor to the national economy, encompassing diverse segments such as food, healthcare, and household products. Valued at US$56.8 billion in December 2022, the sector is projected to reach approximately US$615.87 billion by 2027, reflecting a robust CAGR of 27.9 percent. However, its dependency on demand precision and logistics efficiency renders it vulnerable to volatility, especially during crises such as the COVID-19 pandemic.
The COVID-19 pandemic disrupted global retail, accelerating the shift to e-commerce and highlighting the need for operational resilience. In response, retailers increasingly adopted Artificial Intelligence (AI) to enhance customer experiences and streamline operations. While AI tools like machine learning and deep learning support personalisation and real-time engagement, challenges remain in adoption and workforce readiness. The growing emphasis on online retail presents a valuable opportunity to align AI use with evolving consumer behaviour and sustainability goals.
The present study aims to evaluate the effect of AI adoption on three key dimensions of business performance such as operational growth, WCM, and profitability across select FMCG companies in India. The pre- and post-COVID division reflects the period before and after accelerated AI adoption triggered by pandemic-related operational challenges.

Background of the study
AI served as a crucial strategic enabler for resilience, efficiency, and growth in the FMCG sector, especially in response to challenges caused by COVID-19.

Impact of COVID-19 on FMCG operations
The COVID-19 pandemic created unprecedented challenges in production, distribution, and consumer engagement. FMCG companies faced sudden demand shifts, supply chain bottlenecks, and restrictions on physical retail. These challenges accelerated the move toward digitalisation, with AI emerging as a strategic enabler for resilience and competitiveness.

Rise of AI in FMCG
AI adoption in the FMCG industry offers numerous benefits:

- **improved demand forecasting:** AI analyses vast data sets to predict market fluctuations accurately in volatile environments.
- **Streamlined inventory management:** AI automates stock control, reducing waste and preventing stockouts.
- **Enhanced product innovation:** Consumer data analytics help design products aligned with evolving tastes.
- **Deeper consumer insights:** Behavioural analysis supports personalised marketing campaigns.
- **Optimised supply chain:** AI improves operational efficiency from sourcing to delivery.

AI adoption trends in FMCG
Artificial Intelligence is transforming the FMCG sector both globally and in India. At the global level, the adoption of AI has fuelled substantial revenue growth, with the market reaching USD 7.8 billion in 2023 and projected to expand to USD 57.2 billion by 2033, reflecting a robust CAGR of 22.6 percent for the period 2024-2033. The Food & Beverages sub-industry dominates global AI usage in FMCG with a 30 percent share, while the Asia-Pacific region leads geographically with a 38 percent market share. Among functional applications, Demand Forecasting stands out, accounting for 15 percent of total revenue generated from AI integration in the sector.

In India, AI adoption in the FMCG and retail sector reached 43 percent in the year 2023-24, indicating strong post-pandemic acceleration in digital transformation initiatives (Team Lease Digital, 2024) [13]. Indian FMCG companies are increasingly leveraging AI for inventory optimisation, supply chain automation, customer analytics, and personalised marketing. The broader Indian AI market, valued at USD 6 billion in 2023, is projected to grow to USD 20 billion by 2028 at a CAGR of 26 percent. Notably, non-IT sectors contribute over 28 percent of this market, with FMCG emerging as one of the fastest-growing contributors, second only to BFSI, which holds a 30 percent share.

Global vs. India maturity
As shown in Table 1, Indian companies are more active in experimenting with AI (46 percent have implemented AI in some departments) than the global average (28 percent). However, only 5 percent have scaled it across the entire organisation, compared to 25 percent globally.:

Table 1: Comparison of AI maturity stages between Indian and global companies

AI adoption stage	India (percent)	Global (percent)
Not used AI	6	5
Investigated use of AI	24	15
Conducted AI pilots	19	27
Implemented AI in some businesses/departments	46	28
Scaled AI across the organisation	5	25

Source: PwC Survey in India during 2022-23

Post-2022 progress
Table 2 shows that the share of "expert" AI adopters in India rose from 13 percent in 2022 to 27 percent in 2024, with the average maturity score increasing from 2.3 to 2.47.

Table 2: AI adoption progress: 2022 vs 2024

Indicator	2022	2024
Enterprises in "Expert" stage (percent)	13	27
Enterprises in "Experimenter" stage (percent)	23	13
Average AI maturity score (out of 4)	2.3	2.47

Source: (NASSCOM & EY, 2024) [3].

Sectoral position of FMCG
According to Table 3, FMCG and retail have 19 percent "expert" adopters and 63 percent "enthusiasts," indicating strong pilot adoption but slower scaling compared to BFSI (37 percent experts) and Technology (33 percent experts). These trends highlight that while FMCG in India is advancing in AI maturity, particularly in supply chain, IT, and customer service functions, full-scale adoption remains a challenge.

Table 3: Sector-wise AI maturity levels in India during 2024

Sector	Experimenter (percent)	Enthusiast (percent)	Expert (percent)
BFSI	7	56	37
Technology	10	57	33
Healthcare	16	66	18
Retail/FMCG	18	63	19
Manufacturing	17	64	19
Energy/Utilities	15	67	18
Others	22	61	17

Source: (NASSCOM & EY, 2024) [3]

Post-COVID sector-wise adoption
An overview of AI adoption patterns across industries in the post-COVID period, highlighting the FMCG sector's position relative to other key sectors in India and globally is presented:

Global comparison
As shown in Table 4, India recorded the highest increase in AI adoption post-COVID, with 45 percent of organisations expanding AI use, outpacing the US (35 percent), Japan (28 percent), and the UK (23 percent).

Table 4: Comparison of AI adoption growth after COVID across countries

Country	Percent of Organisations Increasing AI Use Post-COVID
India	45
US	35
Japan	28
UK	23

Source: PwC Survey in India during 2022-23

Sector-wise trends in India

Table 5 reveals mixed sectoral performance between 2020-21 and 2022-23. While the retail and consumer segment saw a temporary decline in AI adoption (from 76 percent to 70 percent), manufacturing (+20 percentage points) and technology (+12 percentage points) registered sharp gains.

Table 5: AI Adoption rates across various industries in India

Industry	Adoption rate (Percent)		Increase/ decrease (Percent)
	2020-21	2022-23	
Retail and consumer	76	70	-6
Healthcare and pharmaceuticals	75	82	+7
Technology, Media and Telecommunications (TMT)	80	92	+12
Travel and hospitality	92	99	+7
Industrial products and manufacturing	72	92	+20
Financial services	85	86	+1

Source: PwC Survey in India during 2022-23

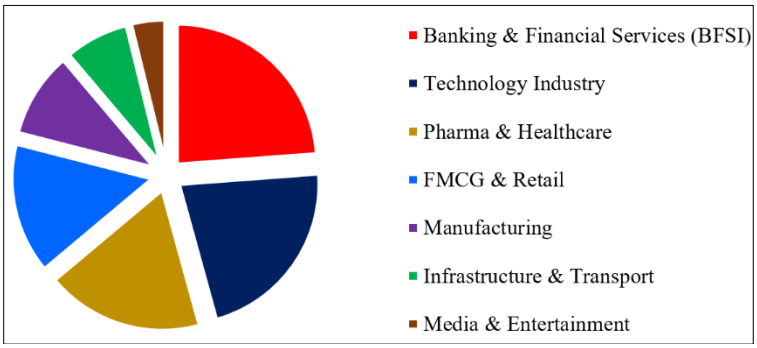
Current adoption rates

In 2023-24, FMCG and retail recorded a 43 percent AI adoption rate (Table 6), trailing BFSI (68 percent) and technology (60-65 percent), but showing recovery from the earlier dip.

Table 6: AI adoption rates in key Indian sectors during 2023-24

Sector	AI adoption rate (percent)
Banking & Financial Services (BFSI)	68
Technology industry	60-65
Pharma & healthcare	52
FMCG & retail	43
Manufacturing	28
Infrastructure & transport	20-22
Media & entertainment	10-12

Source: TeamLease Digital, 2024 [13]



Source: Table 6

Fig 1: AI Adoption Rates in Key Indian Sectors during 2023-24

Functional Adoption

Table 7 shows significant post-COVID gains across supply chain and logistics (+43 percentage points), manufacturing/operations (+39 percentage points), finance/tax (+39 percentage points), and risk/legal compliance (+39 percentage points). According to ASSOCHAM (2024) data, AI adoption in the FMCG sector is most prominent in Information Technology, customer service, and logistics functions.

Table 7: AI adoption rates across various business functions

Business function	Adoption rate (Percent)		Increase/Decrease (Percent)
	2020-21	2022-23	
IT and cybersecurity	60	87	+27
Supply chain and logistics	26	69	+43
Research and development/ innovation	40	67	+27
Manufacturing and operations	36	75	+39
Customer service	68	87	+19
Sales and marketing	61	86	+25
Finance and tax	28	67	+39
Risk, legal, and compliance	23	62	+39
Human resource	43	68	+25

Source: PwC Survey in India during 2022-23

Literature Review

Many researchers have studied the role of AI in the FMCG industry. A few important ones are:

- Jayawardana, P. W. (2025) [11] examines AI-driven supply chain optimization in the FMCG sector, highlighting how predictive analytics, machine learning, and real-time data integration enhance inventory management, reduce stockouts, cut costs, and improve customer satisfaction. The study also notes adoption barriers, recommending phased implementation, staff training, and strong data governance.
- Maheswari, S. (2023) [9] reviews AI's transformative influence on FMCG marketing, noting how techniques such as word-of-mouth promotion, personalized recommendations, advanced retail analytics, customer segmentation, and multichannel management enhance consumer engagement and decision-making. The study also stresses the importance of integrating AI with traditional marketing channels, safeguarding data privacy, and addressing ethical considerations. It concludes that AI holds strong potential to reshape FMCG marketing strategies, but calls for further research on consumer acceptance, performance measurement, and long-term sustainability.
- Karl Hirsch, Wesley Niemann, and Brendan Swart (2024) [7] investigate how AI and information systems enhance supply chain resilience in South Africa's FMCG sector, particularly in the post-COVID context. Using qualitative interviews with 12 manufacturers and retailers, the study identifies AI-enabled capabilities such as integration, automation, monitoring, predictive planning, and data-driven decision-making that help firms adapt to disruptions and demand volatility. These findings reinforce the view that AI-driven operational improvements, especially in supply chain management, can indirectly strengthen working capital efficiency and profitability in the FMCG industry.
- Umeorah *et al*. (2024) [14] explore AI's transformative potential in working capital management, addressing the shortcomings of traditional methods. Through a review of research, case studies, and industry reports, they show how machine learning algorithms and big data analytics optimize inventory management, improve demand forecasting, enhance cash flow predictions, and enable automated reconciliations, debtor risk analysis, and invoice processing. While challenges such as integration with legacy systems persist, the study underscores AI's significant potential to strengthen financial health and operational efficiency in FMCG companies.

Research gap

Although prior studies have provided valuable insights into the role of AI in enhancing marketing efficiency, strengthening supply chain operations, and improving working capital frameworks, the existing body of literature is predominantly qualitative, case-specific, or limited to functional applications. Empirical examinations that quantitatively assess AI adoption's direct impact on core financial metrics such as operational growth, working capital efficiency indicators (e.g., cash conversion cycle, current ratio), and profitability remain scarce. Furthermore, there is an absence of cross-company, pre- and post-adoption statistical analyses, particularly within the context of the post-COVID period, which witnessed an accelerated uptake of AI technologies in the FMCG sector. This gap underscores the necessity for a comprehensive, data-driven investigation. The present study addresses this void by employing a comparative pre- and post-COVID framework, utilising ratio analysis and paired t-tests on leading NIFTY FMCG companies to evaluate the measurable impact of AI adoption on operational growth, working capital management efficiency, and profitability.

Objectives of the study

The study aims to examine the impact of Artificial Intelligence (AI) adoption on the operational and financial performance of select FMCG companies in India during the pre- and post-COVID periods. The specific objectives are:

1. to assess the impact of AI adoption on the operational growth of the select FMCG companies through pre- and post-COVID comparisons;
2. to examine the effect of AI adoption on Working Capital Management (WCM) efficiency of select FMCG companies through pre- and post-COVID comparisons.
3. to assess the influence of AI-driven technologies on the profitability of select FMCG companies through pre- and post-COVID comparisons.

Hypotheses of the study

The hypotheses formulated in light of the objectives of the study are:

H_{01}: There is no significant impact of AI adoption on the operational growth of the select FMCG companies during the pre- and post-COVID periods.

H_{02}: There is no significant impact of AI adoption on the WCM efficiency of select FMCG companies during the pre- and post-COVID periods.

H_{03}: There is no significant impact of AI-driven technologies on profitability in select FMCG companies during the pre- and post-COVID periods.

Research methodology

The study adopts a comparative and analytical research design to evaluate differences between pre- and post-COVID performance in operational growth, WCM efficiency, and profitability of select FMCG companies.

Nature of data

The study relies on secondary data collected from

- Annual reports and financial statements of HUL, ITC, Britannia, GCPL, and TCPL.
- Published articles, press releases, and AI initiative updates from company websites.
- Industry reports from PwC, TeamLease Digital, BCG, EY-NASSCOM, and marketresearch.biz.

Sample selection

The study selects ITC, HUL, Britannia, TCPL, and GCPL as prominent FMCG companies with active engagement in AI adoption. They are listed before 2014-15 and inclusion in the Nifty FMCG Index, along with diverse operations and AI initiatives, makes them well-suited for evaluating the

impact of AI on working capital efficiency and profitability during the pre- and post-COVID periods.

Period of the study

The study spans ten years, divided into two distinct phases. The pre-COVID period covers 2014-15 to 2018-19, and the post-COVID period covers 2019-20 to 2023-24. The year 2019-20 is included in the post-COVID phase as pandemic-related disruptions began during this period, significantly affecting business operations.

Tools for analysis

The tools used for the present study are:

- Ratio analysis for operational growth, WCM efficiency, and profitability.
- Paired Sample t-tests are employed to evaluate statistically significant differences in operational growth, WCM and profitability indicators before and after COVID.

Key variables

- Operational growth
- Revenue from core operations - Income from primary business activities, excluding non-operating revenue.
- Working capital efficiency
  - Inventory Turnover Ratio (ITR): Indicates how many times inventory is sold and replaced in a period.

$$ITR = \frac{Cost\ of\ Goods\ Sold\ (COGS)}{Average\ Inventory}$$

  - Current Ratio (CR): Measures short-term liquidity.

$$CR = \frac{Current\ Assets}{Current\ Liabilities}$$

  - Cash Conversion Cycle (CCC): Shows the number of days to convert investments in inventory into cash.

CCC=DIO+DSO−DPO

- Profitability
  - Net Operating Profit After Tax (NOPAT): Reflects after-tax profit from core operations.

$$NOPAT\ Margin = \frac{NOPAT}{Sales} \times 100$$

  - Economic Value Added (EVA) Margin: Measures value created above the cost of capital as a percentage of sales.

$$EVA\ Margin = \frac{EVA}{Sales} \times 100$$

  - Return on Invested Capital (ROIC): Indicates efficiency in generating returns from total invested capital.

$$ROIC = \frac{Net\ Operating\ Profit\ After\ Tax}{Invested\ Capital} \times 100$$

Leading AI initiatives in select FMCG companies

The applications of AI in the select FMCG companies mentioned in Table 8 are, in fact, noteworthy and impactful. The leading AI applications and their implications with reference to the select FMCG companies are presented briefly:

Table 8: Impact of AI innovations in the FMCG sector

Company	AI initiative	Year of implementation	Impact
HUL	Shikhar App	2017	Enabled faster reporting for 1.4 M+ Kirana stores.
	Jarvis (AI Forecasting)	2018	Improved stock availability and reduced stockouts.
	Chanakya Data Platform	2021	Enhanced decision-making and forecasting accuracy.
	Project Nakshatra	2023	Reduced manufacturing costs and lead time.
	Supply Chain Nerve Centre	2023	Cut costs and energy usage in the supply chain.
	Sangam	2024	Improved media planning efficiency and digital media impact.
BIL	Britannia A-Eye	2024	Enables visually impaired users to identify products via a smartphone.
	Britannia BourbonIT	2024	Offers AI-generated recipe twists to boost user engagement.
	NutriChoice Mixed Reality Camera	2024	Delivers interactive, personalized ad experiences via AI and QR codes.
GCPL	AI-Driven Demand Forecasting	2020	Reduced unmet demand from 15-20 percent to 2-3 percent.
	Smart Supply Chain Optimization	2020	Achieved 99 percent fulfilment rate and reduced logistics costs by 5-10 percent
TCPL	Infiniti	2021	Optimized procurement decisions using AI-powered analytics.
	Digital Testing Room & Blend Forecasting	2022	Enhanced blend accuracy and accelerated quality control.
	MAVIC	2022	Streamlined visual data collection for sales teams.
ITCL	Sixth Sense	2019	Boosted sales execution by 17 percent and digital channel sales by 7X.
	ITC e-Store	2020	Scaled FMCG e-commerce platform post-lockdown to reach wider markets.
	Unnati	2016	Contributed 20 percent+ of business, enhancing sales and distribution for 800K+ outlets.
	ITCMAARS	2022	Empowered 1.5 M+ farmers, improving returns, yields, and reducing fertiliser use.
	Project Astra	2021	Optimised Agri sourcing efficiency and real-time pricing using AI/ML.

Source: Compiled from official company websites and media reports, 2023-2025

Results and Discussion

The results of this study provide empirical evidence on how AI adoption has influenced the operational and financial performance of select FMCG companies in India during the post-COVID period. In line with the study's objectives, the analysis examines three core dimensions: operational growth, Working Capital Management (WCM) efficiency, and profitability. Each dimension is evaluated through pre- and post-COVID comparisons, with paired t-tests used to determine statistical significance. By combining quantitative results with company-specific AI adoption contexts, the discussion not only highlights where performance improvements have occurred but also identifies variations across companies, shedding light on the strategic conditions under which AI delivers the most value.

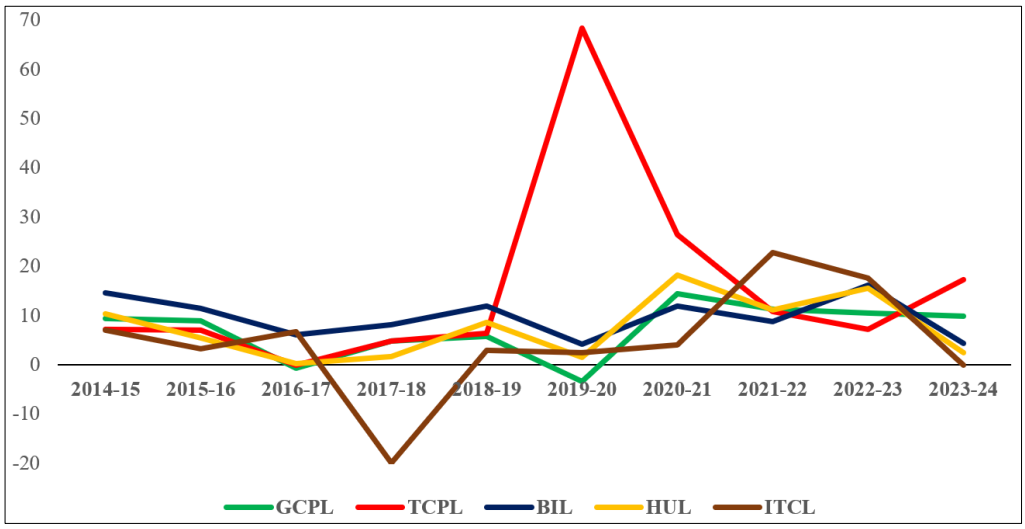
To understand the revenue growth trajectory over the study period, Table 9 presents the annual revenue growth rates of select FMCG companies from 2014-15 to 2023-24. This detailed view helps identify periods of accelerated growth corresponding with key AI adoptions.

Table 9: Annual revenue growth rates of select FMCG companies from 2014-15 to 2023-24 (percent)

Year	GCPL	TCPL	BIL	HUL	ITCL
2014-15	9.35	7.19	14.52	10.29	6.96
2015-16	8.88	6.91	11.40	5.36	3.24
2016-17	-0.81	-0.13	5.97	0.18	6.63
2017-18	4.84	4.83	8.16	1.66	-20.08
2018-19	5.72	6.39	11.93	8.52	2.88
2019-20	-3.52	68.31	4.15	1.50	2.44
2020-21	14.40	26.38	11.95	18.19	3.95
2021-22	11.18	10.71	8.71	11.16	22.74
2022-23	10.43	7.17	16.07	15.58	17.56
2023-24	9.79	17.24	4.28	2.39	-0.05

Source: Computed from annual reports of select FMCG companies

As deduced from Table 9 (Fig. 2), the revenue growth in select FMCG companies improved significantly in the post-COVID period, closely following the adoption of key AI tools. HUL's growth accelerated after implementing Jarvis in 2018, enhancing stock availability, with further gains from Chanakya and supply chain AI tools that boosted forecasting and operational efficiency. GCPL's growth improved from 2020 onward due to AI-driven demand forecasting and supply chain optimization, which reduced unmet demand and logistics costs. TCPL's sharp 2019-20 revenue spike reflects a major corporate merger, while sustained growth post-2021 aligns with AI tools like Infiniti and Digital Testing Room that optimized procurement and product quality. Britannia's AI initiatives launched mainly in 2024, so earlier growth likely stems from prior digital investments. ITC's revenue spikes in 2021-23 correspond with agri-focused AI programs improving sourcing efficiency and yields. Overall, AI adoption in forecasting, supply chain, and procurement has been instrumental in supporting revenue growth during this period.



Source: Table 9

Fig 2: Annual revenue growth rates of select FMCG companies

After analysing the revenue from operations growth trends over the study period, the subsequent section evaluates the impact of AI adoption on operational growth, WCM efficiency, and profitability through a comparative pre- and post-COVID analysis.

Impact on operational growth

This analysis compares differences in core operational revenue between the pre-COVID period (2014-15 to 2018-19) and the post-COVID period (2019-20 to 2023-24) to assess the impact of AI adoption on business growth, using paired t-tests to determine statistical significance.

Table 10: Pre- and post-COVID operational growth metrics of select FMCG companies

Company	Revenue from Core Operations (Crore)					
	Pre-Covid	Post-Covid	Mean Diff.	*p*-value	Post-COVID Change	Significance
GCPL	5104.73	6822.54	+1717.81	0.010	Increased	Significant
TCPL	3048.01	7761.32	+4713.32	0.002	Increased	Significant
BIL	8724.03	13465.45	+4741.42	0.000	Increased	Significant
HUL	34858.08	50616.60	+15758.52	0.009	Increased	Significant
ITCL	49145.45	58500.63	+9355.18	0.223	Increased	Not Significant

Source: Compiled from Annual reports of select FMCG companies

H_{01}: There is no significant impact of AI adoption on the operational growth of the select FMCG companies during the pre- and post-COVID periods.

Table 10 shows that AI adoption significantly contributed to operational growth in most FMCG companies post-COVID. HUL, Britannia, TCPL, and GCPL saw notable improvements driven by AI tools that enhanced forecasting, inventory, and supply chain efficiency. Earlier digital efforts also supported Britannia's gains. In contrast, ITC's growth was not statistically significant, likely due to its focus on agri-based AI applications with longer return cycles.

Overall, aligning AI with core operations proved crucial for driving measurable growth in the sector.

Decision: H_{01} is rejected, indicating that AI adoption significantly improved operational growth in most of the select FMCG companies.

Impact on working capital management

This analysis examines changes in key WCM indicators between the pre- and post-COVID periods to evaluate AI-driven efficiency gains, with paired t-tests pinpointing significant differences.

Table 11: Pre- and post-COVID WCM efficiency metrics of select FMCG companies

Company	Inventory Turnover (ITR) (Times)		Current ratio (CR) (Times)		Cash Conversion Cycle (CCC) (Days)	
	Pre-Covid	Post-Covid	Pre-Covid	Post-Covid	Pre-Covid	Post-Covid
GCPL	5.67	6.13	1.06	1.86	-93.79	-39.98
TCPL	3.19	4.84	2.76	2.47	90.14	11.19
BIL	14.18	10.83	1.61	1.18	-16.42	-10.33
HUL	9.22	9.50	1.21	1.38	-86.40	-74.18
ITCL	4.23	3.82	2.63	3.12	43.97	51.23

Source: Computed from annual reports of select FMCG companies

Table 12: Paired t-test results for pre- and post-COVID WCM practices

Company	Metric	Mean Diff.	*p*-value	Post-COVID Change	Significance
GCPL	ITR	+0.46	0.479	Increased	Not Significant
	CR	+0.80	0.104	Increased	Not Significant
	CCC	+53.81	0.205	Increased	Not Significant
TCPL	ITR	+1.65	0.000	Increased	Significant
	CR	-0.29	0.809	Decreased	Not Significant
	CCC	-78.95	0.001	Decreased	Significant
BIL	ITR	-3.35	0.016	Decreased	Significant
	CR	-0.43	0.174	Decreased	Not Significant
	CCC	+6.09	0.058	Increased	Marginal
HUL	ITR	+0.28	0.380	Increased	Not Significant
	CR	+0.17	0.020	Increased	Significant
	CCC	+12.22	0.297	Increased	Not Significant
ITCL	ITR	-0.41	0.300	Decreased	Not Significant
	CR	+0.49	0.411	Increased	Not Significant
	CCC	+7.26	0.135	Increased	Not Significant

Source: Table 11

H_{02}: There is no significant impact of AI adoption on the WCM efficiency of select FMCG companies during the pre- and post-COVID periods.

Tables 11 and 12 indicate that AI adoption had a varied impact on working capital efficiency across FMCG companies. TCPL saw significant gains in inventory turnover and a sharp reduction in the cash conversion cycle due to tools like Infiniti, despite a slight dip in liquidity. HUL improved its current ratio, supported by Jarvis and Sangam, while maintaining stable inventory efficiency. GCPL showed moderate but non-significant improvements. Britannia's inventory turnover declined, with AI tools like A-Eye launched too late to affect core metrics. ITC experienced a lengthened cash cycle, reflecting delayed returns from agri-based AI tools like Astra and MAARS. Overall, TCPL and HUL showed the strongest working capital gains from AI use.

Decision: H_{02} is partially rejected as AI adoption enhanced some WCM efficiency measures, but effects were not consistent across all variables.

Impact on profitability

In addition to working capital performance, the study also investigates whether AI adoption has translated into measurable profitability gains for the sample companies. It compares NOPAT margin, EVA margin, and ROIC across pre- and post-COVID periods, using paired t-tests to validate H_{03}.

Table 13: Pre- and post-COVID profitability metrics of select FMCG companies

Company	NOPAT Margin (percent)		EVA Margin (percent)		ROIC (percent)	
	Pre-Covid	Post-Covid	Pre-Covid	Post-Covid	Pre-Covid	Post-Covid
GCPL	15.17	17.69	6.86	5.99	18.17	15.34
TCPL	8.46	9.09	-3.38	-7.05	7.19	5.70
BIL	9.04	11.65	6.20	7.64	33.50	29.64
HUL	12.25	15.83	10.47	7.98	70.57	29.02
ITCL	20.13	22.23	11.07	10.91	23.31	19.90

Source: Computed from Annual reports of select FMCG companies

Table 14: Paired t-test results for pre- and post-COVID profitability metrics

Company	Metric	Mean diff.	*p*-value	Post-COVID change	Significance
GCPL	NOPAT	+2.52	0.117	Increased	Not Significant
	EVA	-0.87	0.619	Decreased	Not Significant
	ROIC	-2.83	0.168	Decreased	Not Significant
TCPL	NOPAT	+0.63	0.164	Increased	Not Significant

	EVA	-3.67	0.068	Decreased	Not Significant
	ROIC	-1.49	0.073	Decreased	Not Significant
BIL	NOPAT	+2.61	0.010	Increased	Significant
	EVA	+1.44	0.010	Increased	Significant
	ROIC	-3.86	0.474	Decreased	Not Significant
HUL	NOPAT	+3.58	0.031	Increased	Significant
	EVA	-2.49	0.251	Decreased	Not Significant
	ROIC	-41.55	0.004	Decreased	Significant
ITCL	NOPAT	+2.10	0.264	Increased	Not Significant
	EVA	-0.16	0.855	Decreased	Not Significant
	ROIC	-3.41	0.341	Decreased	Not Significant

Source: Table 13

H_{03}: There is no significant impact of AI-driven technologies on profitability in select FMCG companies during the pre- and post-COVID periods.

Tables 13 and 14 show that AI adoption led to notable profitability gains in only some FMCG companies. HUL recorded a significant rise in NOPAT margin ($p = 0.031$), supported by decision-intelligence tools like Jarvis and Chanakya. However, this was offset by a significant decline in ROIC ($p = 0.004$), suggesting slower capital return. Britannia posted statistically significant improvements in both NOPAT and EVA margins ($p = 0.010$), largely driven by earlier digital infrastructure and operational AI readiness. Meanwhile, GCPL, TCPL, and ITC registered modest, statistically non-significant changes in profitability, despite deploying AI in supply chain and customer-facing functions. All five companies saw a decline in ROIC, reinforcing the gap between operational efficiency and capital productivity.

Decision: H_{03} is partially rejected, as AI adoption improved profitability in HUL and Britannia, but effects varied and all companies recorded ROIC declines.

Challenges of AI implementation in the FMCG sector

Implementation of AI in the FMCG sector brings various challenges to the limelight that must be overcome to unlock its full potential. Some of the hand pressed challenges are:

Lack of skilled workforce

Implementing AI requires a workforce proficient in AI technologies, which is currently limited in many regions including India. 28 percent of Indian enterprises report talent scarcity as a key barrier to AI scaling (EY-NASSCOM, 2024) [3].

Data quality and availability

AI systems rely on vast amounts of high-quality data. In many cases, the required data is either unavailable, fragmented, or of poor quality, making it difficult to train effective AI models. 32 percent of companies are not data-ready, and 68 percent operate with ad hoc or immature AI budgets (EY-NASSCOM, 2024) [3].

Regulatory and privacy concerns

The use of AI involves handling large volumes of personal data, raising significant concerns around data privacy and regulatory compliance. Thirty-eight percent of organizations cannot explain or audit AI outputs, creating compliance and trust issues. (PwC, 2021) [10]. The enactment of India's Digital Personal Data Protection Act (DPDPA), 2023, has further heightened scrutiny.

Brand management

Ensuring consistent and effective brand communication while integrating AI can be challenging due to the dynamic nature of consumer preferences and market trends. Globally, only 26 percent of companies succeed in scaling AI to deliver tangible business value. (BCG, 2024) [1].

Consumer demand and spending power

The FMCG industry faces issues with fluctuating consumer demand and low spending power, which can complicate the deployment and effectiveness of AI systems.

Summing up

The study concludes that AI adoption has played a transformative role in enhancing operational performance across the select FMCG companies during the post-COVID period. HUL and Britannia demonstrated significant improvements in profitability, particularly in NOPAT and EVA margins, supported by well-integrated AI tools and earlier digital initiatives. TCPL recorded substantial gains in working capital efficiency, with notable improvements in inventory turnover and cash conversion cycle, driven by AI-powered procurement and quality control tools. GCPL achieved moderate progress in operational growth and inventory management through demand forecasting and supply chain optimization, though financial gains remained statistically non-significant. ITC, despite implementing AI in agri-sourcing and digital sales platforms, showed limited short-term impact on profitability and efficiency, likely due to the longer gestation period of its rural-focused initiatives.

To sum up, the findings suggest that the effectiveness of AI adoption depends on the scale, timing, and operational alignment of implementation. While most companies saw improvements in growth and process efficiency, returns on capital declined for all companies, although the magnitude of decline varied. Addressing data quality, talent readiness, and enterprise-wide integration will be crucial for unlocking the full potential of AI in the Indian FMCG sector.

Limitations of the study

- Reliance on secondary data from public reports may introduce reporting biases.
- Sample limited to five large NIFTY FMCG companies. The results may not generalize to smaller or unlisted companies.
- Pre/post-COVID split is a proxy for AI adoption timing and may not fully isolate AI effects.
- The study does not measure companies' AI investment amounts or implementation intensity.
- Short post-adoption window for some initiatives may understate long-term impacts.

- Other factors like changes in the economy, company mergers, or new policies may have affected the results and were not fully accounted for.

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