

TechAlly – E-Commerce Platform for Smart Device Retail

Objective:

Design, develop, and deploy a fully functional e-commerce application for "TechAlly" – a smart device company aiming to expand its retail presence into the online marketplace. The application will provide an intuitive, secure, and responsive platform for customers to browse, purchase, and review smart devices, with integrated inventory, order tracking, and analytics for business operations.

Business Context:

With increasing competition in the smart device industry and consumer preference for online tech shopping, TechAlly needs a robust e-commerce platform to cater to its customers across desktop and mobile devices. The platform must support scalability, secure transactions, seamless user experience, and integration with backend systems like inventory and CRM for smart devices, IoT products, and tech accessories.

Scope of Work (Aligned to SDLC Phases)

1. Requirement Gathering & Analysis

Activities:

- Conduct stakeholder interviews (Sales, Marketing, Warehouse, IT teams) - Assume the details
- Define business goals and target audience for smart device market
- Capture functional requirements:
 - User registration & authentication with multi-factor security
 - Product catalog with advanced filtering (brand, specs, compatibility)
 - Product detail pages with 360° views, reviews and tech specifications
 - Device compatibility checker and comparison tools
 - Shopping cart and checkout with multiple payment options
 - Payment gateway integration (Stripe/PayPal/Apple Pay/Google Pay)
 - Order tracking & history with real-time updates
 - Customer profile management with device preferences
 - Admin dashboard for product and order management
 - Inventory management & stock alerts for tech products
 - Promotional features (discount codes, bundle offers, trade-in programs)
 - Live chat support with technical expertise
- Capture non-functional requirements:
 - Performance: Load <1.5 seconds
 - Scalability: Handle 100,000 concurrent users
 - Security: PCI-DSS compliance, SOC 2, data encryption
 - Compatibility: Mobile-first, tablet, and desktop responsive design
- Define acceptance criteria for each feature

Deliverables:

- SRS (Software Requirements Specification)
- Use case diagrams & user stories
- Requirements traceability matrix (RTM)

2. Planning & Estimation

Activities:

- Select tech stack:
 - Frontend: Next.js 14, React 18, TypeScript, Tailwind CSS
 - Backend: Node.js with Fastify/Express, GraphQL
 - Database: PostgreSQL for relational data, Redis for caching, Elasticsearch for search
 - Payment: Stripe API, PayPal, Apple Pay integration
 - Cloud Deployment: AWS (ECS, RDS, S3, CloudFront) with auto-scaling
- Create project plan with development phases
- Resource allocation (Frontend Devs, Backend Devs, Mobile Devs, QA, DevOps, Security)
- Risk analysis and mitigation plan for smart device market
- Budget estimation for enterprise-scale platform

Deliverables:

- Project plan with development phases
- Resource allocation matrix
- Risk register
- Cost estimation report

3. System Design

Activities:

- High-Level Architecture:
 - Microservices architecture with API Gateway
 - Separate services for products, orders, payments, inventory, and recommendations
 - CDN for global content delivery and device image optimization
 - Real-time notification system
- Database Design:
 - ER diagram for smart devices, users, orders, payments, inventory, compatibility matrix
- API Design:
 - REST APIs and GraphQL endpoints for web and mobile
 - Swagger/OpenAPI documentation
 - Rate limiting and authentication strategies
- UI/UX Design:
 - Mobile-first wireframes for key screens (Figma)
 - Interactive prototypes with device visualization
 - Accessibility compliance check (WCAG 2.1 AA)
 - Design system for consistent smart device presentation

Deliverables:

- HLD & LLD documents
- ER diagram with device specifications schema
- API documentation
- UI wireframes and interactive prototypes

4. Development

Activities:

- Setup development environment & version control (GitHub with CI/CD)
- Implement features using Agile methodology with 2-week sprints
- Code reviews and automated merge approvals
- Integrate APIs with frontend components and mobile apps
- Unit testing for each module with 90%+ coverage
- Build responsive layouts with device-specific optimizations
- Implement advanced search and filtering for tech products
- Develop mobile applications (iOS/Android) using React Native

Deliverables:

- Source code repository with comprehensive documentation
- API endpoints with interactive documentation
- Mobile applications (iOS/Android)
- Unit test reports and coverage analysis

5. Testing

Activities:

- Functional Testing: Verify features against SRS including device compatibility
- Integration Testing: Ensure smooth interaction between all microservices
- Performance Testing: Load testing for 100K+ concurrent users
- Security Testing: Comprehensive security audit, penetration testing
- Mobile Testing: Cross-device and cross-platform validation
- UAT (User Acceptance Testing): Real-world smart device shopping simulation
- Accessibility Testing: WCAG 2.1 AA compliance verification

Deliverables:

- Comprehensive test plan & test cases
- Bug/defect reports with priority classification
- Performance benchmarking results
- Security audit reports
- UAT sign-off document

6. Deployment

Activities:

- Setup CI/CD pipelines with GitHub Actions and automated testing
- Deploy microservices to AWS ECS with auto-scaling
- Deploy frontend to AWS CloudFront with global CDN
- Configure monitoring, logging, and alerting systems
- Database migration and optimization
- Final production release with zero-downtime deployment

Deliverables:

- Deployment checklist and procedures
- Monitoring and alerting configuration
- Rollback plan and disaster recovery procedures

7. Maintenance & Support**Activities:**

- Monitor application performance and user behavior
- Fix post-release defects and optimize performance
- Add new smart device categories and features
- Update device compatibility database
- Implement user feedback and feature requests
- Regular security updates and compliance monitoring

Deliverables:

- Maintenance logs and performance reports
- Feature enhancement backlog
- Customer satisfaction reports
- Security compliance reports

Project Evaluation Metrics

Area	Metric	Target
Requirement Quality	% of requirements covered in RTM	≥ 100%
Design Quality	% of design changes after development start	≤ 3%
Development Quality	Code coverage (unit tests)	≥ 90%
Performance	Avg. page load time	≤ 1.5s
Performance	API response time	≤ 500ms
Scalability	Concurrent users supported	≥ 100,000
Security	Critical vulnerabilities post-launch	0
Security	Compliance certifications	SOC 2, PCI-DSS
Testing Efficiency	Defect detection ratio (pre vs. post-release)	≥ 95%
Deployment	Downtime during deployment	≤ 15 min
User Experience	Customer satisfaction score (post-UAT)	≥ 8.5/10
User Experience	Mobile conversion rate	≥ 4.5%
Maintenance	Mean time to resolve critical issues	≤ 2 hrs
Business Impact	Increase in online sales in 3 months	≥ 40%
Business Impact	Customer retention rate	≥ 75%
Business Impact	Average order value	≥ \$250