

# Research Simulation Engine - Project Blueprint

## Executive Summary

This document outlines a comprehensive approach to building a sophisticated research simulation engine that creates realistic analyst personas with believable performance patterns over time. The system will enable rapid demo environment setup for Bloomberg RMS by generating authentic research workflows, analyst behaviors, and performance analytics that showcase platform capabilities across multiple analytical themes.

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## Project Overview

### Core Objectives

The research simulation engine aims to address key analytical themes for Bloomberg RMS demos:

- **Analyst Productivity:** Research volume, workflow efficiency, task management
- **Recommendation Efficacy:** Performance tracking, timing analysis, success rates
- **Forecasting Accuracy:** Estimate precision, revision patterns, consensus relationships
- **Research Timing:** Market timing, event responsiveness, idea progression
- **Task Management:** Idea lifecycle management, coverage optimization, workload balancing

### Value Proposition




By creating believable analyst archetypes with realistic performance patterns, the system will:

- Accelerate demo environment setup
  - Provide compelling analytical narratives
  - Showcase platform insights and capabilities
  - Enable comparative performance analysis
  - Demonstrate research workflow optimization
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## Project Structure & Phases

### Phase 1: Foundation (Current - Template System)

**Status:** In Progress

-  Template creation and publishing infrastructure
-  Basic orchestration for content generation
-  Template system completion and testing

### **Key Deliverables:**

- Excel company model template
- Word research note templates
- Publishing orchestration system
- Data structure definitions

## **Phase 2: Data Architecture & Historical Context**

**Timeline:** 2-3 months

- Market data acquisition and normalization
- Historical performance baseline establishment
- Analyst behavior pattern analysis
- Data model design for temporal tracking

### **Key Deliverables:**

- Historical market data repository
- Consensus history database
- Performance baseline metrics
- Temporal data model architecture

## **Phase 3: Archetype Design & Simulation Engine**

**Timeline:** 3-4 months

- Archetype definition and parameterization
- Temporal decision-making algorithms
- Portfolio management and coverage simulation
- Performance feedback loops

### **Key Deliverables:**

- Analyst archetype framework
- Simulation engine core
- Decision-making algorithms
- Performance tracking system

## **Phase 4: Narrative Engine & Demo Generation**

**Timeline:** 2-3 months

- Story arc creation and management
- Multi-analyst ecosystem simulation
- Demo scenario orchestration
- Analytics and insights generation

### Key Deliverables:

- Demo scenario library
  - Analytics dashboards
  - Story arc management
  - Complete simulation environment
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## Data Model Architecture

### Core Entities

#### Analyst Profile

##### Core Attributes:

- analyst\_id, name, firm, start\_date, coverage\_sectors
- archetype\_profile (behavior parameters)
- coverage\_universe (securities, max\_capacity, sector\_weights)
- performance\_metrics (historical and target)
- current\_state (active\_ideas, workload, recent\_performance)

##### Behavioral Parameters:

- accuracy\_profile (estimate precision, forecast horizon)
- timing\_characteristics (consensus relationship, market timing)
- productivity\_metrics (research volume, idea progression speed)
- bias\_tendencies (overconfidence, anchoring, loss aversion)

### Security Universe

#### Fundamental Data:

- security\_id, sector, market\_cap, region, volatility\_profile
- fundamental\_data (earnings\_history, consensus\_history, price\_history)
- event\_calendar (earnings\_dates, corporate\_actions, sector\_events)
- research\_coverage\_history

#### Market Context:

- price\_performance (returns, volatility, correlation)
- consensus\_metrics (estimate\_dispersion, revision\_frequency)
- event\_impact (earnings\_surprise\_history, news\_sensitivity)
- coverage\_intensity (analyst\_count, research\_frequency)

### Research Actions

#### Action Tracking:

- action\_id, analyst\_id, security\_id, action\_type, timestamp
- content (note, recommendation, target\_price, estimates)
- triggers (what caused this action)
- performance\_outcome (subsequent price movement, accuracy)

#### Content Structure:

- research\_depth (thesis, model, quick\_update)
- confidence\_level (conviction, uncertainty\_indicators)
- rationale (fundamental, technical, event-driven)
- revision\_history (previous\_views, change\_magnitude)

### Idea Lifecycle

#### Lifecycle Management:

- idea\_id, analyst\_id, security\_id, current\_stage, stage\_history
- stage\_transitions (timestamps, triggers, duration\_in\_stage)
- idea\_performance (returns\_while\_active, accuracy\_metrics)
- abandonment\_reasons

#### Performance Tracking:

- stage\_duration\_analysis
- progression\_success\_rates
- abandonment\_pattern\_analysis
- portfolio\_impact\_measurement

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## Archetype Framework

### Behavioral Dimensions

## Research Quality & Accuracy

- **Estimate Accuracy Distribution:** High/medium/low performers with realistic error patterns
- **Forecast Horizon Capabilities:** Short-term vs long-term accuracy profiles
- **Model Complexity:** Simple vs sophisticated analytical approaches
- **Sector Expertise Depth:** Specialist vs generalist knowledge patterns

## Timing & Market Dynamics

- **Consensus Relationship:** Leader/follower/contrarian positioning
- **Market Timing Ability:** Early/late/random response patterns
- **Event Responsiveness:** Earnings, news, market move reaction speeds
- **Revision Frequency:** Conservative vs frequent update patterns

## Workflow & Productivity

- **Research Volume:** High/medium/low publication frequency
- **Idea Progression Speed:** Fast/slow/variable lifecycle management
- **Coverage Capacity:** Focused vs broad universe coverage
- **Task Management:** Organized vs chaotic workflow patterns

## Behavioral Biases

- **Confidence Patterns:** Overconfident/underconfident tendencies
- **Anchoring Behavior:** Consensus, prior view, or price anchoring
- **Loss Aversion:** Reluctance to change losing recommendations
- **Sector Rotation:** Timing and execution of coverage changes

## Detailed Archetype Examples

### "The Oracle" (High Accuracy, Independent)

#### Performance Profile:

- 75%+ estimate accuracy, early consensus changes
- Long holding periods, confident in contrarian views
- Low research volume but high impact
- Quick idea progression, low abandonment rate

#### Behavioral Characteristics:

- Independent research methodology

- High conviction in differentiated views
- Selective coverage with deep analysis
- Strong sector expertise and pattern recognition

#### **Demo Value:**

- Showcases analyst differentiation analytics
- Demonstrates timing and accuracy tracking
- Highlights value of independent research
- Proves ROI of quality over quantity

#### **"The Follower" (Consensus Dependent)**

##### **Performance Profile:**

- Moderate accuracy, changes after consensus shifts
- High correlation with street recommendations
- Medium research volume, reactive publishing
- Slow idea progression, high pass rate

##### **Behavioral Characteristics:**

- Risk-averse approach to recommendations
- Waits for market validation before changes
- Follows established analyst opinions
- Conservative in contrarian positioning

#### **Demo Value:**

- Illustrates consensus relationship analytics
- Shows timing disadvantage analysis
- Demonstrates herd behavior identification
- Highlights independence value proposition

#### **"The Sprayer" (High Volume, Mixed Results)**

##### **Performance Profile:**

- Variable accuracy, frequent updates
- High research volume, many ideas in pipeline
- Fast idea progression but high abandonment

- Covers many names but shallow analysis

### **Behavioral Characteristics:**

- Quantity-focused research approach
- Rapid idea generation and turnover
- Broad coverage with limited depth
- Frequent position changes and updates

### **Demo Value:**

- Shows productivity vs quality trade-offs
- Demonstrates workload optimization analytics
- Illustrates idea lifecycle inefficiencies
- Highlights focus and prioritization insights

### **"The Specialist" (Sector-Focused Expert)**

#### **Performance Profile:**

- High accuracy within sector expertise
- Deep knowledge of sector dynamics
- Moderate volume but high sector impact
- Strong sector rotation timing

#### **Behavioral Characteristics:**

- Deep sector knowledge and relationships
- Focused coverage universe
- Strong understanding of sector cycles
- Influential within sector coverage

#### **Demo Value:**

- Showcases sector expertise analytics
- Demonstrates specialization value
- Illustrates sector rotation insights
- Highlights knowledge depth tracking

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## **Simulation Engine Components**

# Temporal Decision Framework

## Event-Driven Architecture

Market Events → Analyst Response Probability → Action Generation → Performance Tracking

### Event Types:

- **Scheduled Events:** Earnings, guidance, conferences, sector calls
- **Market Movements:** Stock price changes, sector rotation, volatility spikes
- **Information Events:** News releases, competitor actions, regulatory changes
- **Internal Triggers:** Quarterly reviews, coverage changes, performance pressure
- **Portfolio Events:** Rebalancing needs, capacity constraints, opportunity costs

### Decision Logic Flow

1. **Event Detection:** Monitor market data feeds and calendar events
2. **Relevance Assessment:** Determine impact on analyst's coverage universe
3. **Response Probability:** Calculate likelihood of action based on archetype
4. **Timing Simulation:** Model realistic delays and response patterns
5. **Action Generation:** Create appropriate research content and recommendations
6. **Performance Tracking:** Monitor outcomes and update analyst state

## Response Algorithms

### Probabilistic Action Generation

- **Base Response Rates:** Archetype-specific probability distributions
- **Event Sensitivity:** Magnitude-based response likelihood adjustments
- **Capacity Constraints:** Workload and attention limitations
- **Momentum Effects:** Recent performance impact on confidence

### Timing Simulation

- **Processing Delays:** Information absorption and analysis time
- **Decision Latency:** Internal approval and review processes
- **Publication Timing:** Market hours, competitive considerations
- **Revision Patterns:** Frequency and magnitude of updates



# Performance Feedback Loops

## Accuracy Tracking

- **Real-time Performance:** Continuous monitoring vs predictions
- **Confidence Adjustment:** Success/failure impact on future actions
- **Learning Simulation:** Gradual improvement or deterioration patterns
- **Streak Effects:** Hot and cold performance period modeling

## Behavioral Adaptation

- **Performance Pressure:** Accuracy impact on risk tolerance
  - **Market Regime:** Bull/bear market behavioral changes
  - **Career Progression:** Experience level impact on decision-making
  - **Peer Influence:** Team and firm culture effects
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# Integration with Template System

## Enhanced Data Flow Evolution

### Current State

Static Data → Template Selection → Content Generation → Publication

### Future State

Archetype Engine → Dynamic Data Generation → Template Selection → Contextual Publication → Performance Tracking

## Template Evolution Requirements

### Dynamic Template Selection

- **Archetype-Driven Choice:** Behavior patterns determine template types
- **Content Depth Variation:** Research quality reflects analyst profile
- **Timing Controls:** Publication frequency and schedule management
- **Context Awareness:** Market conditions and event-driven content

### Content Generation Enhancement

- **AI-Assisted Text:** Thesis and assumption generation reflecting archetype

- **Financial Model Generation:** Accuracy profiles embedded in forecasts
- **Recommendation Rationale:** Bias and methodology reflection
- **Historical Consistency:** Maintaining analyst voice and approach

## Publishing Orchestration

### Timeline Management

- **Event Calendar Integration:** Earnings and announcement schedule alignment
- **Response Timing Control:** Archetype-specific delay and frequency patterns
- **Lifecycle Automation:** Idea progression through stages
- **Coverage Management:** Portfolio rebalancing and capacity optimization

### Content Coordination

- **Multi-Analyst Scenarios:** Competing views and collaborative coverage
  - **Market Regime Adaptation:** Bull/bear market content variation
  - **Sector Rotation:** Coverage shifts and timing simulation
  - **Performance Pressure:** Accuracy streaks impact on content style
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## Technical Implementation Strategy

### Architecture Patterns

#### Event Sourcing Implementation

- **Immutable Event Store:** All analyst actions as permanent events
- **State Reconstruction:** Point-in-time portfolio and performance recreation
- **Temporal Analytics:** Performance analysis across different periods
- **Scenario Replay:** Easy modification and testing of alternative histories

#### Strategy Pattern for Archetypes

- **Behavior Interfaces:** Standardized decision-making method signatures
- **Pluggable Algorithms:** Easy swapping of different behavioral models
- **Parameter Tuning:** Configuration-driven archetype customization
- **A/B Testing:** Comparative analysis of different approaches

#### Observer Pattern for Market Events

- **Event Broadcasting:** Market data feeds trigger analyst responses

- **Configurable Sensitivity:** Archetype-specific event importance weighting
- **Realistic Delays:** Information processing and response time modeling
- **Cascade Effects:** Multi-analyst response to same events

## Key Algorithms Required

### Idea Generation Engine

- **Screening Logic:** Opportunity identification based on archetype preferences
- **Capacity Management:** Maximum ideas, sector limits, workload balancing
- **Opportunity Cost:** Resource allocation optimization
- **Timing Optimization:** Entry and exit point determination

### Performance Simulation

- **Monte Carlo Methods:** Accuracy distribution simulation
- **Mean Reversion:** Streak behavior and regression patterns
- **Market Beta Adjustment:** Return attribution and risk adjustment
- **Sector Impact:** Industry rotation and timing effects

### Timeline Generation

- **Schedule Optimization:** Realistic publication calendar creation
- **Event Response:** Trigger-based action timing
- **Workload Balancing:** Coverage universe time allocation
- **Deadline Pressure:** Performance under time constraints

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## Demo Scenario Orchestration

### Story Arc Management

#### Multi-Analyst Narratives

- **Competing Views:** Same security, different recommendations and rationales
- **Sector Rotation:** Timing differences in sector coverage shifts
- **Market Regime Changes:** Bull/bear market adaptation variations
- **Firm Culture:** Different analytical approaches and risk tolerances

### Performance Divergence Stories

- **Rising Star vs Veteran:** Experience and adaptation patterns

- **Specialist vs Generalist:** Coverage depth vs breadth trade-offs
- **Contrarian vs Consensus:** Independent thinking vs market following
- **Volume vs Quality:** Productivity approaches and outcomes

## Compelling Demo Scenarios

### "The Great Sector Rotation"

- Multiple analysts with different timing on tech-to-value rotation
- Performance divergence based on timing and conviction
- Analytics showing early movers vs late adopters
- ROI analysis of independent vs consensus thinking

### "Earnings Season Showdown"

- Accuracy competition across multiple analysts
- Revision timing and magnitude analysis
- Market reaction and analyst attribution
- Learning and adaptation pattern demonstration

### "The Contrarian's Vindication"

- Long-term outperformance of differentiated views
- Tracking conviction levels and position sizing
- Risk-adjusted return analysis
- Behavioral bias identification and exploitation

## Analytics Generation

### Performance Dashboards

- **Accuracy Tracking:** Hit rates, magnitude errors, timing analysis
- **Recommendation Efficacy:** Return attribution, risk-adjusted performance
- **Idea Lifecycle:** Stage progression efficiency, abandonment analysis
- **Portfolio Impact:** Coverage optimization, resource allocation effectiveness

### Comparative Analytics

- **Analyst Rankings:** Multi-dimensional performance comparisons
- **Consensus Analysis:** Street accuracy vs individual differentiation
- **Sector Expertise:** Specialist vs generalist performance patterns

- **Risk Metrics:** Volatility, drawdown, and Sharpe ratio analysis
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## Critical Success Factors

### Data Quality & Realism

#### Historical Accuracy

- **Market Data Precision:** Accurate pricing, volume, and volatility data
- **Consensus History:** Reliable estimate and recommendation tracking
- **Event Timeline:** Precise earnings, guidance, and announcement dates
- **Performance Attribution:** Accurate return calculation and risk adjustment

#### Behavioral Authenticity

- **Realistic Distributions:** Statistically valid performance patterns
- **Timing Patterns:** Believable response delays and frequency
- **Content Quality:** Authentic-sounding research and rationale
- **Consistency:** Maintaining character traits over time

### Flexibility & Configurability

#### Scenario Customization

- **Parameter Tuning:** Easy archetype behavior modification
- **Timeline Adjustment:** Flexible scenario duration and timing
- **Universe Scaling:** Variable coverage size and complexity
- **Content Variation:** Customizable research depth and style

#### Demo Adaptation

- **Audience Targeting:** Different analytical focus for different clients
- **Complexity Scaling:** Simple vs sophisticated analytical demonstrations
- **Industry Focus:** Sector-specific scenario creation
- **Performance Emphasis:** Highlighting different analytical capabilities

### Scalability Requirements

#### System Performance

- **Multi-Analyst Support:** Simultaneous simulation of multiple personas
- **Extended Horizons:** Multi-year scenario generation

- **Large Universe:** Broad market coverage capability
- **Real-Time Processing:** Live demonstration and modification support

## Content Generation

- **Volume Scaling:** High-frequency research publication support
- **Quality Maintenance:** Consistent content quality at scale
- **Variety Management:** Diverse content types and styles
- **Integration Efficiency:** Smooth template system integration

## Demo Value Optimization

### Story Clarity

- **Narrative Focus:** Clear differentiation between archetypes
- **Analytical Insights:** Compelling performance and behavior patterns
- **Explanation Ease:** Simple scenario background and setup
- **Visual Impact:** Impressive analytical outputs and dashboards

### Platform Showcase

- **Feature Demonstration:** Comprehensive analytical capability display
  - **Workflow Illustration:** Complete research process representation
  - **Insight Generation:** Meaningful analytical conclusions and recommendations
  - **ROI Justification:** Clear value proposition for research analytics
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## Implementation Roadmap

### Phase 1 Completion (Current Focus)

**Timeline:** 1-2 months

- Finalize template system with full data flexibility
- Complete publishing orchestration testing
- Validate data structure and content generation
- Document integration points for archetype system

### Phase 2: Foundation Building

**Timeline:** 2-3 months

- Historical market data acquisition and normalization

- Consensus and analyst performance database creation
- Baseline statistical analysis and pattern identification
- Initial archetype parameter definition

## Phase 3: Core Engine Development

**Timeline:** 3-4 months

- Event-driven simulation engine architecture
- Archetype behavior algorithm implementation
- Template integration and dynamic content generation
- Performance tracking and feedback loop creation

## Phase 4: Demo Scenario Creation

**Timeline:** 2-3 months

- Multi-analyst scenario development
- Analytics dashboard and visualization creation
- Story arc management and narrative tools
- Demo environment testing and optimization

## Phase 5: Scaling and Enhancement

**Timeline:** 2-3 months

- Performance optimization and scaling
- Advanced analytical features
- Client customization capabilities
- Training and documentation creation

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## Risk Mitigation

### Technical Risks

- **Complexity Management:** Phased development approach and modular architecture
- **Performance Scaling:** Early performance testing and optimization
- **Integration Challenges:** Continuous integration testing with existing systems
- **Data Quality:** Rigorous validation and cleansing processes

### Business Risks

- **Demo Effectiveness:** Regular stakeholder feedback and iteration
- **Resource Allocation:** Clear milestone definition and progress tracking
- **Scope Creep:** Disciplined requirement management and change control
- **Timeline Pressure:** Buffer time allocation and priority management

## Success Metrics

- **Demo Impact:** Client engagement and conversion rate improvement
  - **Time Savings:** Demo setup time reduction measurement
  - **Quality Metrics:** Research authenticity and analytical insight quality
  - **Platform Showcase:** Feature demonstration comprehensiveness and effectiveness
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## Conclusion

The research simulation engine represents a sophisticated approach to creating compelling, realistic demo environments for Bloomberg RMS. By combining authentic analyst archetypes, realistic market behavior, and comprehensive performance analytics, the system will dramatically enhance demo effectiveness while showcasing the full analytical power of the platform.

The phased approach ensures manageable development complexity while delivering incremental value throughout the implementation process. The focus on behavioral authenticity and analytical insight generation will create demo scenarios that resonate with clients and effectively demonstrate platform capabilities.

Success will be measured not just by technical implementation, but by the system's ability to create compelling narratives that showcase the value of research analytics in identifying analyst strengths, weaknesses, and optimization opportunities. The ultimate goal is to transform demo preparation from a time-intensive manual process into an automated, configurable, and highly effective sales enablement tool.