Anomaly detection platform

Bridging the gap for modern day retailers with GenAI and machine learning

pwc

The retail sector is often considered to be a microcosmic reflection of the larger societal and economic dynamics as it depicts the shifts in consumer choices and cultures influences, technological innovations, regulatory changes and global market trends. Retail businesses typically have both high volume and low value transactions. Thus, efficiency and effectiveness in this business is not just a driver of business longevity but a competitive differentiator as well. However, the complexities originate from myriad of reconciliations and transaction monitoring and manual reconciliations alone cost the industry millions in lost profitability each year due to high instances of manual errors. Therefore, there is a growing need for a better method to address these leakages and improve the efficiency of various processes within the industry.

Top value generating opportunities for retailers:

Driving revenue assurance
- Sales transaction monitoring
- Payments, discounts and schemes transaction monitoring
- Payment gateways, aggregators, channels

Trade promotions effectiveness

Effective financial reconciliations
- Bank, intercompany, vendor

Optimal working capital and money velocity
- Cash applications – partial, many-to many, deductions, taxes, enterprise resource planning (ERP)

Preventing frauds and leakages
- Employee travel expense
- Vendor invoice payments

Balance sheet health – account substantiation

The above figure outlines some of the value negation opportunities for the retail sector. However, monetising these opportunities is not easy and retailers face a variety of challenges. Some of the challenges are:

1. Retail businesses grapple with managing **massive volume of daily transactions**, which can impact manual reconciliation and transaction monitoring processes, **heightening the risk of oversight and financial inaccuracies**.

2. Retail transactions often involve **intricate patterns, encompassing discounts, refunds and loyalty programmes**. The **complexity of transactions** in the retail sector, characterised by **variability, context-dependency and potential data ambiguity**, poses multifaceted challenges for business.

3. **Manual tracking of diverse offers for discounts and promotions** across multiple channels is **error-prone, amplifying the risk of revenue leakage** in the absence of a robust reconciliation process.

4. The proliferation of **diverse payment methods, coupled with varying processing mechanisms**, contributes to transaction errors, double charges and failed transactions, further complicating the reconciliation process.

The machine learning (ML) and GenAI-led platforms herald a new era of automation, promising enhanced speed, precision and adaptability in financial operations. Their potential to revolutionise workflows, mitigate risks and empower decision-makers is pivotal in an era defined by data-driven insights and operational excellence.
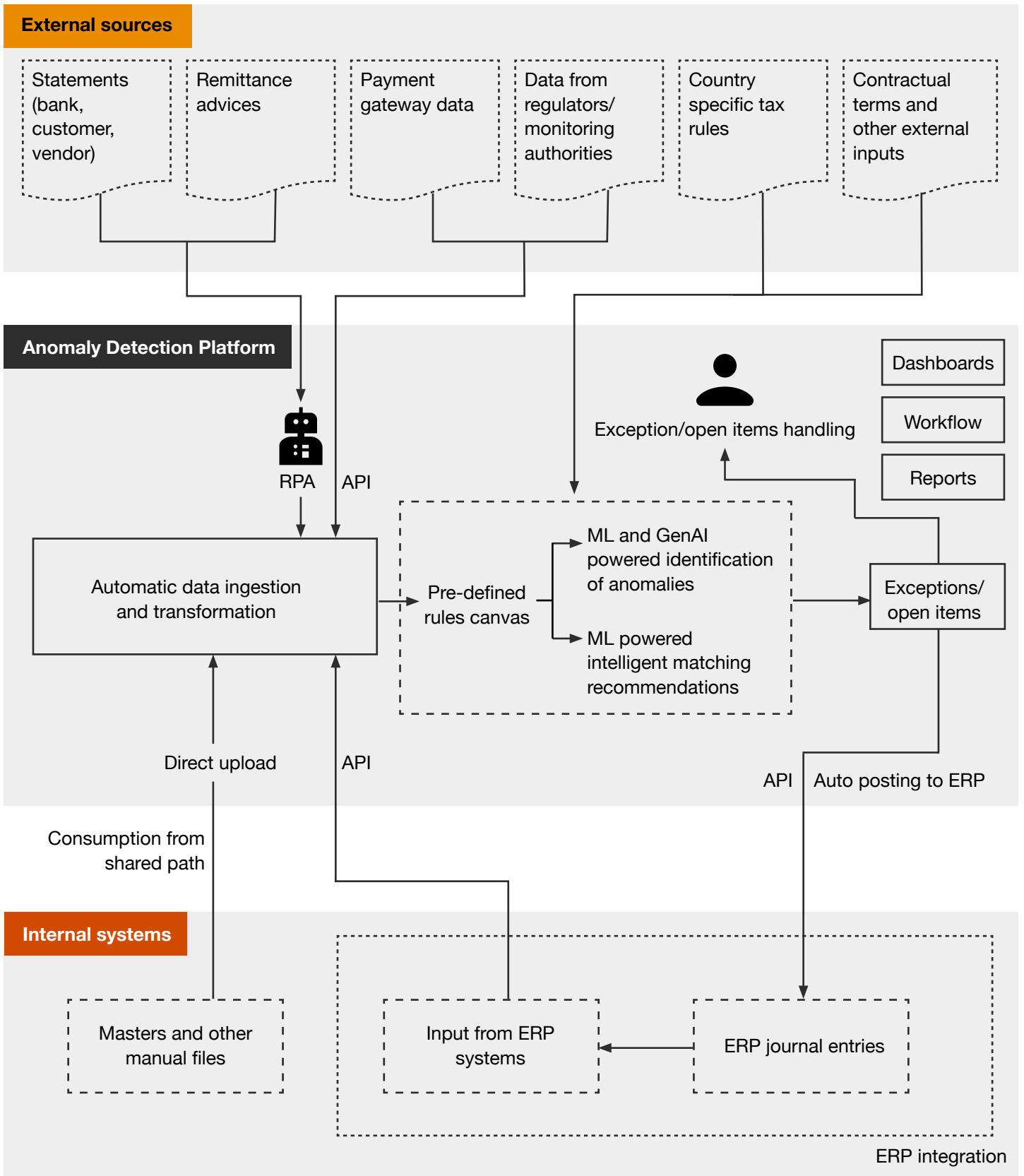
PwC's Anomaly Detection Platform

PwC's Anomaly Detection Platform (ADP) is a cutting edge GenAI and ML-driven digital platform. This award-winning platform is designed to offer seamless reconciliations, anomaly detection and robust continuous transaction monitoring. The platform consists of, a UI-based business rules engine (BRE), and persona-specific workflows and dashboards.

Some of the key features of ADP which can help streamline the reconciliation and transaction monitoring processes are:

- **Data-driven efficiency:** The time-consuming task of data extraction from multiple sources (point of sales (PoS) systems, e-commerce platforms and financial institutions) reduces the full-time equivalent (FTE) hours. ADP's auto-extraction and standardisation features allow users to focus on other key tasks such as deriving valuable insights and working on resolving the discrepancies.

- **Smart reconciliation:** Leverage ML capabilities for intelligent matching recommendations and handling complex matching patterns like many-to-one, one-to-many and many-to-many with reduction in error rates and discrepancies.

- **AI and NLP-led unsupervised anomaly detection:** ADP helps the user gain complete control over the data by identifying unknown risks, anomalous patterns, new rules and potential frauds with AI and NLP led techniques which can result in significant amount of reduction in losses resulting from reconciliation errors and fraudulent transactions.

- **GenAI capabilities:** Large language models (LLMs) provide business context and data-driven reasoning to the suspicious patterns generated by unsupervised algorithms.

- **Tailored workflows:** Streamline the operations with ADP's customisable workflows. Efficiently analyse and resolve open/unreconciled items, ensuring smooth transitions between different stages of the operations.

- **Secure access:** Safeguard sensitive data with role-based access, ensuring that only authorised personnel can access critical information.

- **Real-time updates:** Stay ahead of the curve with real-time notifications and progress tracking. Respond swiftly to any operational anomalies, ensuring uninterrupted service to the customers.

- **Actionable insights:** Make informed decisions with our custom reports, analytics and personalised dashboards. Track KPIs like reconciliation trends across outlets, remediation and turnaround time (TAT) driving the business towards growth and profitability.

Figure 1: Future state consolidated process flow

External sources

- Statements (bank, customer, vendor)
- Remittance advices
- Payment gateway data
- Data from regulators/ monitoring authorities
- Country specific tax rules
- Contractual terms and other external inputs

Anomaly Detection Platform

Dashboards

Workflow

Reports

Exception/open items handling

RPA | API

Automatic data ingestion and transformation → Pre-defined rules canvas →
- ML and GenAI powered identification of anomalies
- ML powered intelligent matching recommendations

→ Exceptions/ open items

Direct upload | API

Consumption from shared path

API | Auto posting to ERP

Internal systems

Masters and other manual files

Input from ERP systems ← ERP journal entries

ERP integration

Source: PwC analysis

The figure illustrates how data is ingested into the platform from various external and internal sources using robotic process automation (RPA) and application programming interface (APIs). The platform processes data through a rules canvas and applies machine learning and GenAI to identify anomalies. Exceptions are handled and posted to enterprise resource planning (ERP) systems with outputs available via dashboards, workflows and reports.

Solving business challenges using ADP

In-store or online sales transaction monitoring

Sales transaction data is one of the most important sources of information for retail companies since it reflects the demand and preferences of customers as well as the performance and profitability of products and channels. Due to the complexities and high volumes of these transactions, there is a greater chance for errors and discrepancies. With ADP, organisations can have better control over the sales transactions and can effectively identify anomalies such as:

- **Outliers in transaction amounts:** Unusually high or low transaction amounts as compared to historical averages of similar transactions. Consider a scenario where the transaction amount for a particular product category is typically around USD 200. However, you suddenly see a transaction for USD 2,000 for a single electronic item. This would be considered an outlier in terms of unusually high transaction amount compared to the historical average.

- **Unusual transaction frequencies:** Sudden unexplained spikes or drops in sales volume could indicate system glitches or fraudulent activities.

- **Mismatched inventory levels:** Addressing the discrepancies in sales data and inventory levels is important for maintaining operational efficiency and customer satisfaction.

- **Payment processing errors:** Failed payments, double charges and payment reversals can disrupt cash flow and create customer dissatisfaction. These errors are also time consuming as it takes time for reconciliation efforts to resolve.

- **Fraudulent chargebacks:** The AI and ML algorithms utilised by the platform can flag suspicious chargeback requests potentially stemming from friendly fraud, identity theft or unauthorised transactions.

- **Unmatched sales and shipping data:** Discrepancies between sales data and shipping records, such as orders marked as delivered but not reflected in sales revenue could potentially indicate fulfillment errors or fraudulent activities like drop shipping frauds.

- **Unusual time or date patterns:** Transactions occurring outside normal business hours or during holidays highlighting potential irregularities.

- **Inconsistent customer behaviour:** Sudden changes in purchasing frequency, average order value or product preferences can indicate account takeover or identity theft.

Anomalies in trade promotions

Trade promotions data serves as a compass for businesses guiding them through the complex landscape of consumer behaviour and market dynamics. It empowers the retailers to stay agile in a rapidly evolving marketplace and help them drive sustained growth and success.

With the ADP, users can both identify anomalies in the data or leverage insights like sales performance and customer preference as enablers to finetune their promotional strategies for heightened profitability and customer engagement. Different insights/patterns that can be identified by the platform but not limited to are:

- **Overlapping promotions:** Identify potential cases of over discounting or loss of revenue.

- **Promotion misalignments:** Discrepancies between planned promotion and actual execution

- **Inconsistent pricing:** Cases of deviation in pricing from the expected promotional prices

- **Unusual sales patterns:** Unexpected surge or decrease in sales volume during promotional activities.

- **Mismatched discounts:** Discrepancies in the discounts offered to customers as compared to the discounts recorded in the system.

- **Redemption irregularities:** Sudden surge or anomalous redemption of promotional offers

- **Compliance violations:** Identifying the promotions which violate regulatory or contractual requirements.

Payment transactions monitoring

The payments data encompasses transactions made through various payment methods, including cash, credit cards, mobile payments and online platforms. Monitoring this data plays a crucial role in detecting fraudulent activities, managing revenue streams and ensuring compliance with regulatory standards.

By using the platform, retailers can identify suspicious patterns such as:

- **Unusual spending patterns:** Sudden high value purchases or increase in transaction frequency.

- **Suspicious transactions:** Multiple transactions within short frequency from various locations, transactions that exceeded the thresholds without proper approvals etc.

- **Identity theft:** Multiple transactions using the same account from various locations.

- **Card skimming/payment card fraud:** Transactions made using compromised/stolen card information or CVV codes.

- **Transaction laundering/collusion:** Detecting transactions that are used to disguise the true nature of activities or patterns that indicate collusion between merchants and customers.

- **Suspicious merchant activity:** Unusual merchant behaviour; sudden increase in transaction volume, high number of chargebacks, etc.

Bank, intercompany, vendor and customer reconciliations

Finance reconciliations like banks, intercompany, vendors and customers play a crucial role in ensuring that the accuracy and integrity of financial transactions is sacrosanct across different entities.

By using ADP to automate these reconciliations, organisations can improve their operational efficiency, financial accuracy and compliance to the prevailing regulations, driving success and competitiveness in the retail sector. Some of the reconciliation anomalies that the platform can help address are:

Bank reconciliation

- Unauthorised transactions like unexplained withdrawals or debits from the company's bank account.
- Discrepancies in deposits like variances between recorded deposits in the company's books and the actual deposits in the bank statement.
- Bank errors that can lead to discrepancies in the balances.

Intercompany reconciliation

- Differences in account balances between intercompany accounts
- Mismatches between the accounts due to incorrect categorisation of intercompany transactions
- Instances of taxes or other deductions not recorded in one of the entities while the other entity has recorded the deduction adjusted amount.

Vendor reconciliation

- Discrepancies between vendor invoices and recorded payments.
- Overpayment to the vendors due to multiple payments made for the same invoice or purchase order.
- Credits received from vendor not matching with the company books.
- Short or excess accounted for by the company.

Customer reconciliation

- Payments received from customers are unapplied in the company books.
- Unapproved/disputed charges deducted while making the payment.
- Ageing differences in accounts receivables between company books and customer statements.

Anomalies in employee claims

The employee claims data contains different expense reimbursements and allowances like travel expenses, meal allowances and equipment purchases. These claims are often subject to errors or discrepancies, which can result in significant financial losses and operational inefficiencies for organisations. Such anomalies may arise from inaccurate reporting, misclassification of expenses, or even fraudulent activitiesleading to financial losses and operational inefficiencies.

With ADP, retail companies can proactively identify and mitigate exception/anomalies in employee claims data. They can also ensure compliance with the firm's specific expense policies and reduce instances of fraud. Some of the anomalies that can be highlighted by the platform are:

- multiple claims submitted for the same expense

- instances of claiming exaggerated or incorrect

- expenses to obtain higher reimbursements

- claims that do not fall under the purview of the prevalent policies

- suspicious patterns like frequent claims for unusual expenses or suspicious timing and frequency.

Anomalies in logistics data

Logistics covers the complete process of moving goods from suppliers to warehouse and subsequently to customers. The costs involved in logistics are quite high; therefore, effective management of logistics data is extremely important for optimising supply chain operations, reducing expenses and enhancing customer satisfaction.

With ADP, retail organisations can address these issues promptly, optimise logistics operations and minimise disruptions. Additionally, the platform can also help improve overall supply chain visibility and enhance the decision-making process. Some of the key anomalies that can be identified by the platform are:

- delivery delays or instances where the shipments arrived later than expected

- discrepancies in the inventory levels recorded in comparison with physical stock counts

- incorrect addresses or shipping labels leading to misrouted or undelivered shipments

- anomalies in delivery routes

- abnormal order volumes.

Automated cash application

Cash application is a crucial process in the retail sector, where efficiency and accuracy are of utmost importance. Manual process are often time-consuming and susceptible to human errors, leading to delays and discrepancies. Studies indicate that manual cash applications are often time consuming with high error rates. However, with ADP the processing time can be reduced up to 80% and error rates can be reduced to less than 1%.[1]

Some of the scenarios that can be handled using our platform are:

- split, bundled and partial payments requiring complex transaction matching (one-to-many, many-to-one and many-to-many)

- misapplied payments or instances where payments are applied to incorrect invoices or accounts

- cross entity payments where payment is credited to an entity other than the invoice entity

- deductions (withholding tax (WHT), tax deducted at source (TDS), discounts, etc.)

- currency converted payment allocations.

Merchant discount rate (MDR) reconciliation and analytics

In the retail sector, MDR reconciliation and analytics are crucial for financial precision and cost management. Retailers often bear MDR fees on every transaction which needs to be reconciled to ensure that they align with the agreed upon rates.

With the ADP, the retailers can improve cost management by effectively identifying the discrepancies in MDR fees. The platform also provides analytics on key metrics like discrepancy rate, cost savings, payment method distribution, error rate and trend analysis which can provide the required information for cost optimisation. Some of the discrepancies that can be identified by the platform are:

- rate discrepancies (difference between actual and contracted rates)
- value date discrepancies due to differences between actual and agreed terms
- duplicate transfers (transactions processed multiple times leading to excess MDR fees)
- identifying if defined orchestration logics are working optimally in line with the agreed terms
- instances of higher currency conversion margins charged as compared to agreed contractual margins
- unapproved or unexpected fees that do not align with the contractual agreement
- incorrect merchant category codes
- discrepancy in charge back fees
- inconsistent payment method charges.

The platform helps the companies by providing overall spend demographic at instrument, aggregator, region and across channels like business-to-business (B2B), business-to-consumer (B2C) and POS. To conclude, cost analyser serves as the foundation for cost-cutting initiatives of the organisation.

---

1   PwC analysis

Advertisement and marketing expenses reconciliation

The advertising and marketing expenses play a crucial role in attracting customers and driving sales whether it is through traditional avenues like print, television and radio, or through modern digital platforms such as social media and targeted online ads. These expenses directly impact a company's ability to reach its target audience and achieve its revenue goals. Hence ensuring a robust reconciliation process is paramount

With ADP's reconciliation module, retailers can effectively reconcile their spending across different channels and campaigns with enhanced accuracy. Some of the discrepancies that can be highlighted by the platform are:

- difference between planned and actual spending
- discrepancy in the ad spots provided as per the monitoring reports vs the number of spots for which the medial channel has billed the retailer
- variation in the rate applied by the media against the agreed upon rate as per the original contract
- instances where the retailor is charged for the bonus spots provided be the media agency
- discrepancy in the timeslot/location for an advertisement based on what was planned and what was implemented by the media agencies
- other insights based on the monitoring reports like instances where ads are aired consecutively, instances where the percentage of ads aired during non-prime time hours is significantly higher than prime time, etc.

Balance sheet substantiation and analytics

The balance sheet substantiation and analytics play a crucial role in ensuring financial accuracy and strategic decision-making. By ensuring accurate reconciliation of accounts and financial data, retailers can mitigate the risk of errors, fraud and misstatements. ADP not only creates a balance sheet based on the trial balance and the chart of accounts it also provides a comprehensive study and comparative analytics like variances based on the previous period balance sheets. Some of the key exceptions that the platform can highlight are:

- sudden unexpected behavior in slow moving general ledger (GL) balances
- discrepancies in the inventory valuation
- misclassification of the GLs
- discrepancies in the associated GL balances in comparison with individual ERP reports like fixed asset register, advances, and claims and receivables.

Given below are some of the use cases of ADP where customers were able to derive benefits for their businesses by using the platform.

Key benefits of ADP

- **Bespoke AI/ML model:** Unsupervised ML models to cover unknowns with explainable AI and NLP.

- **Customisable and flexible:** Customised UI/UX, exception tracking grids workflow and reports.

- **Fit-for-future:** Tailored for multiple business use cases at a low cost.

- **Limitless access:** No restriction on numbers of users that can be onboarded.

- **End-to-end support by PwC:** PwC assists clients in product licensing, implementation, support and maintenance.

Conclusion

PwC's GenAI-powered ADP offers a revolutionary approach to address the complex challenges faced by the retail sector. With a suite of advanced features, the platform is deployable on cloud or on-premise. This 'low-code no-code' platform offers the flexibility needed to cater to diverse business environments and use-cases.

About PwC

At PwC, our purpose is to build trust in society and solve important problems. We're a network of firms in 151 countries with over 360,000 people who are committed to delivering quality in assurance, advisory and tax services. Find out more and tell us what matters to you by visiting us at www.pwc.com.

PwC refers to the PwC network and/or one or more of its member firms, each of which is a separate legal entity. Please see www.pwc.com/structure for further details.

Contact us

Ravi Kapoor
Partner and Leader – Retail and Consumer
PwC India
ravi.kapoor@pwc.com

Manpreet Singh Ahuja
Partner and Chief Digital Officer
PwC India
manpreet.singh.ahuja@pwc.com

Sudipta Ghosh
Partner
PwC India
sudipta.ghosh@pwc.com

Mukesh Deshpande
Partner
PwC India
mukesh.deshpande@pwc.com

Vidhathrae K
Partner
PwC India
vidhathrae.k@pwc.com

Saurabh Batra
Partner
PwC India
saurabh.batra@pwc.com

Sayantan Mondal
Managing Director
PwC India
sayantan.mondal@pwc.com

Aman Goel
Managing Director
PwC India
aman.goel@pwc.com

Samir Shah
Managing Director
PwC India
samir.shah@pwc.com

Umang Agrawal
Director
PwC India
agrawal.umang@pwc.com

Contributors

Monica Manchanda
Senior Manager
PwC India

Swarupa Chamarty
Manager
PwC India

Antima Garg
Associate
PwC India

pwc.in