Category: Cost Efficiency Analysis for GenAI use cases using Return-on-Investment (ROI)

Question:

What's the best GenAI use case to invest in from the top technology trends in the industry?

Data:
1. **Cost Dimension**
   - Implementation
     1. Time-to-deploy (hours) [ScaleUpAlly]
     2. Infrastructure setup costs ($) [Gartner]
     3. Development Time (hours) [Simublade]
     4. Adoption rate (%) [Gartner]
     5. Average wage per hours ($) [Gartner]
   - Operations
     1. Monthly maintenance cost ($) [ITRex]
     2. Infrastructure operating cost ($) [Gartner]
     3. Licensing cost ($) [TristateTechnology]
   - Model Training
     1. Cost per training iteration ($) [Forbes]
     2. GPU/TPU usage cost ($) [Forbes]
     3. Total usage hour per iteration ($) [Forbes]
   - Data
     1. Data acquisition cost ($) [Deloitte]
     2. Data storage cost per month ($) [Deloitte]
   - Inference
     1. Cost per inference ($) [Forbes]
     2. Total number of inference (count) [Gartner]
     3. Total operational inference cost ($) [Gartner]

2. **Revenue Indicators**
   - Revenue Estimation
     1. Monetized API usage ($) [NetworkComputing]
     2. Total API calls (count) [NetworkComputing]
     3. Product monthly subscription fees ($) [Google]
     4. Model-driven product sales ($) [Google]
   - Cost Savings
     1. Reduced operational costs ($) [MultiModal]
     2. Reduced workforce expenditure ($) [MultiModal]
     3. Decreased data processing costs ($) [MultiModal]
   - Competitive Advantage
     1. First-to-market innovation revenue ($) [McKinsey]
     2. Market share gain ($) [McKinsey]
     3. Industry total revenue ($) [McKinsey]
   - User Retention
     1. Customer Lifetime Value (CLV) ($) [Google 2]
     2. Number of retained users (count) [Google 2]
     3. Number of churned users (count) [Google 2]
   - Market Growth

1. Customer acquisition rate per year (%) [Revvence]
2. Increased product adoption revenue ($) [Revvence]

Metrics:

1. Return On Investment (ROI)

ROI (Return on Investment) evaluates the profitability of an investment by comparing the profit generated to the costs incurred. A positive ROI indicates a profitable investment, while a negative ROI signals a loss. Larger positive values suggest greater efficiency and profitability.

Based on our research in different technology domains, we formulate a generic equation that can be utilized to calculate ROI of different technologies using a common formula which can be utilized by IT Executives to make critical investment decisions.

Traditional ROI Formula:

$$\left(\frac{\text{Revenue Generated by Investment} - \text{Total Cost of Investment}}{\text{Total Cost of Investment}} \right) \times 100$$

Factors affecting GenAI ROI:
1. Market Conditions
2. Metric Variations
3. Recognizing Investments
4. Quantifying Profit
5. Analyzing Improvement

Revised Formula based on available cost dimensions and revenue indicators:

$$ROI = \frac{(\text{Revenue} + \text{Cost Savings} + \text{Market Growth} + \text{User Retention} + \text{Competitive Advantage}) - (\text{Implementation Costs} + \text{Operational Costs} + \text{Model Training Costs} + \text{Data Costs} + \text{Inference Costs})}{(\text{Implementation Costs} + \text{Operational Costs} + \text{Model Training Costs} + \text{Data Costs} + \text{Inference Costs})} \times 100$$

where,

Implementation Cost = ((Time-to-deploy (hours) + Development Time (hours)) × Average Wages per Hour ($) + Infrastructure Setup Costs ($)) × (Adoption Rate (%) / 100)

Operational Cost (Yearly) = (Monthly maintenance cost + Infrastructure operating cost) × 12 + Licensing cost

Model Training Cost = Cost per training iteration × Number of iterations + (GPU/TPU usage cost/hour × Total usage hours per iteration)

Data Cost = Data acquisition cost + (Data storage cost × 12)

Inference Cost = (Cost per inference × Total number of inferences) + Total operational inference cost

Total Cost of Investment ($) = Implementation Cost + Operational Cost + Model Training Cost + Data Cost + Inference Cost

**Revenue ($)=** (Monetized API usage ($) × Total API calls (count)) + (Product monthly subscription fees ($) × 12) + Model-driven product sales ($)

**Cost Savings ($)=** Reduced operational costs ($) + Reduced workforce expenditure ($) + Decreased data processing costs ($)

Market Growth ($)= (Customer acquisition rate per year × CLV) + Increased product adoption revenue

User Retention ($)= (CLV × Number of retained users) − (CLV × Number of churned users)

**Competitive Advantage ($)=** First-to-market innovation revenue ($) + Market share gain (%) × Industry total revenue ($)

Estimated Total Revenue ($)= Revenue + Cost Savings + Market Growth + User Retention + Competitive Advantage

Value Add:

The lack of a standardized ROI calculation across the industry poses significant challenges for organizations in evaluating and comparing emerging technological trends. Different methodologies and metrics often result in inconsistent assessments, making it difficult to determine the true value of investments.

Current industry reports, such as those from Gartner, rely on proprietary analytical metrics to rank technologies but often fail to disclose the specifics of ROI calculations, limiting transparency and comparability.

Our approach addresses this gap by offering a generalized and adaptable ROI framework that integrates key cost factors (e.g., implementation, operational, and deployment costs) with measurable performance indicators like uptime improvements and operational cost reductions. This standardization ensures that organizations can make informed, data-driven decisions by providing a clear, consistent, and comparable metric for evaluating diverse technologies and their corresponding use cases.

Baseline Comparison using Graph Visualization(s)

1. Heatmap of ROI by GenAI use-cases
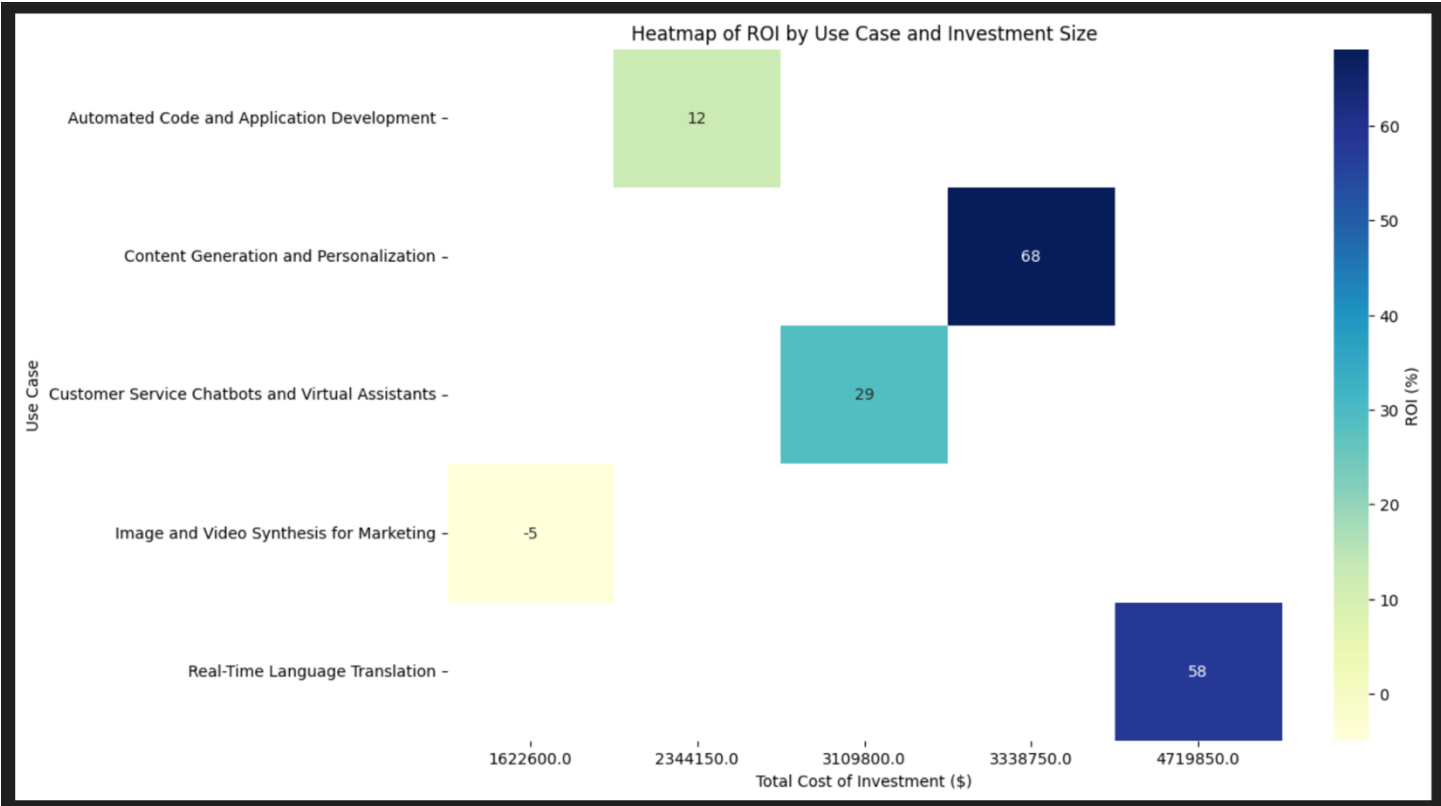

ROI vs Investment Cost
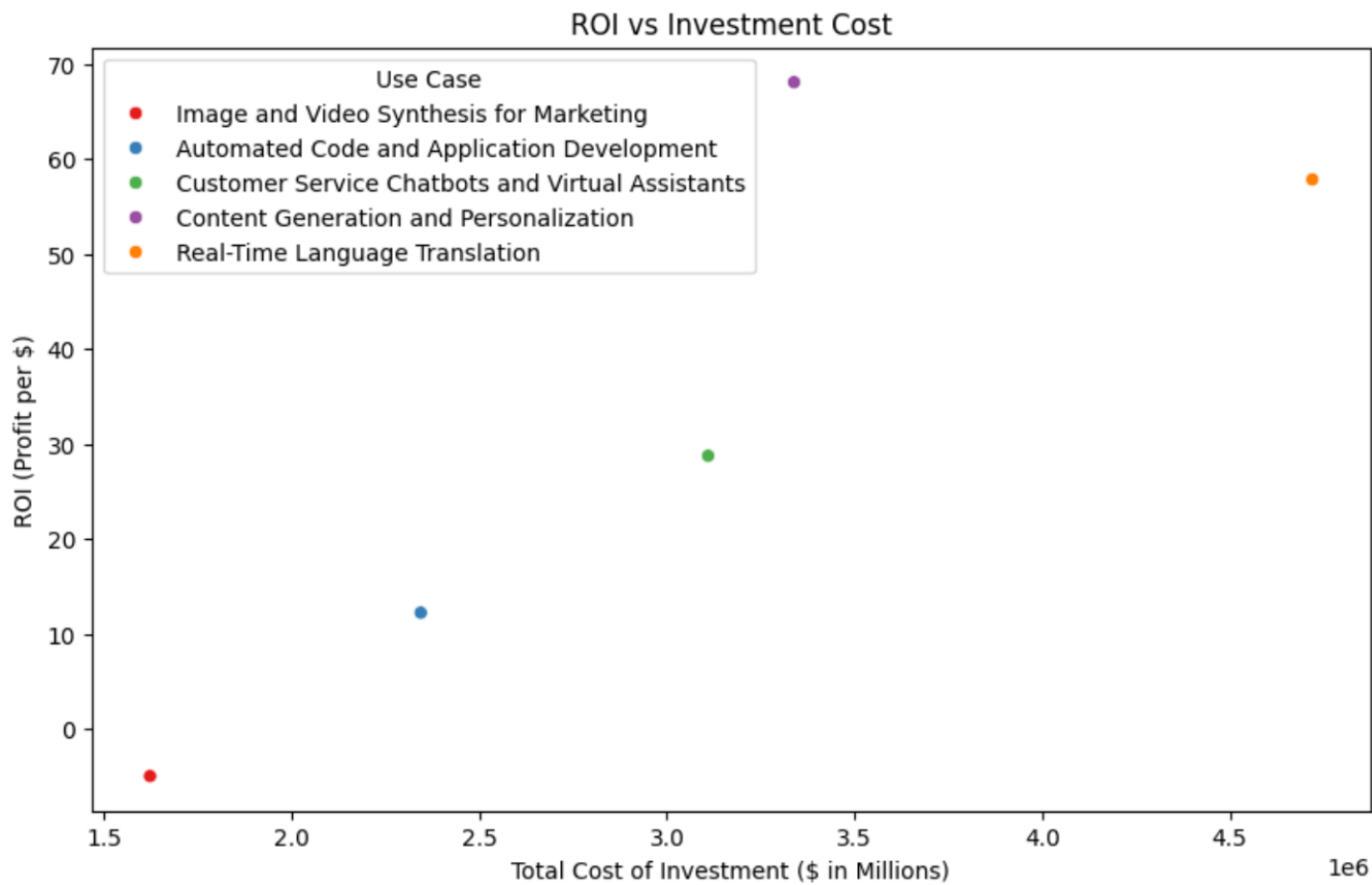
How to Visualize:
- X-axis: Total Cost of Investment
- Y-axis: ROI

Insights for IT Executives:
- **Invest in Technology with the highest ROI potential and considerable investment**

2. Scatterplot

Heatmap of ROI by Use Case and Investment Size

How to Visualize:
- X-axis: Total Cost of Investment
- Y-axis: Use Case
- Gradation from Purple (Positive ROI) to Yellow (Negative ROI)

Insights for IT Executives:
- **Technologies with the highest ROI (dark purple areas) highlight the most profitable investments**
- **Negative ROI (bright yellow) signals areas to avoid or reconsider**

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