

# E-commerce Decision Intelligence Platform

## Final Module Specification

A comprehensive AI-powered system for e-commerce business operations, covering maintenance, intelligence, and growth.

#	Module Name	Purpose
1	Command Center	The brain — where all decisions, opportunities, and strategy converge
2	Product Intelligence	Know what to sell today and discover what to sell tomorrow
3	Growth Engine	Acquire customers smarter and find new markets to capture
4	Customer Intelligence	Understand, retain, and expand your customer relationships
5	Business Intelligence	See profitability clearly and forecast where you're heading

## Module 1: Command Center

*"Your AI business partner that tells you what to focus on today and where to go next."*

### Features

Layer	Feature	What It Does
PAST	Performance Digest	Weekly/monthly summary of what worked and what didn't
PAST	Learning Insights	AI-extracted lessons from past decisions
PRESENT	Decision Queue	Prioritized list of decisions needing attention
PRESENT	Health Score	Single 0-100 metric for overall business health
PRESENT	Alert Stream	Real-time notifications for critical issues
FUTURE	Opportunity Feed	Ranked growth opportunities across all domains
FUTURE	Growth Forecast	30/60/90 day business trajectory prediction
FUTURE	Strategy Brief	AI-generated weekly strategic recommendations

### Key Intelligence

- Cross-domain decision prioritization algorithm
- Anomaly detection across all metrics
- LLM-powered strategy synthesis

## Module 2: Product Intelligence

*"Manage your inventory intelligently and discover your next winning product."*

### Features

Layer	Feature	What It Does
PAST	Sales Analysis	Historical performance by product, category, time
PAST	Seasonal Patterns	What sold when, and why
PRESENT	Stock Pulse	Real-time inventory health dashboard
PRESENT	Stockout Predictor	Days-to-stockout per SKU with alerts
PRESENT	Reorder Recommendations	When to order, how much, from whom

PRESENT	Dead Stock Identifier	Products to markdown or liquidate
FUTURE	Trend Spotter	Rising product categories from Google Trends
FUTURE	New Product Scorer	AI-scored opportunities based on demand + margin + fit
FUTURE	Gap Finder	Products competitors sell that you don't
FUTURE	Expansion Recommender	Product line extensions based on customer behavior

### ***Key Intelligence***

- Time series demand forecasting (Prophet/ARIMA)
- Trend analysis via Google Trends API
- LLM-powered product opportunity descriptions
- Reorder point optimization algorithm

## Module 3: Growth Engine

*"Run smarter campaigns and discover untapped audiences hungry for your products."*

### Features

Layer	Feature	What It Does
PAST	Campaign Analysis	What worked, what failed, and why
PAST	Attribution Insights	True source of conversions
PRESENT	Campaign Health Dashboard	All campaigns with health scores
PRESENT	Creative Fatigue Monitor	Detects declining ad performance early
PRESENT	Budget Tracker	Spend vs. return in real-time
PRESENT	Stock-Ad Sync	Alerts when promoting low-inventory products
FUTURE	Audience Discovery	Untapped audiences similar to best customers
FUTURE	Campaign Idea Generator	AI-suggested campaign concepts
FUTURE	Ad Copy Generator	LLM-written headlines, body copy, CTAs
FUTURE	Creative Concepts	AI-generated visual and messaging directions
FUTURE	Channel Opportunity	Should you expand to new channels?

### Key Intelligence

- Creative fatigue detection (anomaly detection on CTR/frequency)
- Audience clustering and lookalike analysis
- LLM-powered ad copy generation
- Margin-adjusted ROAS calculations

## Module 4: Customer Intelligence

*"Know your customers deeply — prevent churn, unlock upsells, discover new segments."*

### Features

Layer	Feature	What It Does
PAST	Customer Journey Analysis	How customers move through your business
PAST	Cohort Performance	How acquisition cohorts behave over time

PRESENT	Segment Dashboard	RFM segments with health indicators
PRESENT	Churn Radar	At-risk customers with probability scores
PRESENT	VIP Identifier	High-value customers flagged for special treatment
PRESENT	LTV Tracker	Current lifetime value per customer
FUTURE	LTV Predictor	Predicted future lifetime value
FUTURE	Churn Preventer	Recommended actions to save at-risk customers
FUTURE	Upsell Predictor	Customers ready for higher-value products
FUTURE	Cross-Sell Recommender	Which products to recommend to whom
FUTURE	Segment Discovery	New customer segments you didn't know existed
FUTURE	Expansion Planner	How to grow value from each customer

### ***Key Intelligence***

- Churn prediction model (classification)
- LTV prediction model (regression)
- RFM segmentation algorithm
- Propensity modeling for upsell/cross-sell
- Customer clustering for segment discovery

# Module 5: Business Intelligence

*"See the true health of your business and know exactly where you're heading."*

## Features

Layer	Feature	What It Does
PAST	Profitability History	Margins over time by product, channel, segment
PAST	Cost Analysis	Where money went and what it returned
PRESENT	Margin Dashboard	True profitability by product, channel, customer
PRESENT	Cash Flow Monitor	Current cash position and runway
PRESENT	Unit Economics	CAC, LTV, LTV:CAC, payback period
PRESENT	Margin Alerts	Products or channels bleeding money
FUTURE	Revenue Forecaster	Predicted revenue for 30/60/90 days
FUTURE	Profit Optimizer	Highest-impact actions to improve profit
FUTURE	Investment Recommender	Where to put the next dollar for best return
FUTURE	Scenario Modeler	"What if" analysis for business decisions
FUTURE	Break-Even Analyzer	When will a new product/campaign pay off?

## Key Intelligence

- Revenue forecasting (time series)
- Contribution margin calculations
- ROI optimization across domains
- LLM-powered scenario narratives

## Summary: Complete Feature Count

Module	Past	Present	Future	Total
Command Center	2	3	3	8
Product Intelligence	2	4	4	10
Growth Engine	2	4	5	11
Customer Intelligence	2	4	6	12
Business Intelligence	2	4	5	11
<b>TOTAL</b>	<b>10</b>	<b>19</b>	<b>23</b>	<b>52</b>

## AI/ML Components Summary

Component	Type	Used In
Demand Forecasting	Time Series ML	Product Intelligence
Trend Analysis	External API + Scoring	Product Intelligence
Creative Fatigue Detection	Anomaly Detection	Growth Engine
Audience Clustering	Unsupervised ML	Growth Engine
Churn Prediction	Classification ML	Customer Intelligence
LTV Prediction	Regression ML	Customer Intelligence
Upsell Propensity	Classification ML	Customer Intelligence
Customer Segmentation	Clustering ML	Customer Intelligence
Revenue Forecasting	Time Series ML	Business Intelligence
Ad Copy Generation	LLM	Growth Engine
Strategy Synthesis	LLM	Command Center
Product Opportunity Descriptions	LLM	Product Intelligence
Scenario Narratives	LLM	Business Intelligence

**Total: 8 ML Models + 4 LLM Applications**

## Data Integrations Required

Source	Data Pulled	Used By
Shopify	Products, inventory, orders, customers	All modules
Meta Ads	Campaigns, ad sets, ads, audiences, performance	Growth Engine, Business Intelligence
Google Trends	Search interest over time	Product Intelligence
LLM API (Claude)	Text generation, analysis	All modules

**Total: 4 Integrations**

## Why This Design Will Succeed

Success Factor	How This Design Delivers
Academic Value	8 ML models + 4 LLM applications = strong technical depth
Real Business Value	Covers maintenance AND growth — not just another dashboard
Differentiation	Cross-domain intelligence + future prediction = unique positioning
Feasible Scope	5 modules, 4 integrations = achievable in 12 months
Demo-able	Clear "wow moments" in each module
Extensible	Architecture allows adding more domains later

## Final Checklist

Item	Status
Covers Past, Present, Future	✓

Maintenance + Growth balanced	✓
AI/ML showcased meaningfully	✓
LLM integrated for generation	✓
Cross-domain intelligence	✓
Feasible for 12-month FYP	✓
Genuine business value	✓
Clear differentiation from competitors	✓

# System Architecture

The system follows a layered architecture with clear separation of concerns:

## Layer 1: User-Facing Modules

- Command Center — Central orchestration and decision queue
- Product Intelligence — Inventory management and product discovery
- Growth Engine — Marketing campaigns and audience discovery
- Customer Intelligence — Customer analytics and retention
- Business Intelligence — Financial health and forecasting

## Layer 2: Intelligence Engine

- Prediction Engine — ML models for forecasting, classification, clustering
- Generation Engine — LLM for content creation, strategy synthesis
- Optimization Engine — Algorithms for resource allocation, recommendations

## Layer 3: Data Layer

- Shopify API — Products, orders, customers, inventory
- Meta Ads API — Campaigns, audiences, performance metrics
- Google Trends API — Search interest and trend signals
- LLM API — Claude for text generation and analysis

# Conclusion

This module specification defines a comprehensive, AI-powered e-commerce decision intelligence platform that goes beyond traditional dashboards. By covering Past (analysis), Present (maintenance), and Future (creation) across five integrated modules, the system delivers genuine business value while showcasing meaningful technical depth.

The design is feasible for a 12-month Bachelor's Final Year Project while remaining extensible for future development. Each module contains clear 'wow moments' for demonstration, and the cross-domain intelligence provides differentiation from existing market solutions.