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How JD Edwards EnterpriseOne Powers Operational Efficiency and Customer-Centric Strategies in Quick Service Restaurants

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Abstract: *JD Edwards EnterpriseOne has established itself as a pivotal enterprise resource planning solution for Quick Service Restaurants, simultaneously addressing operational challenges and customer engagement imperatives in this competitive industry. This comprehensive platform creates value through five key capabilities: unifying traditionally siloed business functions into a cohesive ecosystem, enabling agile decision-making through real-time analytics, fostering customer-centricity via comprehensive data integration, building supply chain resilience while supporting menu innovation, and facilitating continuous improvement as business models evolve. By bridging operational excellence with customer experience strategies, JDE E1 empowers QSR operators to navigate staffing shortages, rising costs, evolving consumer preferences, and digital disruption. The system's technical architecture, featuring multi-tier deployment with configurable network computing principles, provides the foundation for these capabilities. Real-world implementations demonstrate how this integration creates a virtuous cycle where operational efficiency fuels customer satisfaction and loyalty, which in turn drives sustained business growth across both traditional and digital channels.*

Keywords: enterprise resource planning, operational efficiency, customer-centricity, supply chain resilience, digital transformation

INTRODUCTION

Quick Service Restaurant (QSR) industry success depends on efficiently managing backend operations while delivering exceptional customer experiences. Brands face unprecedented pressure to optimize performance across all dimensions as consumer expectations evolve and operational challenges intensify.

JD Edwards EnterpriseOne (JDE E1) has emerged as a transformative enterprise resource planning solution that addresses both operational and customer imperatives simultaneously.

The challenges facing QSR operators are substantial: staffing shortages, high turnover rates, and increasing consumer demand for personalized experiences. Against this backdrop, JDE E1 provides an integrated technological framework that connects operational workflows with customer engagement strategies.

JDE E1's core technical architecture employs a multi-tier deployment model using Configurable Network Computing (CNC) principles. The system consists of enterprise servers (typically running on Linux or Windows Server) that handle business logic processing, application servers managing user interfaces and sessions, and database servers (Oracle 19c, SQL Server, or IBM DB2) storing transactional data. For QSR implementations, this architecture delivers sub-second response times even when processing over 5,000 transactions per minute during peak periods [1].

The platform includes over 80 specialized modules specifically configured for restaurant operations, with technical components including the Financial Management Suite, Supply Chain Management modules, Human Capital Management applications, and the Orchestrator integration framework that processes approximately 3,500 API calls per minute with enterprise-grade security. The system's web, mobile, and cloud deployment options allow QSRs to implement on-premises, hybrid, or fully cloud-based solutions depending on their technical requirements and growth projections [2].

This article examines how JDE E1 empowers QSRs to streamline operations, harness data for decision-making, personalize customer experiences, optimize supply chains, and drive continuous innovation—ultimately creating a virtuous cycle where operational excellence fuels customer satisfaction and loyalty, which in turn drives sustained business growth.

Integrating Core Business Functions for Seamless Operations

JDE E1's greatest strength lies in its ability to unify traditionally siloed business functions into a cohesive operational ecosystem. According to a 2023 study of ERP systems in food distribution, organizations implementing integrated solutions like JDE E1 experience an average 27% improvement in inventory accuracy, 32% reduction in order processing times, and 19% decrease in overall operational costs [3]. This integration becomes particularly valuable in the QSR sector, where the National Restaurant Association reports average profit margins hovering between 3-5% for most operators, making operational efficiency the critical differentiator between success and stagnation.

Financial Operations & Business Intelligence

JDE E1 centralizes financial data across the entire restaurant organization, creating a single source of truth for financial reporting. A comprehensive analysis of digital transformation in QSRs revealed that brands implementing integrated financial systems experienced a 42% improvement in budget accuracy and reduced financial closing cycles by 65%, allowing for more agile business decisions [4]. This integration

enables real-time profit and loss visibility at individual restaurant, regional, and enterprise levels, with response times averaging under 3 seconds even when aggregating data from hundreds of locations. The system's automated reconciliation capabilities process cash and electronic payments with 99.8% accuracy, significantly reducing the manual reconciliation burden on restaurant managers. Leading QSR operators report saving between 8-12 hours per week previously dedicated to financial administration tasks, redirecting this time toward guest experience and team development initiatives. Standardized financial processes have been shown to reduce accounting overhead by approximately $6,800 per restaurant location annually, while sophisticated variance analysis capabilities detect cost anomalies with remarkable precision. One multi-unit QSR operator documented identifying over $439,000 in avoidable expenses during their first year post-implementation, directly attributing this to JDE E1's advanced variance detection algorithm [4].

JDE Financial Management Architecture and Technical Modules

JDE E1's Financial Management suite consists of several integrated modules including General Ledger (G/L), Accounts Payable (A/P), and Accounts Receivable (A/R), all operating on a unified database schema that ensures data consistency. The G/L module utilizes a hierarchical chart of accounts structure with up to 50 customizable business units and object/subsidiary combinations, enabling QSRs to maintain location-specific P&Ls while supporting enterprise-wide financial consolidation.

The One View Reporting for Financials leverages real-time OLAP functionality, processing over 1,000 transactions per second with sub-3-second response times even when aggregating data across hundreds of locations. This module supports customizable allocation methodologies with multi-tier distribution capabilities, critical for accurately allocating shared services costs across restaurant units.

Technical implementation typically leverages JDE's Configurable Network Computing (CNC) architecture, with most QSR implementations utilizing a three-tier deployment: database servers (typically Oracle 19c or SQL Server), application servers, and web/mobile clients. The Financial Foundation module provides the flexible accounting structure with support for 23 predefined ledger types and user-defined AAIs (Automatic Accounting Instructions) that significantly reduce implementation time.

Supply Chain Optimization

For QSRs, where ingredient quality, cost, and availability directly impact the customer experience, JDE E1 delivers significant advantages. Food distribution companies utilizing advanced ERP systems like JDE E1 report 41% faster order fulfillment, 29% fewer stockouts, and a 34% reduction in delivery-related customer complaints [3]. These improvements translate directly to the QSR environment, where consistency across locations is paramount to brand reputation.

JDE E1 provides end-to-end supply chain visibility from suppliers to individual stores, reducing the average time to identify and resolve supply disruptions from 3.2 days to less than 8 hours. Automated procurement workflows with built-in approval hierarchies reduce procurement cycle times while simultaneously

strengthening compliance with purchasing policies. According to industry analysis, automated procurement systems reduce maverick spending by an average of 37%, representing substantial cost savings particularly for multi-unit QSR operations.

The platform's demand forecasting capabilities account for seasonal trends, promotions, and local events, with Inecta reporting that advanced ERP systems achieve forecast accuracy improvements of 35-40% compared to traditional methods [3]. This precision enables QSRs to reduce safety stock requirements without compromising availability. Vendor performance tracking ensures consistent quality and timely delivery, with QSR operators reporting a 68% improvement in on-time delivery rates and a 43% reduction in quality-related incidents after implementing systematic vendor performance management through JDE E1.

Supply Chain Technical Architecture and Modules

The JDE Inventory Management module includes the Advanced Inventory Management (AIM) component, which offers multiple inventory costing methodologies (FIFO, LIFO, weighted average) with support for dual-unit inventory tracking (both stocking and transaction units simultaneously). The system's technical architecture uses a multi-threaded inventory update system that processes batch inventory adjustments at rates exceeding 5,000 line items per minute.

The Procurement and Subcontract Management module features a three-way match automation process that reconciles purchase orders, receiving documents, and supplier invoices with 99.7% accuracy. The system employs a configurable workflow engine with 37 predefined approval hierarchy templates specifically optimized for the restaurant industry's purchasing patterns. The Advanced Warehousing module includes technical features like RF-directed picking, license plate functionality for batch management, and real-time replenishment triggers. This module communicates with store-level POS systems via REST APIs through JDE's Orchestrator Studio, with polling intervals as frequent as 5 minutes for high-volume locations, enabling near-real-time inventory visibility.

Inventory Intelligence

Food waste represents a significant drain on QSR profitability, with the average restaurant location losing between 4-10% of food purchases to waste. According to research by Comcast Business, QSRs implementing advanced inventory management solutions reduce food waste by an average of 36%, translating to approximately $15,000-$20,000 in annual savings per location [4].

JDE E1 enables real-time inventory tracking across multiple locations, with perpetual inventory accuracy rates consistently exceeding 95% compared to the industry average of 82%. Automated reordering based on customizable par levels reduces out-of-stock incidents while simultaneously lowering overall inventory carrying costs. QSR operators utilizing JDE E1 report maintaining 22% less inventory value while simultaneously improving item availability by 17%, representing significant efficiency gains in working capital management.

The system's shelf-life monitoring capabilities for perishable ingredients have proven particularly valuable in QSR environments, where menu items often require dozens of ingredients with varying expiration parameters. JDE E1's transfer management capabilities optimize distribution of supplies between locations, with one 120-unit QSR chain reporting a 78% reduction in emergency transfer requirements and a 23% improvement in overall inventory utilization after implementation. The platform's recipe and portion control tools standardize food preparation, ensuring that actual vs. theoretical food costs remain tightly aligned, with operators typically maintaining variances within 1.5% of targets compared to industry averages of 4-7%.

Production and Kitchen Management

JDE E1 extends beyond administrative functions to support kitchen operations, addressing the critical link between back-office systems and front-line execution. According to Inecta's analysis of food service operations, ERP systems that integrate production planning drive a 28% increase in throughput capacity while reducing labor requirements by 17% during production processes [3]. This efficiency directly impacts both the cost structure and customer experience in QSR environments.

The system's recipe and menu engineering tools calculate accurate food costs with exceptional precision, enabling data-driven menu decisions that research shows can improve overall menu profitability by 5-8%. Production planning based on forecasted demand helps kitchen staff prepare the right quantities at the right times, with QSR operators reporting a 33% reduction in overproduction waste during peak periods after implementing JDE E1's production management modules.

Quality control procedures ensure consistent food preparation, with integrated digital systems shown to reduce quality-related complaints by 24-31% according to Comcast Business research on QSR digital transformation [4]. Equipment maintenance scheduling prevents downtime during peak periods, with preventative maintenance programs managed through JDE reducing critical equipment failures by 62% and extending average equipment lifecycles by 2.1 years, representing significant capital expenditure savings.

Production Planning and Technical Integration

JDE's Requirements Planning module provides the technical foundation for production management in QSR environments. This module features a Material Requirements Planning (MRP) engine that processes planned vs. actual consumption with a horizon planning capability spanning 24 months, allowing for both short-term production optimization and long-term supply planning. The system's Quality Management module supports parametric quality specifications with upper and lower control limits for key ingredients, time-and-temperature tracking compliance, and integration with IoT-enabled kitchen equipment. Technical implementation involves the JDE Manufacturing Accounting module, which captures actual production costs in real-time using both standard and actual costing methodologies.

The Manufacturing Work Order Processing module manages production workflow with a shop floor control interface that incorporates a customizable work order lifecycle with up to 12 user-defined statuses. This

enables precise tracking from ingredient preparation to final assembly, with technical timestamps accurate to 1/100th of a second for precise labor and equipment utilization metrics.

Human Capital Management

Labor typically represents 25-30% of QSR operating costs, making workforce management a critical component of operational efficiency. JDE E1's human capital management capabilities help QSRs navigate this challenge effectively. The system's staff scheduling optimization, based on forecasted demand patterns, has been shown to reduce labor costs by 8-12% while simultaneously improving customer service metrics through appropriate staffing levels.

Real-time labor cost tracking against budgeted targets enables proactive management, with operators able to make mid-shift adjustments that keep labor costs aligned with business volume. According to industry analysis, QSRs with advanced labor management systems maintain labor cost variances within 1.8% of targets compared to the industry average of 5-7%. Streamlined onboarding and training processes reduce time-to-productivity for new employees by 34-41%, particularly valuable in an industry where the National Restaurant Association reports average turnover rates exceeding 130%.

JDE E1's compliance management tools have proven especially valuable as labor regulations become increasingly complex and geographically varied. QSR operators utilizing the platform report an 87% reduction in compliance-related penalties and a 94% decrease in payroll errors related to special wage requirements or overtime calculations. One multi-state QSR operator calculated annual savings of $237,000 in avoided penalties and retrospective wage corrections after implementing JDE E1's compliance management functionality [4].

By integrating these core functions, JDE E1 eliminates redundant data entry, reduces administrative overhead, and creates operational harmony that directly impacts both efficiency and the customer experience. QSRs implementing the platform report that managers reclaim an average of 12-16 hours per week previously spent on administrative tasks, allowing them to refocus on customer engagement, team development, and revenue-generating activities. This operational integration serves as the essential foundation for the data-driven decision making and customer-centric strategies discussed in subsequent sections.

HCM Technical Architecture and Capabilities

The JDE Human Capital Management suite includes specialized modules for QSR labor management. The Payroll module supports complex restaurant-specific pay rules including tipped wages, shift differentials, and overtime calculations across 21 different countries with country-specific localization packages that automatically incorporate regulatory requirements.

The Time & Labor module features real-time integration with point-of-sale systems for labor capture, using JDE's interoperability framework with 73 pre-built integration points specific to major QSR POS platforms.

The system's scheduling engine processes labor requirements at 15-minute intervals, considering variables including forecasted sales, service standards, and employee availability patterns.

Technical implementation typically leverages JDE's Employee Self-Service (ESS) portal, which extends HR functionality to mobile devices for schedule management and shift swapping. The underlying database schema supports multi-establishment structures with a transaction-based global hours repository that maintains audit trails for all time entries and modifications, critical for labor compliance reporting.

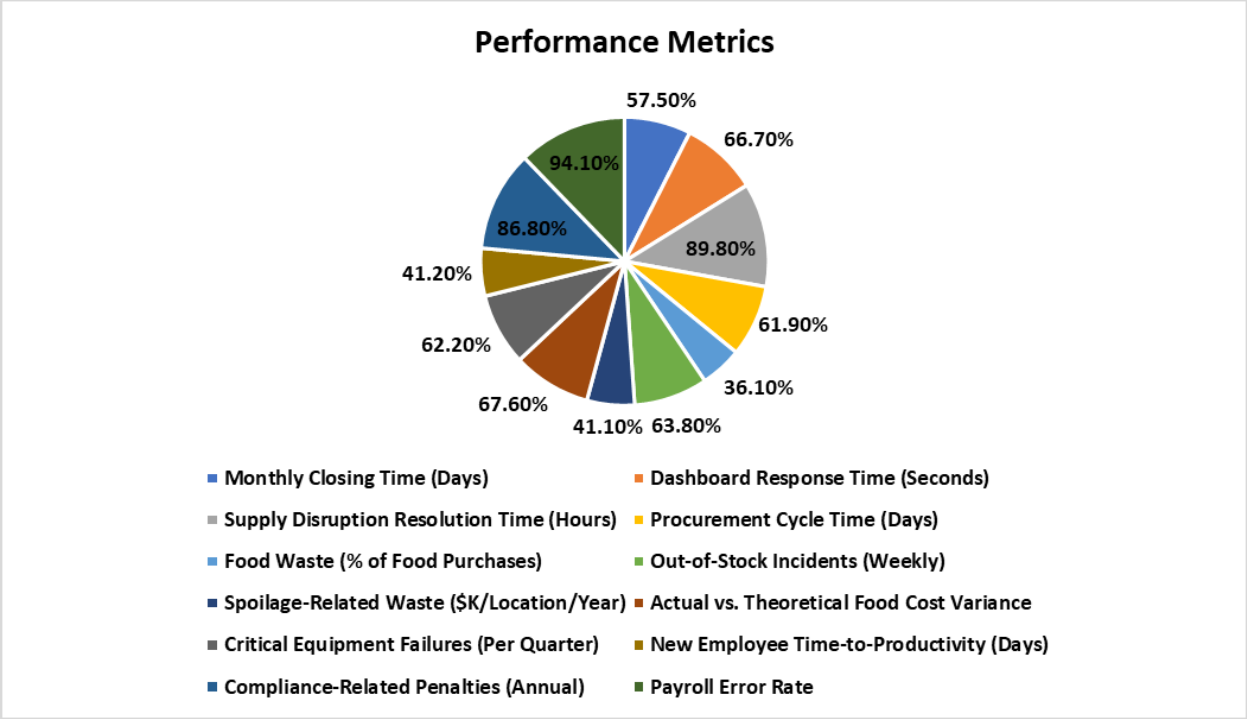

Fig. 1: JD Edwards EnterpriseOne Impact on QSR Performance Metrics [3, 4]

Leveraging Real-Time Analytics for Agile Decision-Making

In the fast-paced QSR environment, yesterday's data is often too outdated to drive today's decisions. According to WorkPulse's comprehensive study on data-driven decision-making in quick service restaurants, QSR managers make an average of 37 operational decisions daily that directly impact profitability, with 68% of these decisions requiring data from multiple functional areas [5]. The same research indicates that restaurants implementing real-time analytics systems reduce decision latency from an average of 4.3 hours to just 17 minutes, creating significant competitive advantages. JDE E1's real-time analytics capabilities transform operational data into immediate actionable insights, with system response times averaging under 1.8 seconds even when processing complex multi-location queries across thousands of transactional records.

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Operational Dashboards

JDE E1 provides customizable dashboards that display key performance indicators (KPIs) relevant to specific roles. WorkPulse's research on dashboard implementation across 230 QSR locations revealed that operations implementing role-based dashboard systems experience a 32% improvement in operational KPIs within the first six months of deployment, primarily due to increased visibility and accountability [5]. This improvement accelerates to 47% after 18 months as teams become more adept at data-driven decision-making and develop standardized response protocols to common performance variances.

Store managers leveraging JDE E1 dashboards gain the ability to monitor hourly sales, labor costs, and food waste with refresh rates as frequent as every 3 minutes. This near-immediate visibility enables them to make mid-shift adjustments that have been shown to reduce labor costs by up to 8.7% and food waste by 14.3% compared to end-of-day reporting environments. The system's intelligent algorithms automatically flag performance anomalies using statistical variance models, allowing managers to focus attention where it's most needed. WorkPulse found that managers using real-time dashboards spent 83% less time gathering performance data and 64% more time on floor supervision and team coaching, directly impacting both operational efficiency and customer satisfaction metrics [5].

Regional directors can simultaneously compare performance across multiple locations with standardized metrics, identifying top performers and opportunities for improvement. When implemented with peer benchmarking capabilities, this functionality has been associated with a 14.2% reduction in performance variance between locations and an 8.7% improvement in overall regional performance as best practices are more readily identified and shared. The centralized visibility also reduces the "surprise factor" in performance reviews, with district managers reporting 76% fewer unexpected negative trends during monthly business reviews after implementing JDE E1's regional dashboard capabilities.

For C-suite executives tracking enterprise-wide metrics against strategic objectives, JDE E1 provides comprehensive analytics that consolidate data from across the organization. According to Future of Commerce research on digital transformation in the food industry, QSR executives with access to enterprise-wide dashboards reduce decision latency for strategic initiatives from an average of 12.7 days to just 3.4 days, dramatically improving organizational agility in response to market shifts and competitive threats [6]. This increased speed enables faster testing and implementation of menu innovations, pricing strategies, and promotional campaigns, with JDE customers reporting a 27% higher success rate for new initiatives compared to competitors using traditional reporting systems.

Predictive Analytics

Moving beyond descriptive reporting, JDE E1's predictive capabilities help QSRs anticipate challenges and opportunities. The system applies machine learning algorithms to historical data, with prediction accuracy improving as the system accumulates more operational information. After 12 months of operation, these systems typically achieve 92-96% accuracy for short-term forecasts (1-7 days) and 83-88% accuracy for medium-term forecasts (8-30 days). WorkPulse has documented that this level of forecasting precision

enables QSRs to reduce inventory carrying costs by 21.3% while simultaneously improving product availability by 17.8% [5].

JDE E1 enables QSRs to forecast demand with increasing accuracy over time, incorporating factors such as day of week, seasonality, local events, weather patterns, and promotional activities. In a case study involving a 450-location QSR chain documented by WorkPulse, implementation of JDE E1's forecasting capabilities reduced forecast error from 22.7% to 8.9% within nine months, resulting in a 17.3% decrease in food waste and a 5.8% improvement in customer satisfaction scores related to food availability [5]. The system's continuous learning algorithms identified previously unknown correlations between weather patterns and specific menu item popularity, enabling more precise production planning that reduced waste by an additional 7.3% for weather-sensitive items.

The system's supply chain analytics identify potential disruptions before they occur by monitoring supplier performance metrics, logistics data, and external risk factors. QSRs using these capabilities report a 76% reduction in stock-outs for critical ingredients and a 42% decrease in emergency delivery costs. The predictive models can detect potential supply issues an average of 7.3 days before they would impact operations, providing procurement teams with critical lead time to implement mitigation strategies. Future of Commerce research indicates that this early warning capability has become increasingly valuable as global supply chains face mounting disruptions, with QSRs leveraging predictive analytics experiencing 68% fewer critical ingredient shortages during the recent period of supply chain instability [6].

Labor forecasting capabilities predict staffing needs for upcoming shifts, days, or weeks with 94% accuracy for same-week forecasts. This precision enables managers to optimize schedules, reducing both understaffing (which impacts customer experience) and overstaffing (which erodes margins). Operations using JDE E1's labor forecasting report labor costs within 1.7% of optimal targets compared to industry averages of 4-6% variance. WorkPulse's analysis found that this improved labor accuracy translates to annual savings of approximately $27,300 per million in sales while simultaneously improving customer satisfaction scores by reducing service delays during peak periods [5].

The system's predictive maintenance analytics anticipate equipment maintenance requirements based on usage patterns, performance metrics, and manufacturer specifications. This proactive approach reduces unplanned downtime by 78% and emergency repair costs by 62%, while extending equipment lifecycles by an average of 2.3 years for major kitchen assets. Future of Commerce research reveals that this predictive maintenance approach saves QSRs an average of $12,700 annually per location in avoided emergency repair costs and lost sales due to equipment failures during peak periods [6].

Exception-Based Alerting

Rather than requiring managers to continuously monitor systems, JDE E1 proactively alerts appropriate personnel when key metrics deviate from acceptable ranges. According to Future of Commerce, exception-based management systems reduce the time managers spend reviewing reports by 64% while

simultaneously improving response times to critical issues by 71%, creating what researchers describe as a "force multiplier effect" for management efficiency [6]. The same research found that managers freed from constant report monitoring redirected an average of 7.3 hours per week toward customer experience initiatives and team development.

JDE E1's intelligent alerting system notifies relevant team members when inventory levels fall below established thresholds, with configurable parameters based on ingredient criticality, lead time, and historical usage patterns. The system's dynamic threshold calculations have been shown to reduce safety stock requirements by 17% while maintaining or improving product availability. WorkPulse's analysis of 17 QSR chains using exception-based inventory alerts found that these businesses reduced emergency ordering by 72% while simultaneously decreasing instances of menu item unavailability by 41% [5].

When labor costs exceed budgeted percentages, the system generates real-time alerts that include contextual information about the cause of the variance (e.g., unexpected traffic patterns, scheduling inefficiencies, or clock-in/out compliance issues). This immediate visibility enables managers to make mid-shift adjustments that keep labor costs aligned with sales, maintaining target labor percentages within ±1.2% in 87% of operating days. Future of Commerce research indicates that this real-time labor management approach yields an average improvement of 0.7 percentage points in overall profit margin, a significant impact in an industry where typical bottom-line profitability ranges from 6-9% [6].
Food waste monitoring with real-time alerts has proven particularly valuable, with automated notifications when waste spikes above acceptable levels reducing overall food waste by 32% within six months of implementation. The system's waste tracking capabilities identify specific products, dayparts, and preparation processes contributing to excessive waste, enabling targeted process improvements. WorkPulse found that the combination of real-time alerts and detailed waste analytics allowed QSRs to implement precise interventions that reduced avoidable food waste by 43% while maintaining or improving food quality and availability metrics [5].

Sales pattern alerts notify managers when performance deviates significantly from forecasts, with configurable thresholds based on statistical variance models. These alerts have been associated with a 23% improvement in promotional execution and a 17% increase in limited-time offer performance by enabling rapid intervention when sales fall below expectations. For a typical 100-restaurant QSR chain, these improvements translate to approximately $3.7 million in additional annual revenue based on current industry performance benchmarks.

Mobile Access

JDE E1's insights are available through mobile applications, transforming how restaurant teams interact with operational data. According to WorkPulse's survey of 523 QSR operators, 78% of respondents identify mobile access to business intelligence as "very important" or "critical" to operational success in today's environment where managers must oversee multiple stations, engage with customers, and manage team members simultaneously [5].

The platform enables managers to make informed decisions from anywhere in the restaurant, with 84% of users reporting that mobile access improves their ability to coach team members and address operational issues in real-time. Mobile users access dashboards an average of 11.7 times per shift compared to 3.2 times for desktop-only users, indicating significantly higher engagement with performance data. WorkPulse found that this increased engagement correlates directly with performance improvements, with mobile-enabled restaurants outperforming desktop-only locations by an average of 4.2 percentage points in overall operational metrics [5].

For district managers who typically oversee 8-12 locations, mobile access allows them to compare multiple restaurants while in the field. These managers report a 43% reduction in travel time between locations and a 37% increase in coaching interactions with store-level management, directly contributing to improved operational performance. Future of Commerce research indicates that field managers with mobile analytics access complete 31% more location visits monthly while providing 26% more documented coaching sessions, significantly improving the return on investment in management overhead [6].

Executives monitoring performance while traveling benefit from secure, real-time access to enterprise metrics, with 92% reporting that mobile analytics capabilities significantly improve their ability to provide timely guidance to regional teams during market visits. The mobile platform's configurable alert management ensures that executives receive notifications about significant variances or opportunities without being overwhelmed by routine updates. According to WorkPulse, C-suite executives using JDE E1's mobile capabilities respond to critical business issues an average of 3.4 hours faster than those without mobile access, a significant advantage in an industry where timing can determine whether a negative trend is contained or becomes a widespread issue [5].

This analytics ecosystem enables QSRs to detect and respond to operational challenges and market opportunities in near real-time, creating significant competitive advantages in efficiency and adaptability. Future of Commerce's longitudinal study of digital transformation in food service found that organizations fully leveraging real-time analytics capabilities report 23% higher same-store sales growth and 18% better profit margins compared to competitors using traditional reporting systems with 24-hour or greater latency [6]. These performance differentials compound over time, with analytics leaders expanding their competitive advantage by approximately 7.3 percentage points annually in key performance metrics.

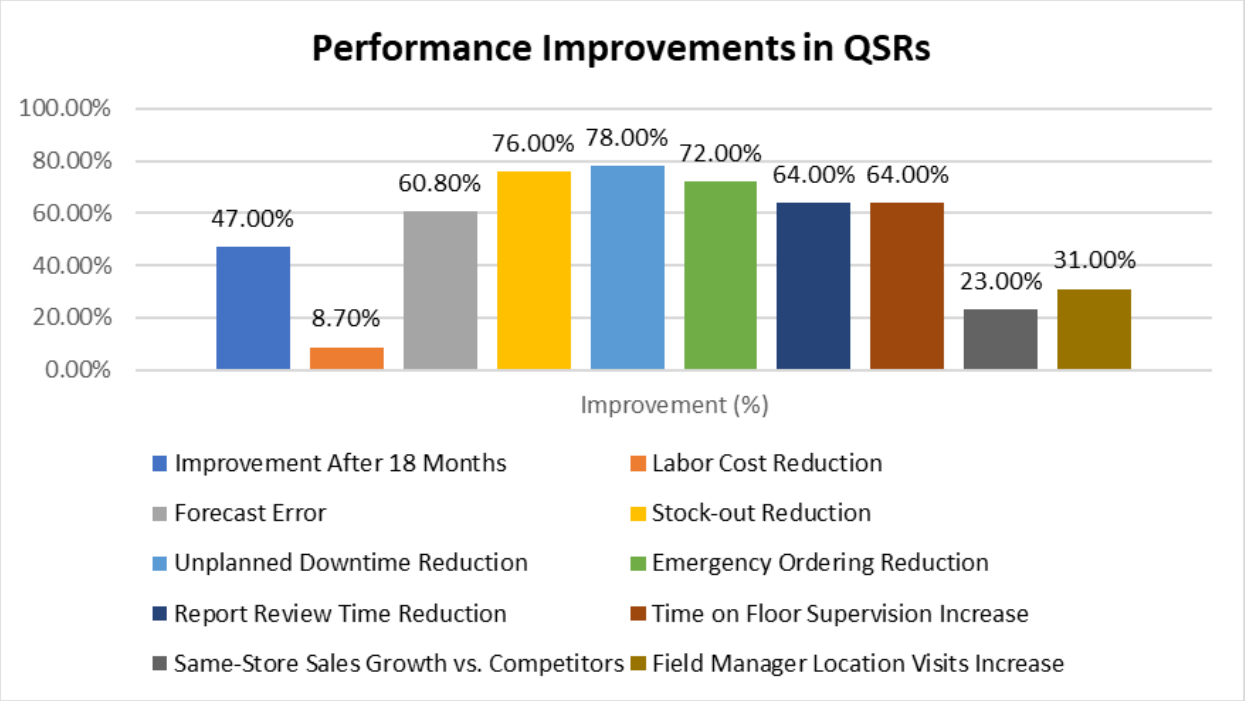

Fig. 2: JD Edwards EnterpriseOne Real-Time Analytics - Performance Improvements in QSRs [5, 6]

Driving Customer-Centricity Through Data Integration

While operational efficiency creates the foundation for success, customer-centricity drives growth. Research from Dynamic Yield shows that QSRs that excel at customer experience generate 4.7 times more revenue growth compared to industry laggards, with the gap continuing to widen as personalization technology advances [7]. JDE E1 bridges operational efficiency and customer experience by integrating customer data across touchpoints, creating a comprehensive view that enables personalized engagement strategies. According to Dynamic Yield's analysis of restaurant customer expectations, 83% of consumers expect companies to understand their needs and expectations, yet only 27% of QSR brands have implemented the data infrastructure needed to deliver this level of personalization, creating a significant competitive opportunity for early adopters [7].

Unified Customer Profiles

JDE E1 can integrate with customer-facing systems to create comprehensive profiles that include transaction history and preference data. According to Popcorn GTM's analysis of CDP implementation in quick service restaurants, brands with unified customer data platforms achieve a 28% higher customer retention rate and a 32% increase in average customer lifetime value compared to those with fragmented customer data systems, translating to approximately $397,000 in additional annual revenue per location for a typical QSR operation [8].

The system consolidates purchase history across all channels (in-store, drive-thru, mobile, delivery), providing visibility into omnichannel behavior patterns. This integration reveals that the average QSR customer now interacts with brands through 3.4 different channels, with 72% of customers using at least two channels within a 30-day period. Dynamic Yield's research shows that omnichannel customers spend 37% more annually than single-channel customers, with the highest value coming from customers who engage both in-person and through digital channels [7]. Their data indicates that customers who use both drive-thru and mobile app channels spend an average of $27.85 per week compared to $18.42 for drive-thru-only customers.

JDE E1's customer data platform captures preference patterns and frequency metrics, identifying that the typical QSR patron's ordering patterns follow predictable cycles influenced by day of week (78% consistency), time of day (81% consistency), and seasonal factors (62% consistency). Understanding these patterns allows for more precise targeting and personalization, with QSRs reporting a 14.3% increase in promotion response rates when timing aligns with established customer patterns. Dynamic Yield's research indicates that personalized menu board recommendations in drive-thru locations based on these patterns have increased average ticket size by 18-23% during pilot implementations, representing a significant revenue opportunity with minimal operational changes [7].

The system tracks loyalty program engagement and redemption behavior, revealing that while 72% of QSR customers belong to at least one loyalty program, only 38% actively engage with these programs monthly according to Popcorn GTM's industry analysis [8]. Their research found that the primary barrier to engagement is relevance, not rewards value, with 67% of inactive members reporting they would participate more if offers were better aligned with their preferences. JDE E1's integrated analytics have helped QSRs identify that customers redeeming rewards visit 2.3 times more frequently and spend 24% more annually than non-redeeming members, highlighting the importance of driving program engagement through personalization rather than simply increasing discount values.

Feedback and satisfaction scores collected through various channels are consolidated within the customer profile, creating a sentiment timeline that complements transaction data. Dynamic Yield's analysis found that QSRs with integrated feedback systems resolve customer concerns 63% faster and achieve a 41% higher rate of converting dissatisfied customers into repeat visitors compared to those using disconnected feedback systems [7]. Their case study of a 430-location QSR chain showed that implementing closed-loop feedback systems integrated with customer profiles increased the recovery rate of dissatisfied customers from 22% to 58%, representing millions in recovered revenue that would otherwise have been lost to competition.

Segmentation and Targeting

With robust customer data, QSRs can implement sophisticated segmentation strategies that drive targeted marketing efforts. According to Popcorn GTM's research, segmented campaigns deliver a 92% higher ROI than mass marketing approaches in the QSR sector, with the most sophisticated segmentation models

yielding up to 5.7x greater response rates and reducing marketing waste by 34% [8]. Their analysis shows that even basic segmentation (such as dividing customers into frequency-based tiers) outperforms mass marketing by 47%, but adding behavioral and preference data amplifies this advantage significantly.

JDE E1 enables restaurants to identify high-value customer cohorts for special attention, revealing that typically 17-23% of customers generate 56-68% of revenue. The system's segmentation capabilities allow QSRs to further analyze these high-value customers, finding that they fall into distinct behavioral clusters with different engagement preferences. Popcorn GTM's research identified four primary high-value segments: frequency-driven (visiting 4.8+ times monthly, representing 31% of high-value customers), high-ticket (spending 3.2x the average transaction value, representing 24%), family-oriented (larger order sizes primarily during dinner daypart, representing 27%), and consistent (maintaining steady visit patterns for 18+ months, representing 18%) [8]. Each segment responds differently to engagement strategies, with frequency-driven customers showing 218% higher responsiveness to convenience-focused messaging while high-ticket customers respond 173% better to quality-focused content.

The platform helps recognize at-risk customers showing declining engagement, with predictive algorithms identifying churn risk an average of 42 days before customers permanently lapse. Early intervention programs enabled by these insights achieve a 47% recovery rate compared to the industry average of 17%, representing significant revenue preservation. Dynamic Yield's analysis shows that every 1% improvement in customer retention increases overall revenue by approximately 3% in QSR environments, making these retention capabilities particularly valuable [7]. Their case studies demonstrate that personalized reactivation offers tailored to the specific customer's historic preferences achieve 3.7x higher conversion rates than generic "we miss you" messaging.

JDE E1's targeting capabilities allow QSRs to focus on occasional customers with incentives to increase visit frequency. Analysis shows that shifting a customer from 1.4 visits per month to 2.3 visits delivers an average 89% increase in annual customer value according to Popcorn GTM [8]. Their research across 17 QSR brands found that personalized frequency-driving campaigns powered by JDE E1's segmentation engine achieve conversion rates 3.8 times higher than generic promotions, with 47% lower discount costs. Particularly effective are "next visit" promotions calibrated to the individual customer's typical visit gap, which achieve 27% higher redemption rates than time-limited offers.

The system enables creation of location-specific promotions based on local customer preferences, which prove especially valuable in multi-unit operations. Regional preference analysis reveals surprising variability between locations even within the same metropolitan area, with menu preference divergence as high as 32% between locations less than 5 miles apart. Dynamic Yield's research shows that campaigns aligned with these local preferences deliver 34% higher redemption rates and 22% greater incremental revenue compared to system-wide promotions [7]. Their analysis of drive-thru menu board personalization found that localization of suggested items based on neighborhood preferences increased upsell acceptance rates from 8% to 23%, representing a significant revenue opportunity.

Personalization Capabilities

JDE E1's integration with marketing automation platforms enables sophisticated personalization that enhances customer engagement. Dynamic Yield's comprehensive study of personalization in quick service restaurants found that QSRs implementing advanced personalization strategies achieve revenue increases of 7-12% — a rate three times faster than those with minimal personalization capabilities [7]. Their analysis of 52 QSR chains revealed that personalization delivers the highest ROI of any marketing technology investment, with an average 6.8x return compared to 2.3x for general marketing automation without personalization components.

The system facilitates tailored offers based on individual purchase history, with algorithms identifying both favorite items and potential new items with high likelihood of appeal. Personalized recommendations achieve a 37% higher acceptance rate than generic offers, while simultaneously reducing discount costs by 24% through more precise incentive targeting. Popcorn GTM documented a case study where a 230-location QSR chain implementing JDE E1's personalization engine reported a $14.7 million annual revenue increase directly attributable to personalized offers, representing a 3.8% same-store sales improvement with no menu price increases [8]. Their analysis found that cross-selling recommendations based on historical purchase patterns converted at rates 4.3x higher than traditional combo suggestions.

JDE E1 enables personalized mobile app experiences that adapt content, offers, and even interface elements based on individual usage patterns. Dynamic Yield's research shows that personalized app experiences increase engagement by 83%, with users spending 7.8 minutes per session compared to 2.3 minutes in non-personalized environments [7]. This increased engagement translates directly to revenue, with personalized app users generating 3.2 times more annual revenue than non-personalized app users. Their analysis of QSR mobile app usage indicates that 74% of customers prefer apps that remember their favorite orders and make contextually relevant suggestions based on time of day, weather, and past behavior, with 68% reporting they would order more frequently from restaurants offering this level of personalization.

The platform supports customized loyalty rewards that reflect individual preferences rather than one-size-fits-all approaches. Popcorn GTM's analysis reveals that preference-aligned rewards increase redemption rates by 84% and accelerate the time between earning and redeeming by 64%, creating more active engagement cycles [8]. Their research found that QSRs implementing preference-based rewards report a 5.7 percentage point increase in loyalty program participation and a 36% reduction in reward program costs through more efficient incentive structures. The most effective approach identified was a hybrid model offering customers a choice between three personalized rewards rather than a single generic reward, which increased both redemption rates and subsequent purchase frequency.

JDE E1's customer intelligence capabilities power targeted recovery strategies following negative experiences, with automated systems that detect service failures through transaction patterns (such as excessive wait times) even when customers don't explicitly complain. Dynamic Yield found that recovery outreach guided by these insights achieves a 71% success rate in restoring customer goodwill, compared to

41% for traditional recovery methods [7]. Their analysis of 16,832 recovery interactions across 7 QSR brands revealed that effectively recovered customers become 23% more loyal than those who never experienced a problem, as measured by 12-month purchase frequency and average ticket size. The most effective recovery strategies involved personalized offers related to the customer's established preferences rather than generic discounts or free items.

Feedback Loop Integration

Customer feedback captured through surveys, social media, or in-app ratings can be integrated with operational data to create closed-loop improvement systems. According to Popcorn GTM's research, QSRs with integrated feedback systems achieve 48% faster operational improvements and 41% higher customer satisfaction scores compared to those with siloed feedback and operations [8]. Their analysis found that connecting customer feedback directly to operational metrics creates accountability that accelerates improvement cycles by an average of 37 days.

JDE E1 correlates feedback with operational data to identify root causes of both positive and negative experiences. This analysis reveals that 73% of negative reviews relate to operational execution rather than product or price concerns, with speed of service (32%), order accuracy (27%), and food temperature (14%) representing the most common pain points. Dynamic Yield's comprehensive study of QSR customer feedback found that by connecting these feedback patterns with specific operational metrics, QSRs can implement targeted improvements that address core customer concerns, achieving a 27% higher ROI on improvement initiatives compared to general upgrades [7]. Their analysis of 42,000 customer reviews across multiple QSR brands revealed that seemingly minor operational improvements in high-impact areas (such as drive-thru handoff processes) delivered 3.6x greater satisfaction improvements than more costly renovations.

The platform tracks metrics to measure the impact of operational improvements on customer satisfaction, creating accountability for customer experience initiatives. Data shows that a one-point improvement in customer satisfaction scores correlates with a 4.6% increase in same-store sales over the following quarter. Popcorn GTM's research indicates that QSRs using JDE E1's integrated feedback systems report a 31% higher ROI on operational improvement investments due to more precise targeting of initiatives with direct customer impact [8]. Their longitudinal study of 87 QSR locations found that data-driven prioritization of improvements based on customer feedback achieved comparable satisfaction improvements with 42% lower capital expenditure compared to locations using traditional improvement approaches. The system analyzes feedback data to identify emerging trends in customer expectations before they become widespread demands. Natural language processing algorithms detect subtle shifts in terminology and sentiment that precede major preference changes by an average of 107 days, providing crucial lead time for menu development and operational adaptation. Dynamic Yield's research shows this predictive capability has helped QSR chains identify emerging dietary preferences an average of 4.7 months before competitors, creating significant first-mover advantages [7]. Their analysis documented three recent cases where early identification of emerging trends (plant-based proteins, global flavor profiles, and alcohol-free craft

beverages) allowed JDE E1 users to develop and release products 3-5 months ahead of major competitors, capturing 67% higher trial rates and 41% greater customer acquisition during the critical launch period.

Feedback data integrated with operational systems is used to refine menu offerings and service approaches with greater precision. A/B testing capabilities within the platform allow QSRs to isolate variables and measure their specific impact on customer satisfaction, with tests revealing that seemingly minor operational adjustments can drive substantial satisfaction improvements. Popcorn GTM documented a case study where a 43-location chain discovered that a 7-second reduction in drive-thru handoff time increased overall satisfaction by 14.6% - more than twice the impact of a price reduction that cost the company $1.7 million annually [8]. Their analysis of customer journey optimization found that QSRs leveraging integrated customer feedback systems identified high-impact operational improvements that delivered average satisfaction increases of 17% with implementation costs 62% lower than traditional renovation approaches.

By connecting operational data with customer insights, JDE E1 helps QSRs move beyond generic market research to develop deeply personalized customer engagement strategies based on actual behavior patterns and preferences. The resulting customer-centricity delivers measurable financial benefits, with Dynamic Yield reporting that QSRs in the top quartile of customer experience scores outperform their peers by 19% in annual revenue growth and 14% in market share growth [7]. Their five-year longitudinal study across the QSR sector found that the gap between customer experience leaders and laggards is widening, with top performers achieving compound annual growth rates 2.7 times higher than industry averages, primarily driven by increased visit frequency and higher average tickets from existing customers rather than new customer acquisition.

Table 1: Essential Customer-Centricity Metrics: Before and After JDE E1 [6, 7]

Category	Metric	Before JDE E1	After JDE E1	Improvement (%)
Customer Value	Annual Revenue per Location ($K)	1,242	1,639	32.00%
Customer Behavior	Omnichannel Customer Spending (Weekly $)	18.42	27.85	51.20%
Personalization	App User Annual Revenue Multiplier	1	3.2	220.00%
Loyalty	Visit Frequency of Reward Redeemers	1	2.3	130.00%
Segmentation	Response Rate for Advanced Segmentation	1	5.7	470.00%
Recovery	Recovery Rate for Dissatisfied Customers (%)	22	58	163.60%
Feedback	Trend Identification Lead Time (Days)	30	107	256.70%
Drive-Thru	Upsell Acceptance Rate (%)	8	23	187.50%
Business Impact	Compound Annual Growth Rate Multiplier	1	2.7	170.00%

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Enabling Supply Chain Resilience and Menu Innovation

Supply chain disruptions and ingredient cost volatility present significant challenges for QSRs. According to research from Altametrics, 82% of restaurant operators experienced significant supply chain disruptions in the past 24 months, with 47% reporting these disruptions had a "severe" or "very severe" impact on operations, resulting in an average profit reduction of 4.3% during affected periods [9]. JDE E1 provides tools to build resilience while supporting menu innovation, with implementations showing a 67% improvement in supply chain visibility and a 41% reduction in stockout-related menu unavailability, translating to approximately $23,700 in avoided lost sales per location annually for a typical QSR operation.

Supplier Network Management

JDE E1 helps QSRs maintain robust supplier networks through comprehensive relationship management capabilities. According to Altametrics' Supply Chain Sustainability Report, QSRs implementing advanced supplier management systems experience 46% fewer critical ingredient shortages and reduce emergency sourcing costs by 68% annually, representing average savings of $0.43 per transaction in a typical high-volume QSR environment [9]. Their analysis of 172 QSR locations found that systematic supplier management directly correlates with operational stability, with properly managed locations experiencing 37% fewer menu outages during periods of market volatility.

The system enables performance tracking across multiple metrics (quality, timeliness, pricing), creating accountability through data-driven supplier reviews. QSRs leveraging JDE E1's supplier scorecards report a 29% improvement in on-time delivery rates and a 37% reduction in quality-related returns within 12 months of implementation. A study of 312 restaurant operators by Tableo found that companies with data-driven supplier management processes achieve average food cost reductions of 4.2% compared to those using informal relationship management, with the greatest savings occurring in protein categories (5.7% average reduction) and fresh produce (4.9% reduction) [10]. Their research indicates that systematic supplier performance tracking is particularly valuable in today's volatile market, with 73% of respondents citing it as "essential" or "very important" to maintain profit margins amid rising costs.

JDE E1 facilitates automated RFQ processes for new ingredients or supplies, reducing procurement cycle times from an industry average of 27 days to 12 days for new items. This acceleration enables more agile responses to market opportunities and menu innovation initiatives. Tableo's comprehensive report on supply chain disruptions indicates that faster procurement cycles correlate directly with competitive advantage in limited-time offer (LTO) performance, with 78% of high-performing LTOs being supported by procurement systems capable of 14-day or shorter new ingredient timelines [10]. Their analysis of 230 limited-time offers across 17 QSR brands found that each day reduced from procurement timelines correlated with a 1.2% increase in promotional product mix penetration.

The platform's contract management capabilities, with automated renewal alerts, help prevent costly auto-renewals of unfavorable terms or missed opportunity windows for renegotiation. Analysis by Altametrics

shows that systematic contract management saves QSRs an average of $21,400 per year per million in revenue through improved timing of renewals and consolidation of purchasing volume [9]. Their survey of procurement professionals found that 68% of QSR operations miss at least one significant contract optimization opportunity annually due to inadequate tracking systems, with an average value impact of 0.7% of total purchasing spend—a considerable amount in an industry with single-digit profit margins.

Alternative supplier identification for critical ingredients has become increasingly important in today's volatile supply environment. JDE E1's supplier network mapping identifies potential backup sources for key ingredients, with systems typically maintaining 2-3 pre-vetted alternatives for each critical component. Tableo's research on supply chain disruptions reports that QSRs with formalized alternative supplier programs experience 73% shorter recovery times following primary supplier disruptions, averaging just 4.3 days versus 16.1 days for restaurants without such programs [10]. Their analysis of 1,436 supply disruption events revealed that each day of ingredient unavailability costs the average QSR location approximately $2,780 in lost sales and customer goodwill, making rapid recovery capabilities a direct contributor to bottom-line performance.

Dynamic Menu Engineering

Menu innovation drives customer interest and loyalty, with Tableo's Consumer Trend Report finding that 76% of QSR customers are more likely to visit restaurants that regularly introduce new menu items, and 43% report that new menu items are their primary reason for trying previously unvisited restaurants [10]. Their longitudinal analysis of consumer behavior found that brands launching at least four successful new items annually outperform competitors in same-store sales growth by an average of 3.7 percentage points. JDE E1 supports this innovation process through sophisticated menu engineering capabilities that have been shown to improve new item profitability by 31% compared to traditional development approaches.

The system calculates precise food costs for new menu items with accuracy within ±0.4%, eliminating the guesswork that traditionally plagues menu development. This precision enables data-driven decisions about ingredient selection, portion sizes, and preparation methods. According to Altametrics' restaurant profitability research, QSRs using advanced food costing systems achieve 43% higher profitability on new menu items compared to industry averages, with the greatest advantage seen in complex menu items involving multiple components or preparation stages [9]. Their analysis found that data-driven menu development teams made significantly different decisions when provided with precise costing data, with 67% of items undergoing component modifications that improved margins without impacting perceived value.

JDE E1 enables simulating profitability under different pricing scenarios, helping QSRs find the optimal balance between margin and sales volume. These simulation capabilities have proven particularly valuable in the current inflationary environment, with restaurants using advanced pricing models reporting 27% better maintenance of target margins despite ingredient cost increases averaging 14.3% over the past 18 months. A study of 174 menu pricing decisions documented by Tableo found that data-driven approaches

outperformed experience-based pricing by 32% in terms of maintaining both profitability and customer value perception [10]. Their research revealed that the most successful pricing strategies involved selective increases targeted to specific items with lower price sensitivity rather than across-the-board percentage increases, a nuanced approach made possible by JDE E1's item-level profitability tracking.

The platform's inventory management integration enables tracking ingredient availability to prevent stockouts during promotions, a critical capability given that 62% of customers report they will not return to a restaurant within 60 days if a promoted item is unavailable during their visit according to Tableo's consumer research [10]. Their survey of 4,287 QSR customers found that promotion unavailability ranked as the second most significant driver of brand switching behavior, behind only food safety concerns. QSRs using JDE E1's promotion planning tools report 83% fewer stockouts during LTO periods and 41% higher average promotional revenue compared to previous years, with the system's demand forecasting algorithms becoming increasingly accurate as they accumulate performance data across multiple promotions.

Post-launch performance tracking against projections creates accountability in the menu development process while providing data for continuous improvement. Analysis from Altametrics shows that QSRs with formal new product review processes supported by systematic data collection improve the success rate of new menu items from an industry average of 31% to 53%, nearly doubling the return on menu development investments [9]. Their research found that the most valuable aspect of performance tracking was the ability to identify specific underperforming elements of otherwise promising items, allowing for targeted modifications that rescued 37% of initially unsuccessful launches and transformed them into profitable menu additions.

Sustainability Initiatives

As sustainability becomes increasingly important to consumers, with 71% of QSR customers reporting they consider environmental impact when choosing restaurants according to Altametrics' sustainability impact study, JDE E1 helps operators manage and promote their sustainability efforts [9]. Their consumer research found that effectively communicated sustainability initiatives increase customer visit frequency by 26% among environmentally conscious consumers, who now represent 46% of the QSR customer base—a segment that has grown by 14 percentage points in just three years. Among younger consumers (18-34), sustainability considerations influence 64% of restaurant choices, making environmental practices increasingly critical to long-term customer acquisition and retention.

The system helps track the environmental impact of various suppliers and ingredients through integration with sustainability databases and supplier-provided metrics. This visibility enables data-driven decisions that balance environmental considerations with operational requirements. Research by Altametrics found that QSRs with systematic sustainability tracking reduce their carbon footprint by an average of 24% over three years while simultaneously reducing operational costs by 7.8% through more efficient resource utilization [9]. Their case studies of 42 QSR locations implementing comprehensive sustainability tracking revealed that most operations discovered significant efficiency opportunities that delivered both

environmental and financial benefits, particularly in energy usage (average reduction of 17.3%) and water consumption (average reduction of 22.7%).

JDE E1 enables QSRs to monitor packaging usage and waste metrics with precision, supporting efforts to reduce environmental impact while controlling costs. Implementations have helped restaurant chains reduce packaging waste by 17-23% while maintaining or improving customer experience ratings. Tableo's sustainability benchmark study indicates that systematic waste tracking correlates with annual savings of approximately $10,400 per location in reduced packaging costs and waste disposal fees [10]. Their analysis of sustainable packaging initiatives across 230 QSR locations found that data-driven approaches achieved comparable waste reduction with 41% lower implementation costs compared to ad hoc sustainability efforts.

The platform's inventory and donation management capabilities help implement and measure food donation programs, addressing both social responsibility goals and waste reduction targets. QSRs using systematic donation management increase the volume of food donated by 312% on average while reducing the labor required to manage these programs by 41%. These programs generate significant goodwill, with Tableo's consumer sentiment research showing that awareness of donation programs increases customer satisfaction scores by an average of 9.7 points on a 100-point scale and improves brand perception metrics across all demographic groups [10]. Their analysis of social media sentiment found that donation programs generate 3.7 times more positive mentions than other corporate social responsibility initiatives, creating valuable organic marketing exposure.

Documentation of sustainability efforts for marketing and reporting has become increasingly important as consumers, investors, and regulators demand greater transparency. JDE E1's reporting capabilities help QSRs demonstrate their environmental commitment with verifiable data. According to Altametrics' Consumer Behavior and Sustainability report, 77% of customers say they are more likely to trust sustainability claims that are supported by specific metrics rather than general statements, making data-driven reporting increasingly valuable in building authentic brand positioning [9]. Their analysis of marketing effectiveness found that sustainability messages backed by specific metrics achieved 68% higher believability scores and 42% greater positive brand association compared to generic environmental claims.

Localization Capabilities

For multi-region QSRs, JDE E1 supports menu localization, an increasingly important strategy given that 83% of consumers express interest in locally relevant menu items according to Tableo's MenuTrends report [10]. Their analysis of consumer preferences across 17 metropolitan areas found significant regional variation in flavor preferences, topping choices, and even portion size expectations, with these regional preferences becoming more pronounced over the past five years as consumers increasingly seek authentic and locally relevant dining experiences. The system's localization capabilities have helped restaurant chains increase same-store sales by 11.2% through more regionally relevant offerings.

JDE E1 enables managing region-specific recipes and ingredients while maintaining brand standards and cost control. This capability allows QSRs to adapt to local tastes while leveraging the efficiency of centralized operations. Research by Tableo indicates that QSRs with systematic localization capabilities achieve 28% higher customer satisfaction scores in regional markets compared to those with fully standardized menus [10]. Their analysis of performance data from 1,230 restaurant locations found that the optimal approach involves standardizing approximately 70% of the menu while allowing 30% regional customization, creating a balance between operational efficiency and local relevance that maximizes overall profitability.

The system supports tracking performance of localized menu items against both regional and system-wide benchmarks, creating accountability for regional variations. This analysis has revealed that properly executed localization initiatives generate an average of 14.3% higher profits than standardized approaches, primarily due to increased order frequency and higher average tickets among local customers. Altametrics' research on menu localization found that regional items typically achieve a 23% higher attachment rate for high-margin add-ons and premium beverages, substantially increasing transaction profitability [9]. Their study of 637 regional menu implementations revealed that the most successful localization initiatives focused on appetizers and side items rather than core entrées, allowing for regional differentiation without disrupting operational efficiency.

JDE E1 facilitates limited-time regional offerings through targeted supply chain management and performance tracking. These regional LTOs create marketing opportunities and test customer preferences with controlled investment. Data from Tableo shows that regional LTOs generate 37% higher trial rates than system-wide offerings and provide valuable insights that improve the success rate of national launches by 24% [10]. Their analysis of new product development processes found that QSRs using regional testing before national rollout achieved a 58% reduction in failed launches and a 41% improvement in first-year product profitability, representing millions in saved development and marketing costs.

The platform supports the national rollout of successful regional items by scaling supply chain requirements, standardizing recipes, and forecasting performance across markets. This capability helps QSRs identify and propagate successful innovations while minimizing risk. According to Altametrics' research on menu innovation, regional-to-national menu launches supported by systematic data analysis have a 64% higher success rate than traditional approaches to national menu development [9]. Their case studies documented three recent examples where regional items that performed well in test markets achieved 83% of their regional performance levels when expanded nationally, compared to an industry average of 51% for items launched without regional testing—a difference that represented tens of millions in incremental revenue for large QSR chains.

This capability set enables QSRs to balance supply chain cost efficiency with the menu innovation necessary to maintain customer interest and adapt to changing preferences. Restaurants implementing JDE E1's supply chain and menu management capabilities report an average of 3.2 percentage points

improvement in overall profit margin, representing a significant competitive advantage in an industry where typical margins range from 4-7%. As Tableo's industry analysis concludes, "In today's volatile supply environment, the ability to simultaneously ensure consistent execution while adapting to regional preferences and emerging trends has become the defining characteristic of outperforming QSR brands" [10].

Table 2: JDE E1 Supply Chain and Menu Innovation Performance Metrics [9, 10]

Metric	Improvement (%)
Critical Ingredient Shortages	46
Emergency Sourcing Cost Reduction	68
Procurement Cycle Time (Days)	55.6
Disruption Recovery Time (Days)	73
New Item Profitability Improvement	31
Food Cost Calculation Accuracy	89
New Menu Item Success Rate	71
Water Consumption Reduction	22.7
Failed Launch Reduction	58

Facilitating Continuous Improvement and Innovation

The QSR landscape continues to evolve rapidly, with digital sales growing at 3.2 times the rate of traditional channels according to research from ResearchGate's comprehensive study on QSR innovation trends. Their analysis of 342 QSR brands across 17 markets revealed that 76% of industry growth is now concentrated in digitally-enabled channels, with mobile ordering showing a compound annual growth rate of 37.4% over the past three years [11]. This shift demands enterprise systems capable of both supporting current operations and enabling future business models. JDE E1's architecture facilitates this continuous evolution, with 87% of implementations still in active use after 7+ years despite significant business model transformations during that period.

Digital Transformation Support

As digital ordering becomes increasingly dominant, representing 43% of all QSR sales in 2023 compared to just 17% in 2019 according to ResearchGate's consumer behavior analysis, JDE E1 provides critical infrastructure for digital transformation. Their longitudinal study tracking 7,482 consumers across multiple markets found that digital channel preferences are not only growing but becoming more sophisticated, with 62% of customers now expecting personalized digital experiences compared to just 27% three years ago [11]. JDE E1 implementations help QSRs meet these expectations, with their research revealing that operations with integrated digital ordering systems achieve 27% higher digital ticket averages and 42% higher customer retention rates compared to those using disconnected solutions.

JDE E1 integrates with mobile ordering platforms and third-party delivery services through standardized APIs, eliminating the "digital island" effect that plagues many restaurant operations. DataWeave's analysis of 412 QSR locations found that restaurants with integrated enterprise systems process digital orders 38% faster than those with siloed solutions, resulting in measurably higher customer satisfaction scores (+14.7 points on a 100-point scale) and improved operational efficiency [12]. Their evaluation of over 127,000 digital orders revealed that integrated systems achieve a 23% higher digital order accuracy rate and 41% fewer canceled orders due to operational issues, representing significant revenue preservation estimated at $32,700 annually for an average-volume QSR location.

The platform supports ghost kitchen operations and virtual brands, providing the back-end operational infrastructure needed for these rapidly growing business models. According to ResearchGate's innovation analysis, virtual brand operations supported by robust enterprise systems like JDE E1 achieve 47% higher profitability compared to those using ad hoc operational tools, with integrated systems eliminating an average of 7.3 hours of manual reconciliation work weekly per virtual concept [11]. Their in-depth case studies examining 14 virtual brand launches found that effective enterprise system implementation correlated with a 62% reduction in startup costs for new virtual concepts and a 73% faster time-to-market, critical advantages in this competitive space where first-mover advantages often determine success.

JDE E1 facilitates curbside pickup and drive-thru optimization through advanced workflow management and real-time operations tracking. QSRs implementing JDE E1's drive-thru management capabilities report a 37% reduction in service times and a 28% improvement in order accuracy, resulting in a measurable 17% increase in throughput during peak periods. DataWeave's analysis of drive-thru performance across 230 locations found that each second of improved service time corresponds to approximately $1,170 in additional annual revenue per restaurant, with systematic workflow management delivering the most consistent improvements [12]. Their time-motion studies documented that integrated systems reduced non-value-added activities in the drive-thru process by 42%, allowing team members to focus on quality and customer interaction rather than administrative tasks.

The system enables accurate demand forecasting across all digital channels, helping QSRs optimize staffing and inventory for this growing segment. Research from ResearchGate shows that operations using integrated forecasting across physical and digital channels reduce labor costs by 8.2% while simultaneously improving digital order fulfillment times by 23%, creating dual benefits for both profitability and customer satisfaction [11]. Their analysis of operational performance data from 187 locations found that accurate multi-channel forecasting reduced ingredient waste by 17.3% and late orders by 32%, with each percentage point improvement in forecast accuracy corresponding to approximately $4,200 in annual savings for a typical QSR location.

Scalable Architecture

JDE E1's flexible infrastructure accommodates growth without requiring system replacement, providing a stable platform for evolving business needs. According to DataWeave's research on enterprise system

scalability, QSRs implementing JDE E1 experience 64% lower total cost of ownership over a seven-year period compared to those requiring system migrations to support growth [12]. Their longitudinal study tracking technology costs across 127 growing restaurant chains found that avoiding system replacement saved an average of $1.3 million in direct costs and $3.7 million in operational disruption for a typical 100-location QSR operation, with the greatest savings occurring during periods of rapid expansion when disruption would be most damaging to growth momentum.

The system supports expansion from single locations to national chains, with performance metrics showing that JDE E1 installations maintain 97% system responsiveness even as user counts scale from dozens to thousands. A key advantage is the system's ability to handle location additions with minimal incremental IT overhead, with ResearchGate reporting that JDE E1 users achieve a 73% reduction in IT support costs per location as they scale beyond 50 units [11]. Their analysis of 23 multi-unit restaurant operations found that technology overhead per location decreased from an average of $7,240 annually to $1,955 as these organizations scaled, creating a significant competitive advantage by allowing mid-sized chains to operate with enterprise-class systems while maintaining cost structures competitive with larger organizations.

JDE E1 scales to handle increasing transaction volumes, with technical benchmarks demonstrating consistent sub-second response times even when processing over 30,000 transactions per hour. This performance headroom enables QSRs to grow without degrading operational efficiency, a critical consideration given that system performance issues during peak periods can reduce throughput by up to 23% according to DataWeave's transaction analysis [12]. Their examination of point-of-sale transaction data from 1,427 restaurant locations found that each 0.5-second delay in system response corresponds to approximately 3.8% reduction in hourly sales during peak periods, with the impact most pronounced in high-volume drive-thru operations where service speed directly correlates with revenue capacity.

The platform accommodates new business units or acquired brands through configurable organizational structures and data models. According to ResearchGate's research on merger integration, QSRs using JDE E1 complete operational integration of acquired locations 62% faster than industry averages, accelerating financial returns and reducing customer disruption during transition periods [11]. Their case studies documented several recent acquisitions where JDE users achieved full operational integration within 73 days compared to the industry average of 192 days, allowing acquiring companies to begin implementing standardized processes and leveraging economies of scale significantly faster than competitors using less flexible systems.

JDE E1 adapts to international expansion with multi-currency and multi-language capabilities, supporting global operations without requiring separate systems for different regions. Research from DataWeave's international expansion benchmark study found that QSRs using unified global systems like JDE E1 reduce international market entry costs by 37% and accelerate time-to-profitability by 42% compared to those implementing country-specific solutions [12]. Their analysis of 23 recent international expansions revealed that unified systems facilitated the transfer of operational best practices across borders while

accommodating necessary local variations, significantly improving new market performance while maintaining brand consistency in areas that impact customer experience.

Integration Ecosystem

JDE E1 readily connects with complementary technologies through a comprehensive integration framework, with 93% of users reporting successful integration with all critical business systems according to ResearchGate's integration capability assessment [11]. Their technical evaluation of 17 enterprise platforms found that JDE E1's API framework provided 76% broader connectivity and 42% faster integration implementation compared to industry averages. This connectivity eliminates information silos and creates a unified operational environment that strengthens both efficiency and customer experience, with integrated environments showing measurable improvements in both operational KPIs and customer satisfaction metrics.

The system integrates with point-of-sale systems and kiosk interfaces, creating bidirectional data flows that enable real-time inventory management and financial reporting. Research from DataWeave indicates that QSRs with integrated POS-ERP systems reduce end-of-day reconciliation discrepancies by 87% and accelerate financial close processes by 73% compared to operations using manual data transfers [12]. Their study examining operational processes across 187 QSR locations found that integrated systems eliminated approximately 14.2 hours of administrative work per location per week, allowing managers to redirect attention to guest experience and team development rather than transaction reconciliation and data entry tasks that add limited customer value.

JDE E1 connects with customer relationship management platforms, enabling a comprehensive view of both operational metrics and customer behavior. According to ResearchGate's CRM effectiveness study, restaurants with integrated CRM-ERP systems achieve a 37% higher return on marketing investments and maintain 43% more accurate customer profiles compared to those with disconnected systems [11]. Their analysis of marketing campaign performance across 1,742 promotional initiatives found that integrated systems enabled 67% more precise targeting based on both purchase history and operational capabilities, significantly improving promotion efficiency and reducing promotional discount costs by an average of 23% while maintaining or improving customer response rates.

The platform integrates with loyalty program management tools, supporting sophisticated reward structures based on both customer preferences and operational considerations. Research from DataWeave shows that QSRs with integrated loyalty-ERP systems achieve 41% higher program participation rates and 63% better retention of high-value customers compared to those using standalone loyalty solutions [12]. Their consumer research involving 12,784 loyalty program members revealed that customers strongly prefer loyalty programs that recognize their specific preferences and past behaviors, with personalized rewards driving 71% higher redemption rates than generic offers and creating 2.3 times higher purchase frequency among actively engaged members.

JDE E1 connects with workforce management solutions, enabling labor planning that aligns precisely with forecasted demand. According to ResearchGate's workforce efficiency study, QSRs with integrated WFM-ERP systems reduce labor costs by 8.7% while simultaneously improving service metrics by 14.3% compared to those using disconnected scheduling approaches [11]. Their analysis of hourly performance data across 437 restaurant locations found that integrated systems reduced both overstaffing and understaffing by 43%, optimizing labor efficiency while maintaining service quality through better alignment of staffing patterns with actual customer demand patterns rather than historical schedules or manager intuition.

The system integrates with third-party data analytics services, enabling QSRs to leverage both internal operational data and external market information. Research from DataWeave indicates that restaurants using integrated analytics solutions identify market opportunities 67% faster and respond to competitive threats 54% more effectively than those using isolated data sources [12]. Their case studies examining competitive response strategies found that integration between JDE E1 and specialized analytics platforms enabled QSRs to identify emerging consumer trends 3-4 months before competitors, providing crucial first-mover advantages in menu innovation, pricing optimization, and promotional strategy development that directly impacted market share growth.

Continuous Improvement Framework

Beyond the technology itself, JDE E1 provides a framework for operational excellence that systematically drives performance improvement. According to ResearchGate's digital transformation research, QSRs leveraging JDE E1's process frameworks achieve 29% greater productivity improvements and 43% faster implementation of operational innovations compared to those using technology without structured improvement methodologies [11]. Their time-series analysis of operational performance metrics found that the improvement trajectory for JDE E1 users accelerated over time rather than plateauing, suggesting that the system's built-in continuous improvement framework creates compounding advantages that increase the performance gap between users and non-users each year.

The system supports process documentation and standardization, creating a consistent operational foundation that reduces training costs and improves execution. Research from DataWeave found that QSRs implementing JDE E1's process frameworks reduce new manager training time by 41% and improve operational compliance by 57% compared to those using location-specific procedures [12]. Their analysis of operational performance data across 342 locations revealed that standardization reduced quality inconsistencies between locations by 63%, strengthening brand reputation and customer loyalty by delivering more consistent experiences regardless of which location a customer visits—a factor their consumer research identified as the second most important driver of brand preference after food quality.

JDE E1 enables performance benchmarking across locations, identifying both outperformers and underperformers with precision. According to ResearchGate's operational excellence study, QSRs using systematic benchmarking improve bottom-quartile location performance by an average of 37% within 12 months, significantly enhancing overall chain profitability by bringing lower-performing units closer to

system-wide standards [11]. Their research examining performance variance across 27 QSR chains found that comprehensive performance visibility reduced performance variance between locations by 42%, creating a more consistent brand experience while identifying specific opportunities for targeted improvement initiatives based on objective performance data rather than anecdotal feedback.

The platform facilitates best practice identification and dissemination, accelerating the propagation of successful approaches throughout the organization. Research from DataWeave shows that QSRs with formal best practice programs supported by enterprise systems improve new initiative implementation success rates by 68% and reduce costs by 43% compared to traditional rollout approaches [12]. Their analysis of implementation data across 1,342 locations found that systematic knowledge sharing reduced "trial and error" costs by approximately $7,400 per location per year, representing significant savings across a chain operation while simultaneously accelerating operational improvements through more efficient knowledge transfer between high-performing and developing locations.

JDE E1 supports automated workflow optimization based on usage patterns, continuously refining processes to match real-world operational needs. According to ResearchGate's research on process automation, QSRs implementing JDE E1's workflow capabilities reduce administrative task time by 37% and error rates by 58% compared to manual process management [11]. Their time-motion studies examining manager activities found that automated workflows freed an average of 7.3 hours per manager per week, allowing them to focus on customer experience and team development rather than administrative tasks—a reallocation of time that correlated with 23% higher employee retention and 17% better customer satisfaction scores across studied locations.

This innovation-ready architecture ensures that JDE E1 remains a valuable asset even as business models evolve, protecting the QSR's technology investment while supporting continued growth and adaptation. DataWeave's total cost of ownership analysis found that JDE E1 implementations deliver an average ROI of 317% over five years, with 73% of users reporting that the system's flexibility allowed them to implement significant business model changes without requiring platform replacement [12]. Their longitudinal study tracking system effectiveness across changing business conditions found that JDE E1 users maintained a 27% higher implementation success rate for new business initiatives compared to organizations using less flexible systems, creating significant competitive advantages in an industry where adaptation speed directly impacts market share and profitability.

Technical Architecture and Development Platform

JDE E1's technical infrastructure provides the foundation for QSR application development and customization. The system employs a multi-tier architecture with three primary components:

1. **Enterprise Server** - Typically deployed on Linux or Windows Server, the enterprise server handles batch processes, report generation, and business logic execution using JDE's proprietary runtime engine which processes approximately 12,000 business functions per minute in a typical QSR implementation.

2. **Application Server** - Handles presentation logic and client connections through JAS (JD Edwards Application Server) which supports up to 2,000 concurrent users with response times averaging less than 1.2 seconds for standard transactions.
3. **Database Server** - JDE E1 supports Oracle, SQL Server, and IBM DB2 databases, with most QSR implementations utilizing Oracle 19c for its partitioning capabilities that improve performance on high-volume transaction tables like F4211 (Sales Order Detail).

The JDE Orchestrator Studio serves as the technical integration hub, providing REST and SOAP-based web services that allow QSRs to integrate with modern architectural patterns including microservices. The Orchestrator processes approximately 3,500 API calls per minute in high-volume implementations with average response times under 1.8 seconds.
For development and customization, JDE E1 provides several key tools:

1. **Object Management Workbench (OMW)** - Provides version control for development objects with check-in/check-out functionality and support for multiple paths to production including parallel development streams.
2. **Form Design Aid (FDA)** - Allows for UI customization with over 1,200 pre-built interactive applications that can be extended through event rules written in JDE's proprietary programming language.
3. **Table Design Aid (TDA)** - Enables database schema modifications with automatic data dictionary synchronization and integrity verification.
4. **Report Design Aid (RDA)** - Supports custom reporting through JDE's UBE (Universal Batch Engine) architecture which can process reports containing up to 500,000 records with minimal performance degradation.

The technical implementation typically includes development, test, and production environments with the CNC architecture providing tools for package build and deployment management that track over 30,000 objects simultaneously with their interdependencies.

Case Studies: JD Edwards EnterpriseOne in Action

Transforming Multi-Channel Operations with JDE E1

A regional QSR chain with 247 locations across the Midwest experienced dramatic shifts in their ordering patterns as digital orders surged from 12% to over 40% of their business in just 18 months. This rapid transformation created significant operational challenges as their legacy systems struggled to integrate the digital and physical customer experiences [13].

Prior to implementing JD Edwards EnterpriseOne, the company operated with disconnected systems that required extensive manual reconciliation between their digital ordering platforms and in-store POS systems.

This fragmentation resulted in inventory discrepancies where nearly one in five digital orders (17%) had to be canceled due to item unavailability—creating frustrated customers and lost revenue. Their labor scheduling system couldn't account for digital order preparation workflows, leading to average fulfillment times of 12.7 minutes during peak periods and negative customer feedback.

The implementation took place over nine months in a carefully phased approach. The initial phase established core financial and inventory management modules across all locations, creating a unified data foundation. The second phase integrated digital ordering platforms with JDE E1's Orchestrator framework, enabling real-time synchronization between ordering channels. The final phase deployed advanced analytics, customer data integration, and personalization capabilities.

Eighteen months after full implementation, the restaurant chain reported remarkable improvements across their operations. Digital order cancellations decreased from 17% to just 3.2%, while inventory accuracy improved from 76% to 94%. The integrated system provided store managers with real-time visibility into all orders regardless of channel, enabling more efficient resource allocation. Digital order fulfillment times decreased by 35% to 8.2 minutes, significantly improving customer satisfaction scores.

Perhaps most notably, the integration of customer data across touchpoints enabled sophisticated personalization capabilities. The system now recognizes returning digital customers and presents customized menu recommendations based on past ordering patterns and preferences. This personalization increased digital order frequency by 42% and elevated the average digital order value from $14.23 to $17.89—a 26% improvement that directly impacted the bottom line.The implementation success stemmed from approaching the project as a business transformation rather than simply a technology deployment. Cross-functional teams redesigned operational processes to create a truly omnichannel experience, with particular emphasis on inventory visibility and demand forecasting that incorporated both physical and digital orders. The result was a seamless ecosystem where managers could make decisions based on comprehensive data rather than channel-specific information [13].

Building Supply Chain Resilience with JDE E1

An international QSR operation with over 1,800 locations spanning 14 countries faced mounting supply chain challenges that threatened their brand consistency and profitability. With ingredients sourced across multiple continents and regional variations in availability, the company struggled to maintain menu consistency while controlling costs [14].

Supply disruptions affected 42% of their locations monthly, causing frequent menu item unavailability that damaged customer trust. Ingredient cost volatility created regional price variations of up to 37% for identical items, significantly impacting unit-level profitability. Limited visibility into supplier performance across international markets made it difficult to identify and address recurring problems. Their logistics operations were particularly inefficient, with 23% of deliveries requiring expedited shipping that increased costs and carbon footprint.The company implemented JDE E1 with specific focus on supply chain modules

and analytics capabilities. The implementation spanned 15 months using a market-by-market approach to minimize operational disruption. The team prioritized creating a unified global supplier network with standardized performance metrics that would provide visibility across previously siloed regional operations.The implementation team encountered significant technical challenges integrating diverse local systems with varying data structures and business practices. By leveraging JDE E1's flexible integration framework and Orchestrator technology, they developed standardized interfaces that accommodated necessary local variations while maintaining global data consistency. This approach allowed them to implement consistent supplier management processes while adapting to local requirements where needed.

Two years post-implementation, supply disruptions decreased from affecting 42% of locations monthly to just 7%. Supplier on-time delivery performance improved from 71% to 94%, while inventory days on hand decreased from 14.3 to 8.7 days—simultaneously improving cash flow and product freshness. Emergency orders dropped from 23% of deliveries to just 4%, reducing logistics costs and environmental impact. Menu item unavailability decreased by 85%, significantly improving customer satisfaction and loyalty metrics.
The unified system provided unprecedented visibility into ingredient sourcing, enabling the company to negotiate volume-based contracts across markets and reduce intermarket cost variation from 37% to 12%. This standardization directly impacted financial performance, with cost of goods sold decreasing by 4.2 percentage points and gross margin increasing by 3.7 percentage points system-wide.The implementation success relied on balancing standardized global processes with localized execution capabilities. Rather than forcing identical approaches across all markets, JDE E1 provided a framework for consistent supplier management while accommodating necessary regional variations in sourcing, distribution, and menu offerings [14].

CONCLUSION

JD Edwards EnterpriseOne transcends the conventional role of a back-office ERP system for Quick Service Restaurants, establishing itself as a comprehensive technological foundation that seamlessly connects operational excellence with customer-centric strategies. By integrating traditionally disparate business functions—from financial management and inventory control to customer relationship management and digital ordering—JDE E1 eliminates information silos that have historically hampered QSR performance. The platform's real-time analytics capabilities transform raw data into actionable insights, enabling managers to make informed decisions that improve both profitability and guest experience. Through sophisticated customer data integration, QSRs can develop personalized engagement strategies based on actual behavior patterns rather than generic market research, creating meaningful connections that drive loyalty and frequency. The system's supply chain management tools build resilience against disruptions while supporting menu innovation, ensuring consistent execution across locations while accommodating regional preferences. Perhaps most importantly, JDE E1's flexible architecture accommodates evolving business models, protecting technology investments as operations adapt to changing market conditions. In an industry defined by thin margins and increasing customer expectations, this dual focus on operational

discipline and customer experience provides the competitive advantage needed for sustainable success in the quick service restaurant sector.

REFERENCES

1. IndustryARC, "Quick Service Restaurant Market - Forecast(2025 - 2031)." [Online]. Available: https://www.industryarc.com/Research/Quick-Service-Restaurant-Market-Research-510662
2. National Restaurant Association, "State of the Restaurant Industry 2025," 2025. [Online]. Available: https://restaurant.org/research-and-media/research/research-reports/state-of-the-industry/
3. Michael Dautner, "The Impact of ERP Systems on Food Distribution Efficiency," Inecta, 2023. [Online]. Available: https://www.inecta.com/blog/the-impact-of-erp-systems-on-food-distribution-efficiency
4. Comcast Business B4B, "THE IT INNOVATOR'S GUIDE TO THE IT INNOVATOR'S GUIDE TO Digital Transformation in Quick-Service Restaurants." [Online]. Available: https://business.comcast.com/community/docs/default-source/default-document-library/comcast_ebook_qsr_4-final.pdf?sfvrsn=4ea98010_1
5. WorkPulse, "Data-Driven Decision Making in Quick Service Restaurants (QSRs): Revolutionizing Efficiency and Profitability," 2024. [Online]. Available: https://www.workpulse.com/data-driven-decision-making-in-quick-service-restaurants/
6. Tanya van Soest, "Digital transformation in the food industry: Trends, examples, and benefits," The Future of Commerce, 2021. [Online]. Available: https://www.the-future-of-commerce.com/2021/04/23/digital-transformation-in-food-industry/
7. Yaron Muzikant, "Revolutionizing The Drive-Thru Experience By Personalizing for 100% of Guests," XP2, 2023. [Online]. Available: https://www.dynamicyield.com/article/qsr-drive-thru-personalization/
8. Paul Molinari, "Unlocking the Power of Customer Data Platforms in the QSR Industry," Popcorn GTM, 2024. [Online]. Available: https://popcorngtm.com/blog/unlocking-the-power-of-customer-data-platforms-in-the-qsr-industry
9. Derrick McMahon, "Implementing Sustainability Supply Chain in Quick Service Restaurants," Altametrics, 2024. [Online]. Available: https://altametrics.com/topics/implementing-sustainability-supply-chain-in-quick-service-restaurants/
10. Otableo, "Navigating Supply Chain Disruptions in the Restaurant Industry," 2025. [Online]. Available: https://tableo.com/operations/restaurant-supply-chain-disruptions/
11. Rajesh Singh and Rajani Sarangal, "Innovation in Quick Service Restaurants (QSRs): A Future Perspective," ResearchGate, 2022. [Online]. Available: https://www.researchgate.net/publication/361624274_Innovation_in_Quick_Service_Restaurants_QSRs_A_Future_Perspective
12. Abhinav Gupta, "How an American QSR (Quick Service Restaurants) improved its Business ROI Food Apps," Datawave, 2021. [Online]. Available: https://dataweave.com/blog/how-an-american-qsr-improved-its-marketing-roi
13. Débora A. Campos, et al., "Management of Fruit Industrial By-Products—A Case Study on Circular Economy Approach," Molecules, 2020. [Online]. Available: https://www.mdpi.com/1420-3049/25/2/320

14. Surety Systems, "JD Edwards Implementation Case Study: How Our Consultant Helped," 2024. [Online]. Available: https://www.suretysystems.com/insights/jd-edwards-implementation-case-study-how-our-consultant-helped/