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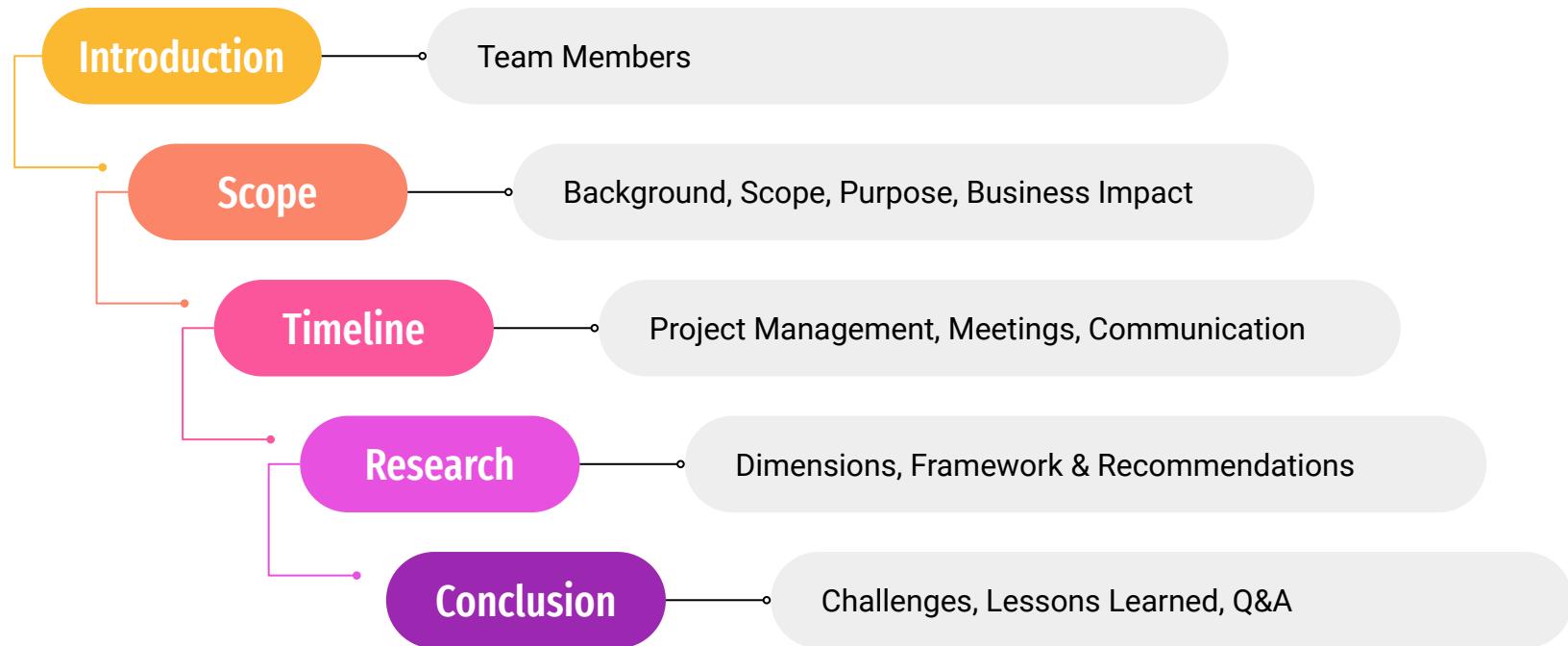
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Capstone Project Fall 2024

December 10, 2024 - Final Presentation

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Agenda



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Background

- **Tata Consultancy Services (TCS)** is an Indian multinational information technology (IT) company headquartered in Mumbai, India, provides IT, consulting, and business-related solutions to some of the **world's largest** companies.
- Through their impressive portfolio, TCS has established themselves as a significant **benchmark** for software development in the industry through its **Location Independent Agile delivery model**.



Background Continued

- TCS is apart of the Tata Group which serves as **India's largest** multinational business group.
- Currently operates in approximately **150 locations** that span across **46 countries** with **over 600,000 employees**.
- Serves as the **second largest** Indian company by market capitalization
- **Ranked seventh** on the Fortune India 500 list 2024
- **Over 1,000** clients globally



TCS Partners & Clients

Some notable partnerships and clients of TCS that the consultancy service provides strategic advisement to include...



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Problem Statement

“Performance benchmarking is a practice of **comparing** business performances and processes against industry standards. By **identifying** the best practices for performance benchmarking, the students must develop a framework to **improve** the organization's current benchmarking analysis techniques.”

Scope

“The **objective** of the project is to curate a benchmarking **framework** to uncover insights that are not considered in current benchmarking analysis. The goal is to build a **novel** framework that introduces a new methodology to the practice that will ultimately improved business performances with the focus on **IT Infrastructure** benchmarking.”

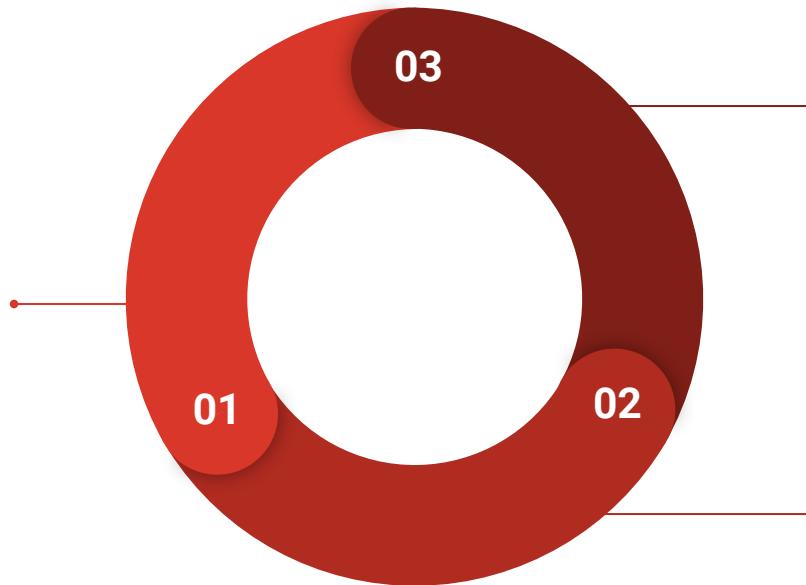
Purpose

Why?

Purpose Continued

Comprehensive Research for KPIs

KPIs vary depending on the domain within the selected industry, ensuring that each performance metric is tailored to its specific context.



Eliminate Manual Errors

Ensures no KPIs or metrics are overlooked, avoiding costly manual mistakes and test redesigns.

Prevent the Duplication of Tasks

Once the KPIs for a particular industry are determined, they only need periodic updates, avoiding repetitive efforts in re-establishing metrics.

Business Impact

How?

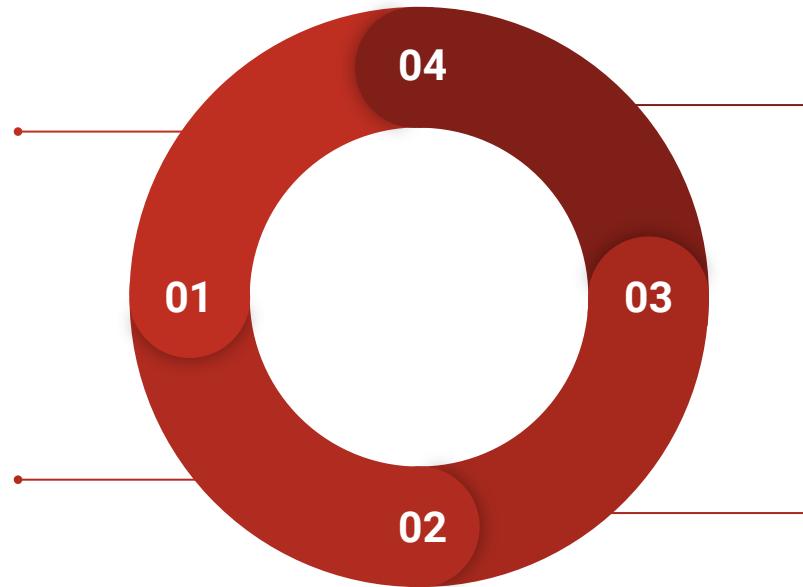
Business Impact Continued

Increased Operational Efficiency

Automating research and testing streamlines operations, minimizing manual intervention and reallocating resources to high-priority tasks.

Cost Savings & Resource Optimization

By eliminating manual errors and redundant processes, organizations achieve significant cost savings and optimize manpower usage.



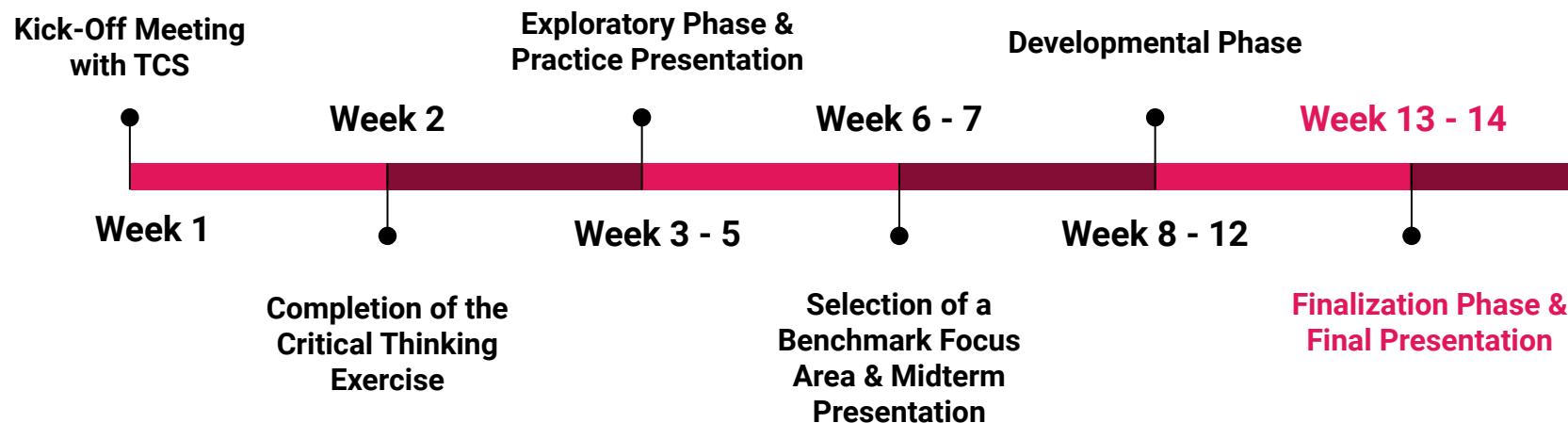
Competitive Advantage

Continuous monitoring of performance metrics helps organizations identify improvement areas swiftly, ensuring they remain ahead of industry trends.

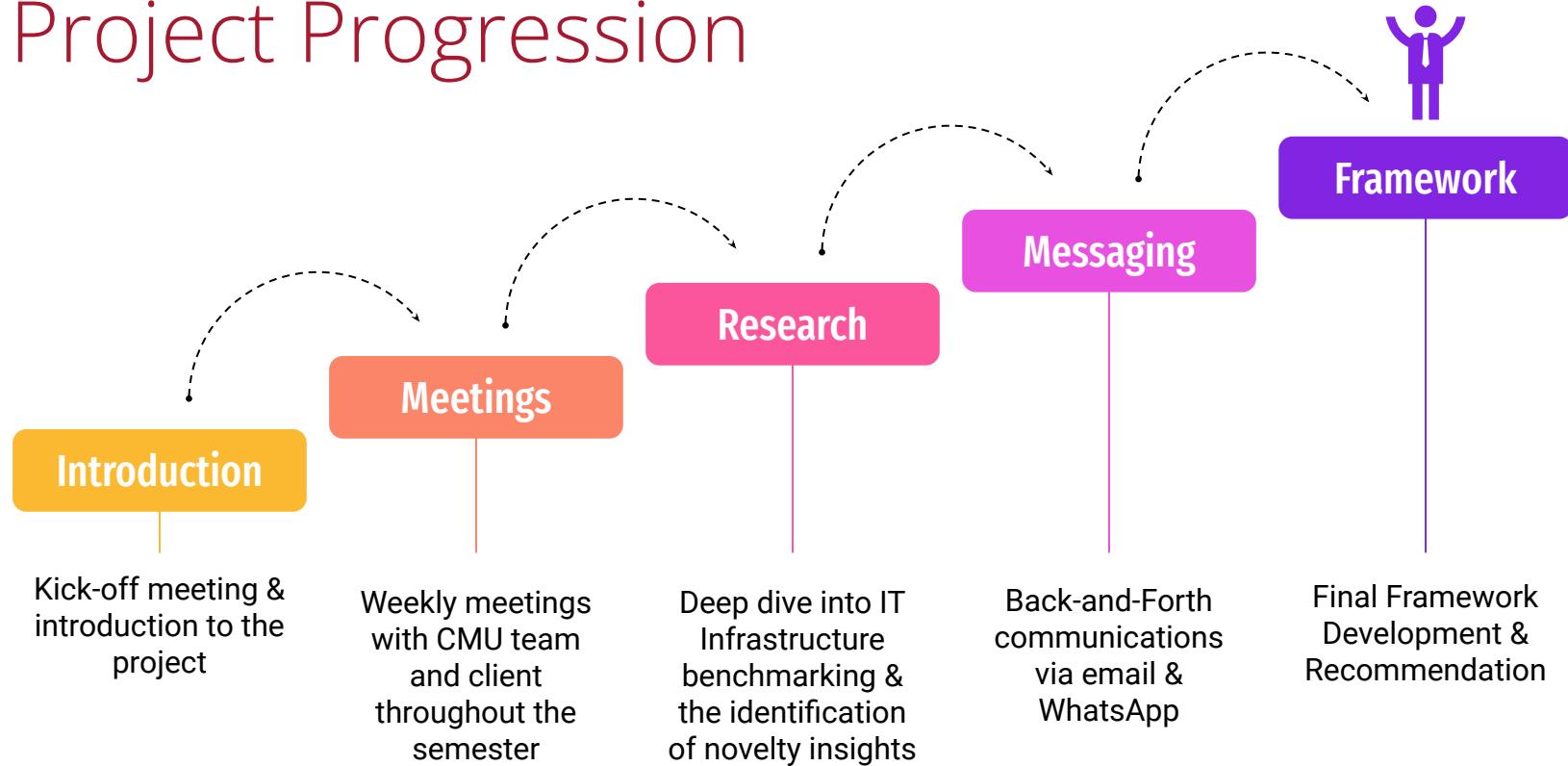
Enhanced Strategic Planning

Actionable insights that empower companies to align their improvement strategies with industry benchmarks and long-term goals.

Project Management Timeline



Project Progression



IT Infrastructure Benchmarking

“A **multifaceted** practice that provides a perspective to inform organizations to better understand where their IT infrastructure **performances** and **capabilities** lie compared to industry leaders in respect to the **digital maturity curve**.”

- Trianz

IT Infrastructure Dimensions

Cost Efficiency

Optimizing resources and investments to achieve maximum performance and scalability at the lowest possible cost.

Workforce Productivity

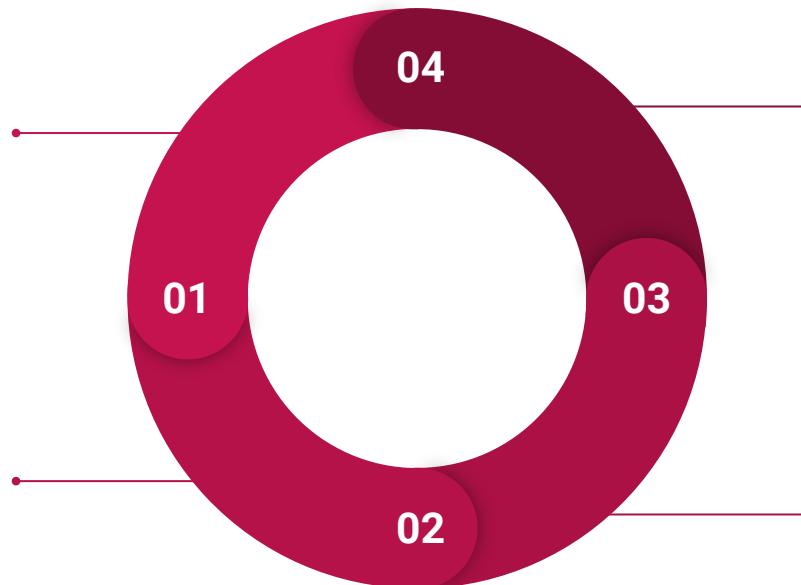
Focuses on enabling employees to perform efficiently by providing reliable, secure, and high-performing technological resources.

Process

Involve structured activities to manage, maintain, and optimize an organization's technological environment.

Security

Ensures the protection of data, systems, and networks against unauthorized access, breaches, and cyber threats.



Cost Efficiency

“Benchmarking cost efficiency involves comparing the expenses of IT infrastructure, including hardware, software, and operational costs, against industry standards. This process identifies areas for **cost optimization** while maintaining or improving performance and scalability.”

Cost Efficiency - GenAI Use-Cases

Innovation Enablement: Powers ideation and problem-solving, offering creative approaches to product design, marketing strategies, and more

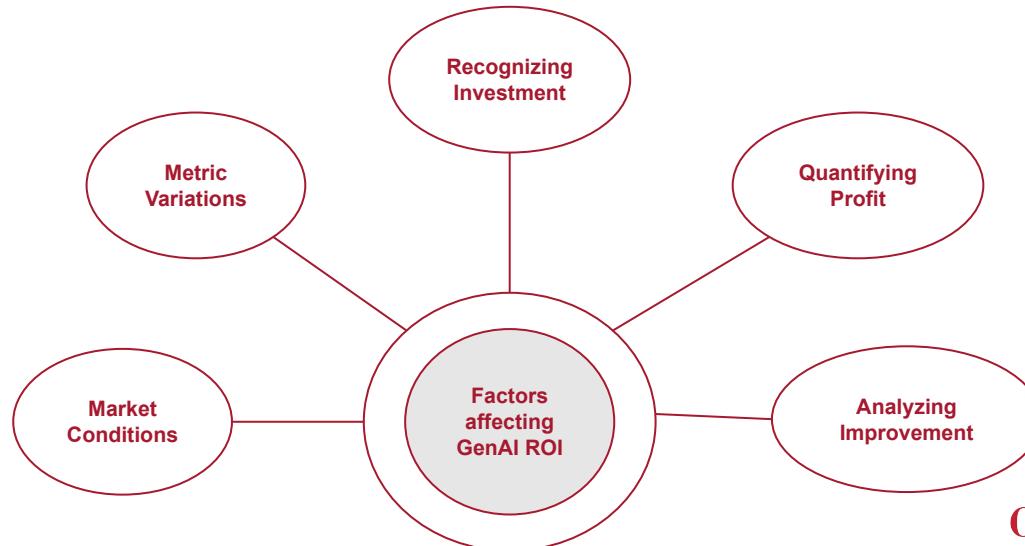
Market Growth: The Generative AI market is expected to show an annual growth rate (CAGR 2024-2030) of 46.47%, resulting in a market volume of **US \$356.10 bn by 2030**

Competitive Advantage: Early adopters gain a strategic edge, leveraging GenAI to outpace competitors in innovation, personalization, and operational efficiency

Diverse Use Cases: Image and Video Synthesis for Marketing, Automated Code and Application Development, Customer Service Chatbots and Virtual Assistants, Content Generation and Personalization, Real-Time Language Translation

Return-on-Investment (ROI)

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



Cost Dimensions for AI Use-Cases

Implementation

- Time-to-deploy (hours) [\[ScaleUpAlly\]](#)
- Infrastructure setup costs (\$) [\[Gartner\]](#)
- Development Time (hours) [\[Simublade\]](#)
- Adoption rate (%) [\[Gartner\]](#)
- Average wage per hours (\$) [\[Gartner\]](#)

Operations

- Monthly maintenance cost (\$) [\[ITRex\]](#)
- Infrastructure operating cost (\$) [\[Gartner\]](#)
- Licensing cost (\$) [\[TristateTechnology\]](#)

Model Training

- Cost per training iteration (\$) [\[Forbes\]](#)
- GPU/TPU usage cost (\$) [\[Forbes\]](#)
- Total usage hour per iteration (\$) [\[Forbes\]](#)

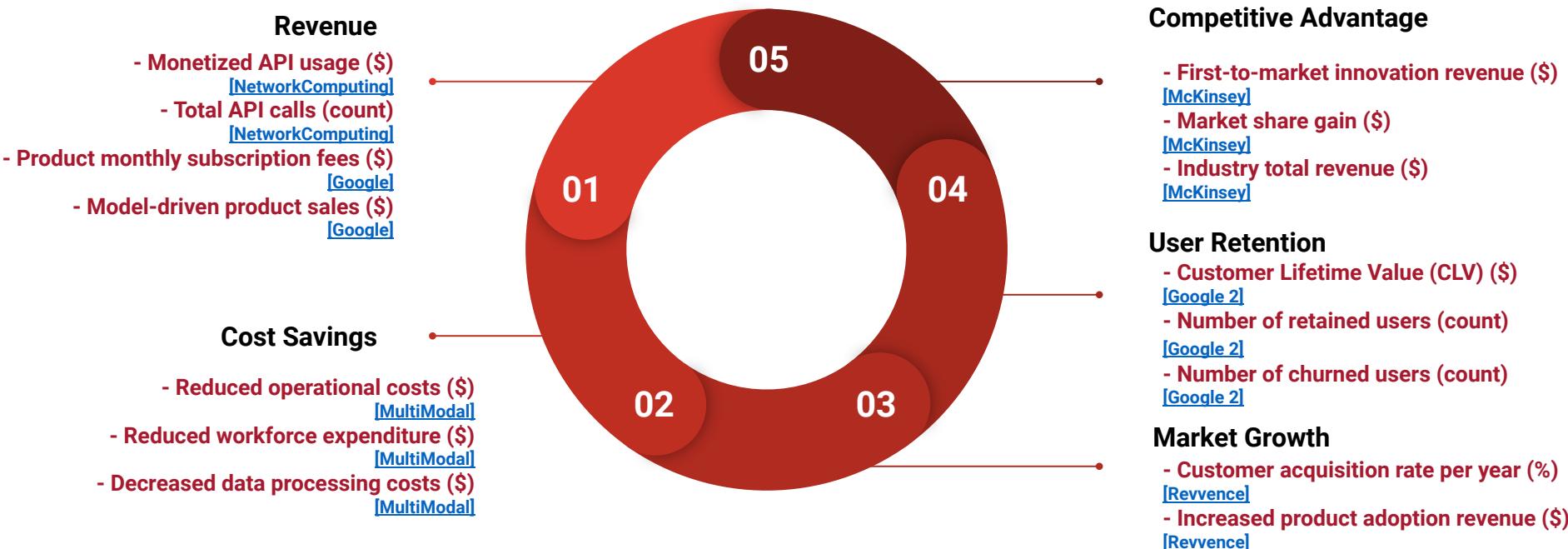
Data

- Data acquisition cost (\$) [\[Deloitte\]](#)
- Data storage cost per month (\$) [\[Deloitte\]](#)

Inference

- Cost per inference (\$) [\[Forbes\]](#)
- Total number of inference (count) [\[Gartner\]](#)
- Total operational inference cost (\$) [\[Gartner\]](#)

Success Indicators for Gen AI Use Cases



Calculating Total Cost for Gen AI Use-cases

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

Calculating Profit Potential for Gen AI Use-cases

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**



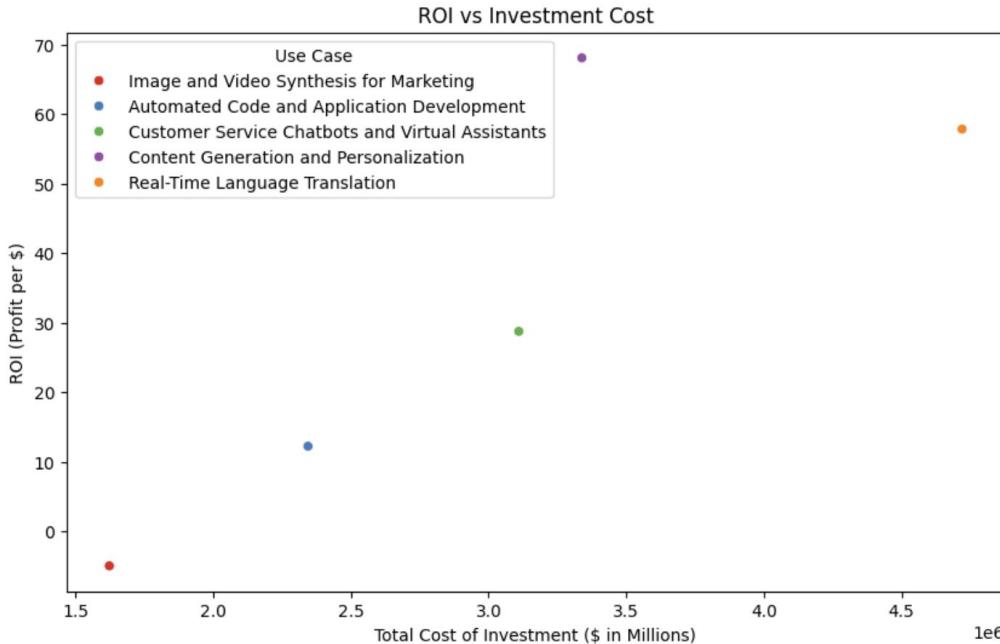
Calculating Return-on-Investment (ROI)

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



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

Deriving Insights using ROI: Scatter-plot



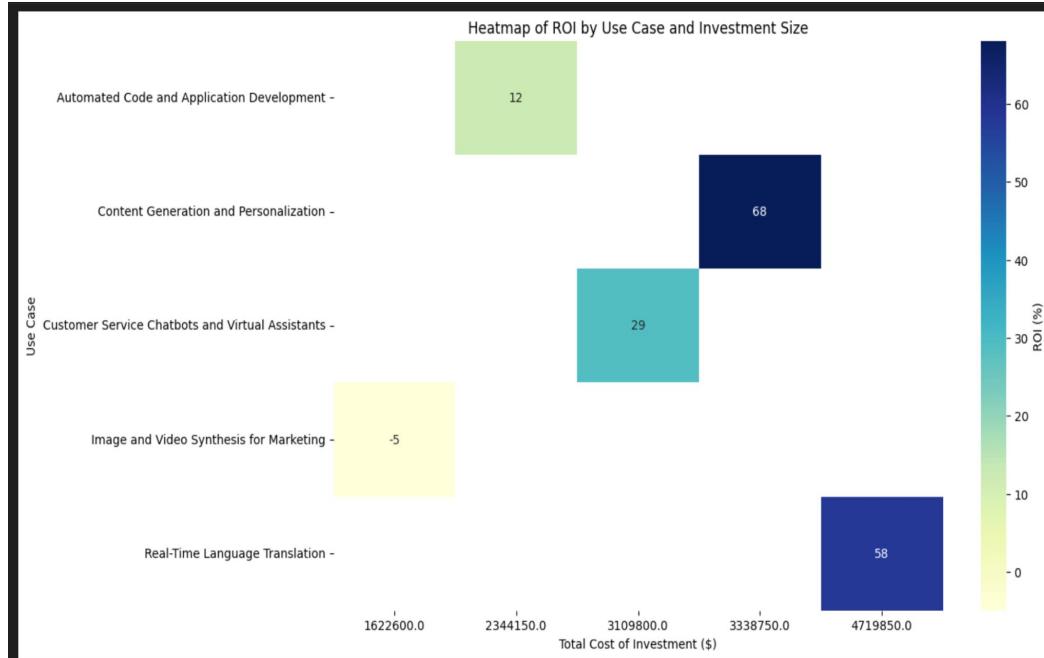
How to Visualize:

- X-axis: Total Cost of Investment
- Y-axis: ROI

Insights for IT Executives:

- **Invest in Technology with highest ROI potential**

Deriving Insights using ROI: HeatMap



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**

AI in Workforce Productivity

“Benchmarking workforce productivity for IT infrastructure evaluates the efficiency and output of IT teams in managing, maintaining, and optimizing infrastructure. Highlights areas where **productivity** may be improved to ensure organizational goals are met by the allocation of skills, automation of repetitive tasks, and enhancement of the overall IT service delivery.”

AI in Workforce Productivity

- Rapid evolution of AI tools transforming operations, decision-making, customer engagement.
- Businesses face a fragmented landscape of AI solutions with varied costs, benefits, and impacts.



The Need For a Framework

- **Challenge:** Absence of a standardized evaluation framework for selecting AI tools aligned with business goals.
- **Objective:** Build a robust, adaptable framework to measure and compare AI tools based on operational, financial, and experiential metrics for organizations like TCS which have multiple moving and interacting parts.

Framework Overview

To provide a structured approach to identify the best AI tools for workforce productivity, we should look at the following Key Evaluation Dimensions:

Cost Metrics – Evaluate financial feasibility and ROI.

Operational Metrics – Measure task efficiency and error reduction.

Employee Experience Metrics – Assess adoption and satisfaction.

Customer Impact Metrics – Gauge improvements in customer engagement.

Category-Specific Metrics – Tailored to the use case of the AI tool (Generative AI, Business Automation, CRM).

Key Metrics and Their Relevance

Granular Metrics:

1. **Error Reduction Ratio (ERR)**: Measures operational reliability.
2. **Adoption Velocity (AV)**: Reflects ease and speed of tool adoption.
3. **Employee Satisfaction Gain (ESG)**: Indicates tool impact on workplace morale.
4. **Customer Experience Improvement (CXI)**: Tracks downstream effects on customers.
5. **Cost Efficiency Index (CEI)**: Quantifies financial ROI.

Category-Specific Metrics:

1. **Generative AI**: Accuracy, multi-modality, and safety.
2. **Business Automation**: Integration, low-code interfaces, and RPA impact.
3. **Customer Relation Management**: Customer retention, pipeline efficiency, and engagement scores.



Analytical Approach

How the Framework Works:

- Metrics are calculated for each tool to identify trends and gaps.
- Granular insights (e.g., reduction in manual errors or faster task completion) complement broader perspectives (e.g., overall ROI).

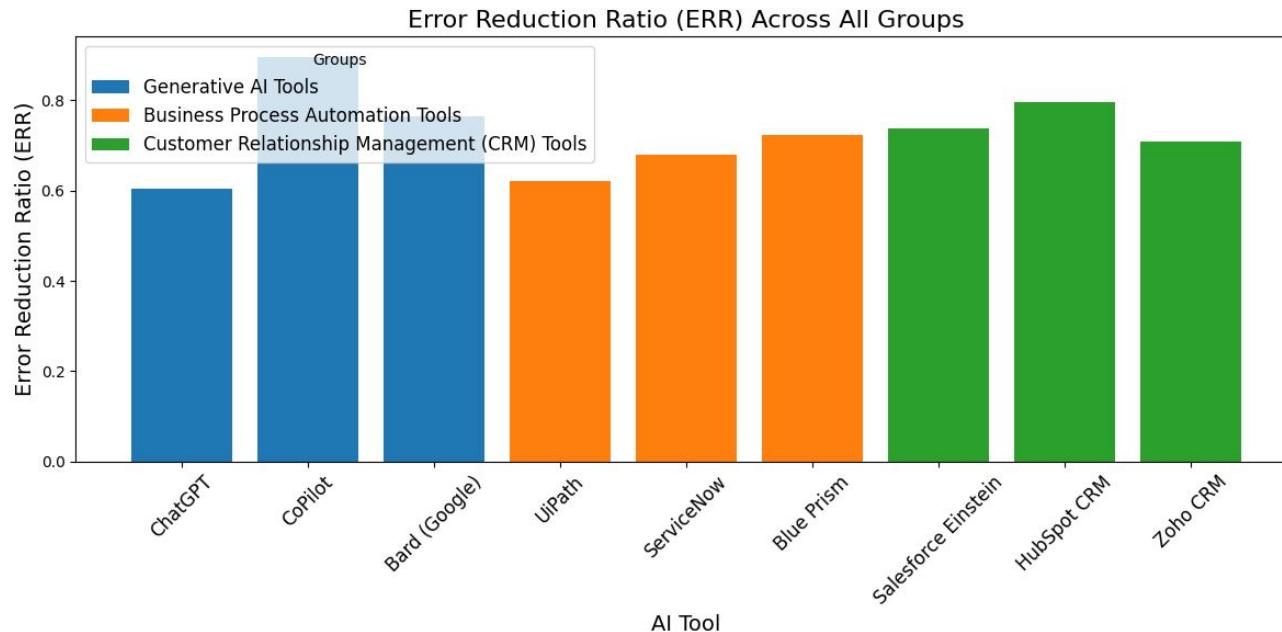
Focus Areas:

- Highlight areas where AI tools show significant performance improvements.
- Identify trade-offs, such as higher costs vs. operational benefits.

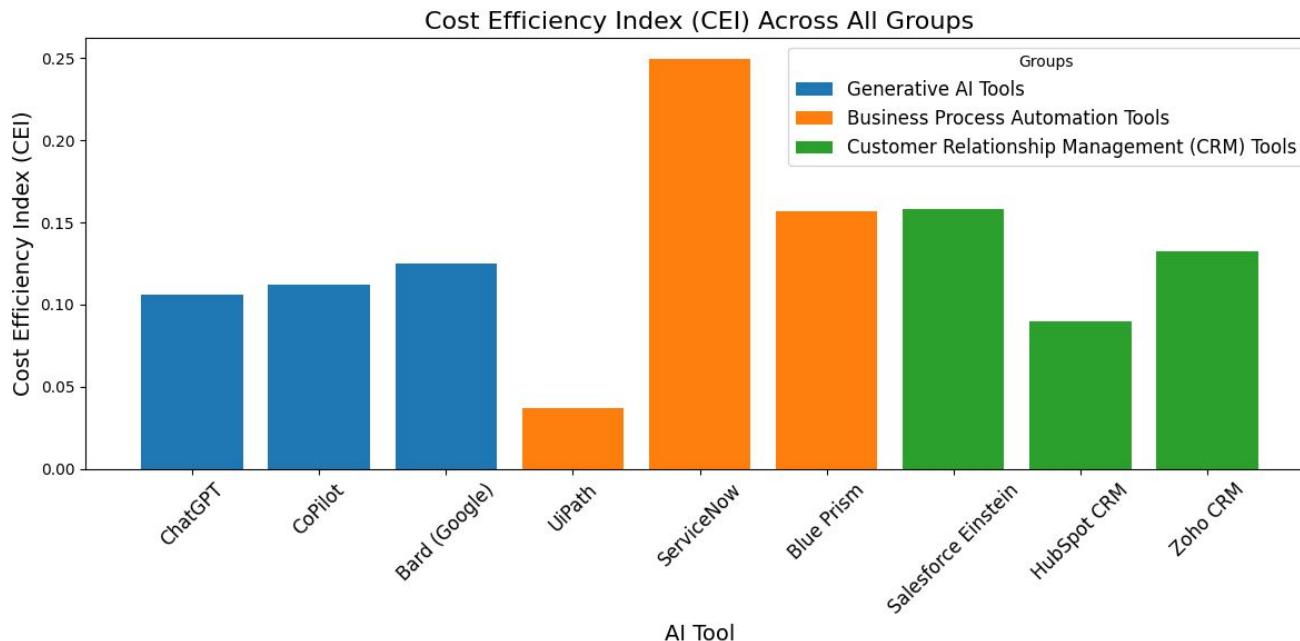
Example Scenarios:

- Generative AI: Balancing accuracy with efficiency in content creation.
- Automation Tools: Comparing integration capability with cost-efficiency.

Visualizations of Metrics - Categorical



Visualizations of Metrics - Categorical



Metric Heatmap

- Focus on tools with high metric scores aligned to your organizational priorities.
- Use darker cells in critical areas to shortlist tools for deeper evaluation.
- Identify tools with balanced performance across metrics for multi-functional use cases.



Actionable Recommendations



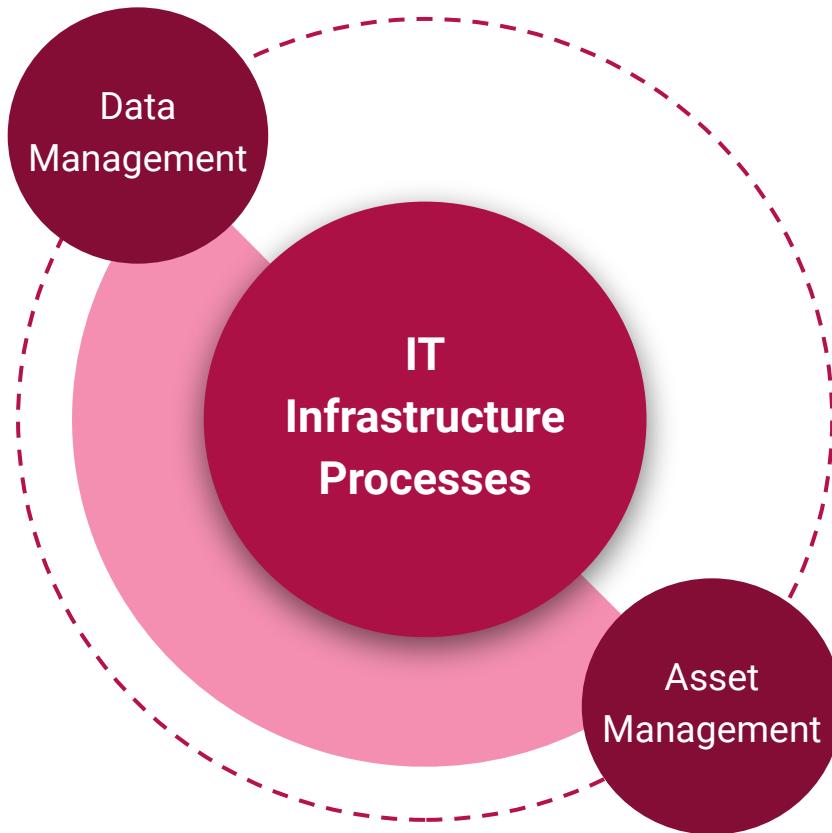
Pilot High-Performing Tools: Start with tools that align with your organization's immediate priorities, such as customer experience enhancement or operational reliability.

Focus on ERR and CEI Metrics: Prioritize tools that reduce errors and deliver high ROI to maximize both operational and financial benefits.

Customize Implementations: Leverage tools with strong category-specific strengths—whether for generative AI, process automation, or CRM workflows.

Iterate and Scale: Use real-world feedback to refine the framework and scale successful implementations across the organization.

Process



Data Management

“Benchmarking data management processes, organizations can align their practices with best standards to enhance operational efficiency, cost-effectiveness, and security while establishing **scalable data handling solutions.**”

Benchmark Use Case

Data Storage Utilization & Recovery Time

Target Value

70-80%

Storage Utilization Rate (%)

Measures the proportion of allocated storage actively in use.



Low Utilization = over-provision or underutilization of resources

High Utilization = risks of storage saturation

Reference: Implement Efficient Data Storage Measures (Energy Star)

<20ms

Access Latency (ms)

The speed at which data is retrieved from storage systems.



High Latency = inefficiencies in storage configurations or network bottlenecks

Low Latency = efficient operations & better user experience

Reference: Latency Critical Big Data Computing (Sciedirect)

<1 hr

Recovery Time Objective (RTO)

Measures the time required to restore data systems after an outage.

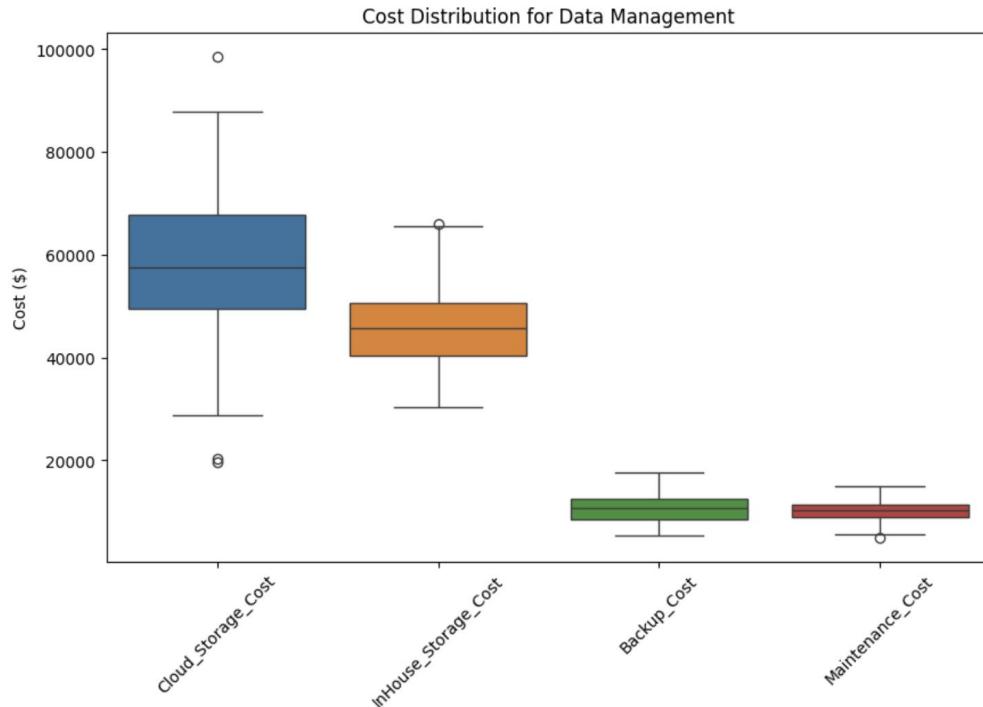


High RTO = inadequacies in backup or recovery processes

Low RTO = enhances operational resilience & minimizes financial losses

Reference: RTO and RPO (Commvault)

Data Visualization

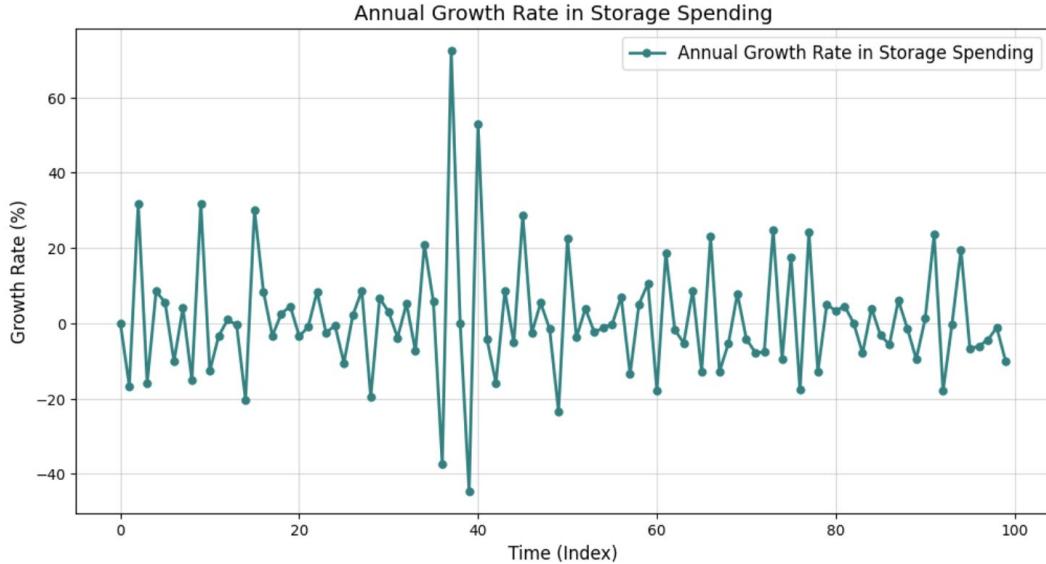


Box Plot: Cost Distribution

Boxplot that shows the distribution of costs associated with four key areas of data management: Cloud Storage Cost, In-House Storage Cost, Backup Cost, and Maintenance Cost.

*utilized synthetic data

Data Visualization

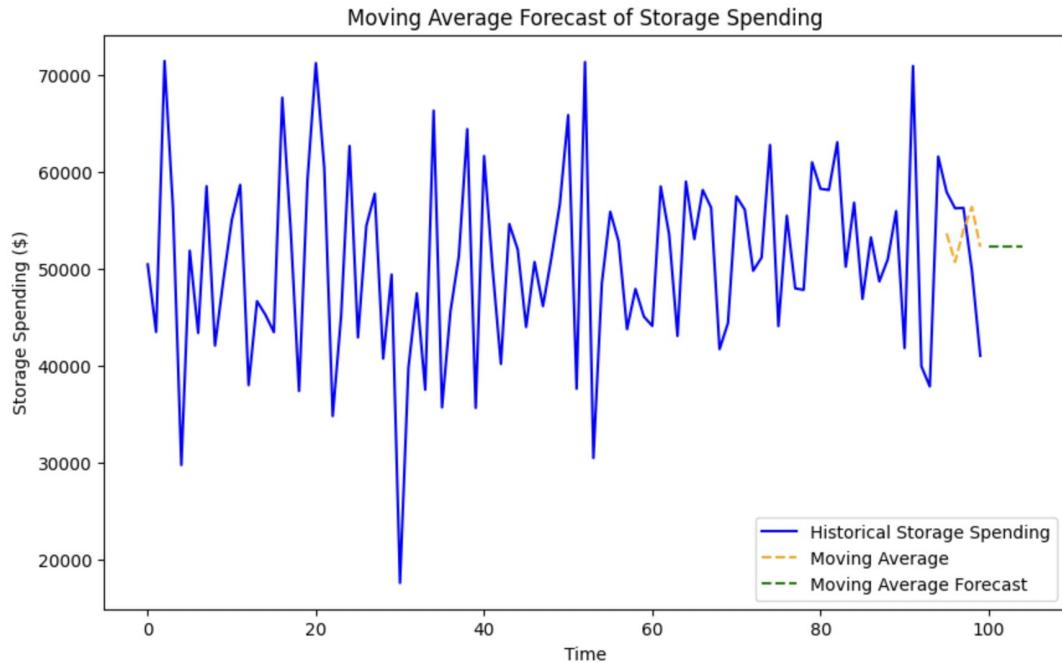


Line Plot: Annual Growth Rate in Storage Spending

The line graph presents an illustration of the annual growth rate in storage spending. The volatility and lack of a clear trend highlight the complexity of storage investment decisions and the need for careful analysis to understand the underlying drivers and potential future trajectories.

*utilized synthetic data

Data Visualization



Line Plot: Forecast of Storage Spending

The graph shows a historical trend of fluctuating storage spending. The moving average forecast suggests a potential upward trend in storage spending in the near future. However, the simple moving average model may not capture complex patterns or sudden changes in spending.

*utilized synthetic data

Optimization Strategies - Recommendation

01	Dynamic Data Tiering	<ul style="list-style-type: none">• Use automated solutions to tier data based on access frequency for storing hot data in high speed systems and cold data in cost-efficient storage.
02	Predictive Storage Scaling	<ul style="list-style-type: none">• Employ machine learning to forecast storage requirements, enabling proactive capacity adjustments, and avoid over-provisioning.
03	Real-Time Monitoring & Alerts	<ul style="list-style-type: none">• Deploy real-time monitoring tools to track storage usage and latency.

Asset Management Use Case

Asset Utilization Rate & Downtime Rate

Target Value

75-85%

Asset Utilization Rate (%)

Measures how effectively an asset is being used relative to its total available time



Low Utilization = inefficiencies and increased operational costs due to over-provisioning.

High Utilization = risks of system overloading, and system outages

Reference: Deloitte IT Asset Management Survey 2023 (Deloitte, 2023).

<5%

Downtime Rate (%)

Measures the percentage of time an asset is not operational due to failures or maintenance

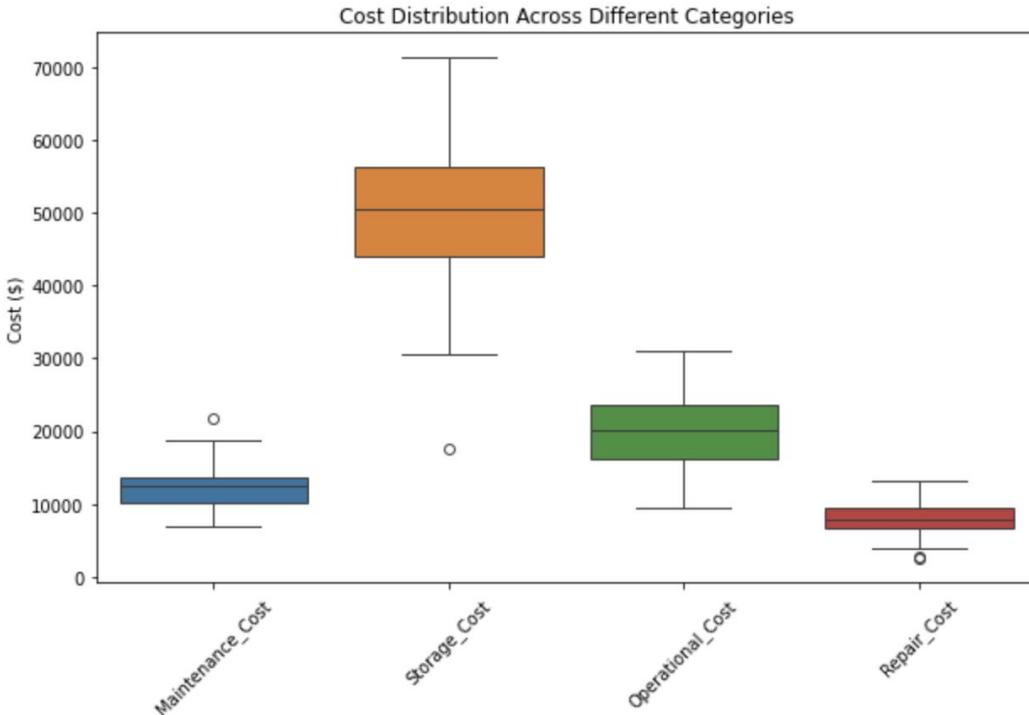


Low Rate = highly efficient and reliable systems.

High Rate = Frequent outages, leading to operational inefficiencies, financial losses, and reduced trust.

Reference: Gartner IT Infrastructure Report (Gartner, 2023).

Data Visualization

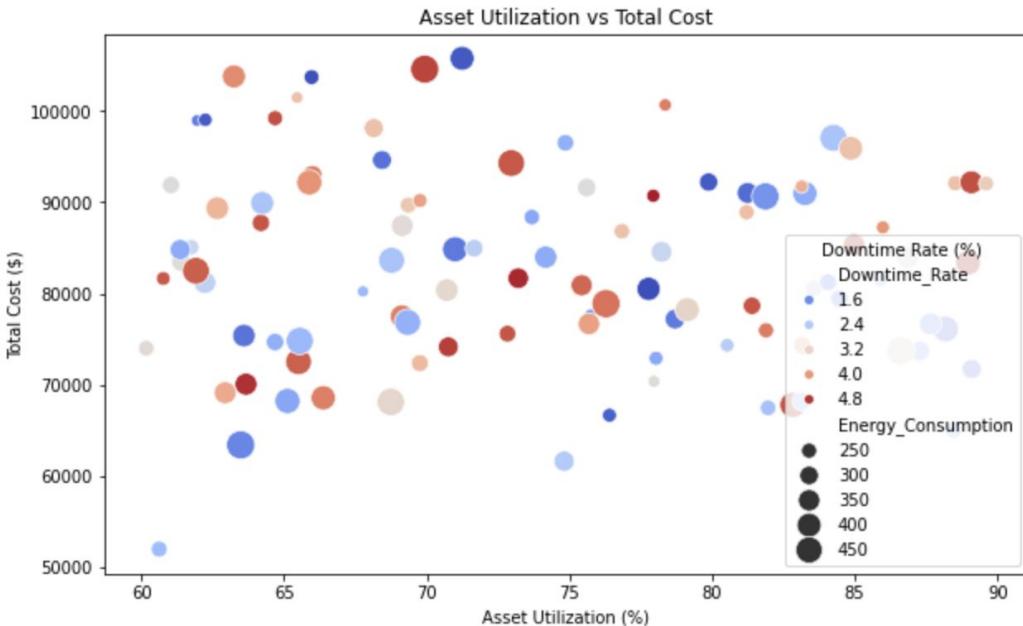


Boxplot for Cost Distribution Across Categories

Illustrates the cost distribution across categories like Maintenance, Storage, Operational, and Repair, highlighting medians, variability, and outliers to identify areas for cost optimization.

*utilized synthetic data

Data Visualization

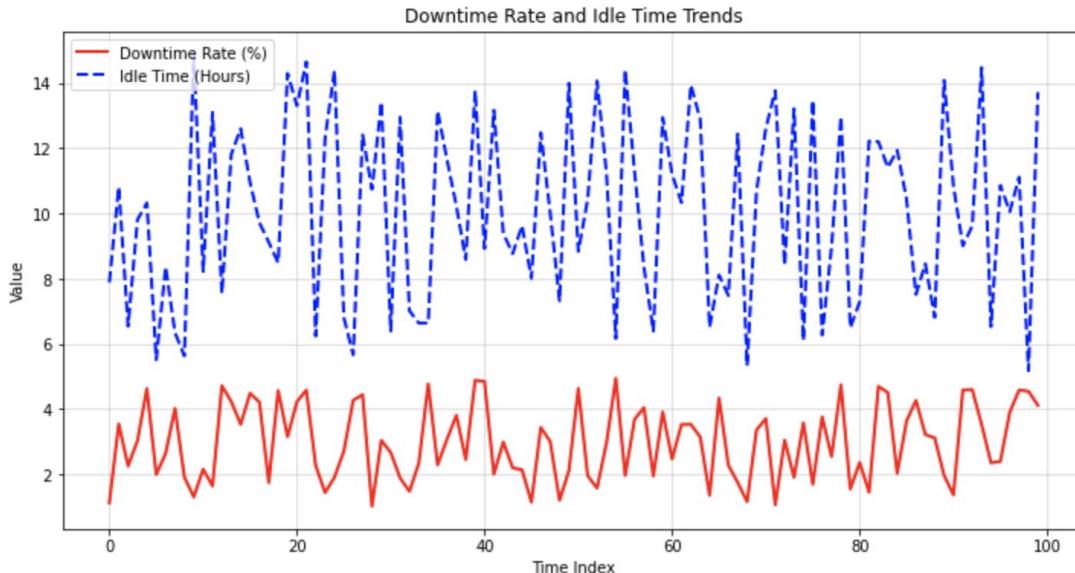


Scatter Plot: Asset Utilization vs Total Cost

The plot shows Asset Utilization vs. Total Cost, with points color-coded by Downtime Rate (%), and sized by Energy Consumption (kWh), revealing cost-impact trends and assets needing attention.

*utilized synthetic data

Data Visualization

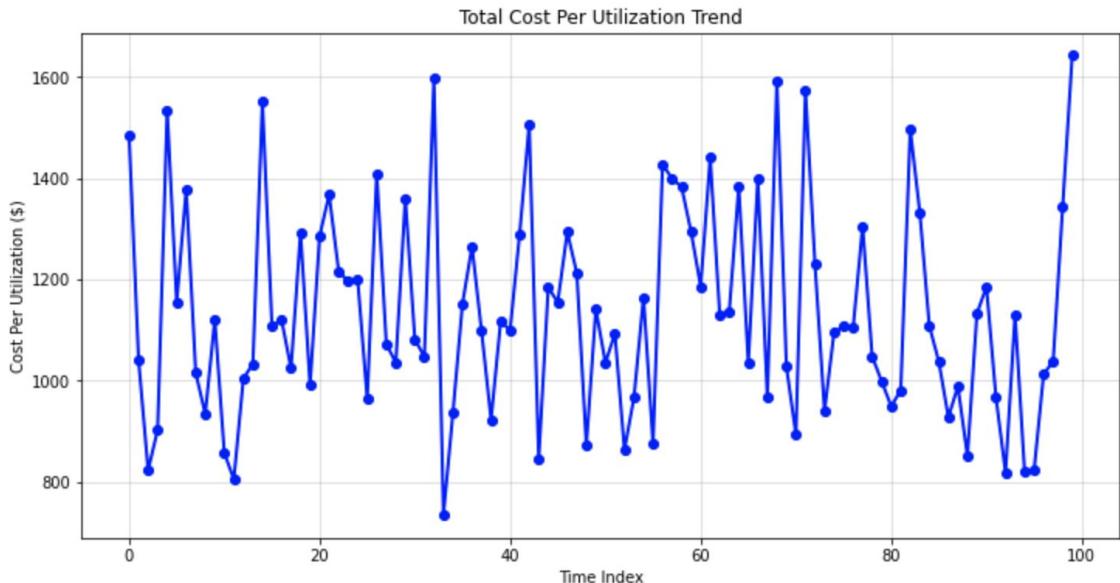


Line Plot: Downtime Rate and Idle Time Trends

The trends of Downtime Rate and Idle Time over time. The red line represents Downtime Rate (%), while the blue dashed line indicates Idle Time (hours). This comparison helps track how these two metrics change together, enabling a better understanding of operational inefficiencies and the impact of maintenance schedules or policy changes.

*utilized synthetic data

Data Visualization

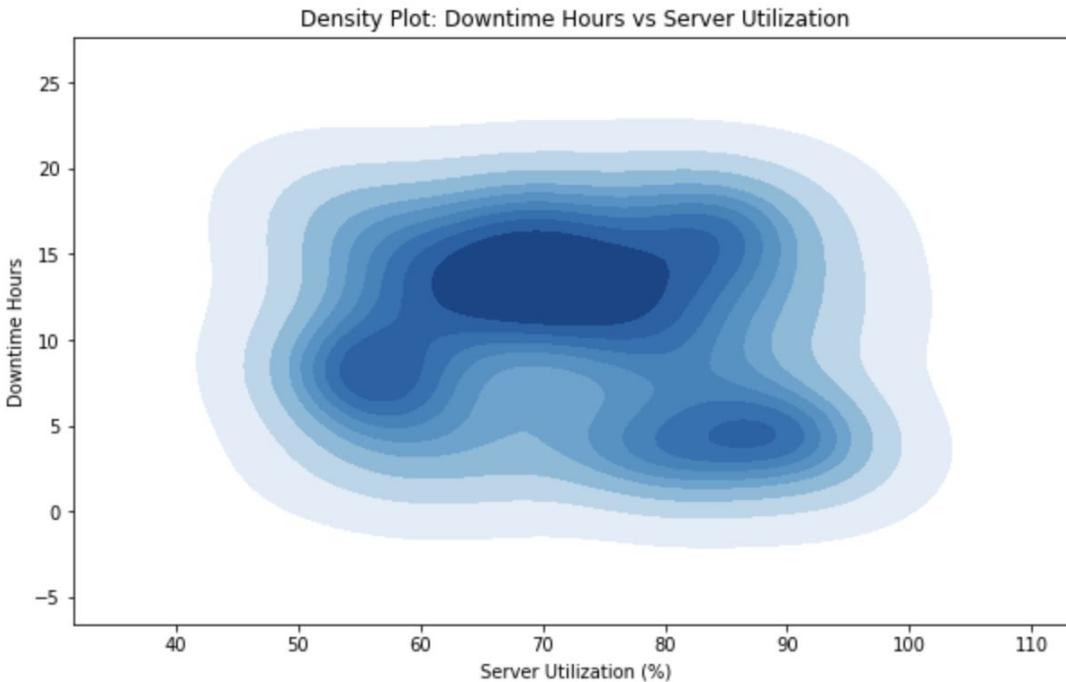


Line Plot: Total Cost Per Utilization Over Time

The trend of Total Cost Per Utilization over time, calculated as Total Cost divided by Asset Utilization. This plot reveals how efficiently costs are managed relative to asset utilization. A downward trend would suggest improving cost efficiency, while an upward trend may highlight areas needing further investigation.

*utilized synthetic data

Data Visualization



KDE Plot: Downtime Hours vs Server Utilization

KDE plot visualizes downtime hours and server utilization, highlighting patterns like correlations between high downtime and low utilization. Peaks indicate common values, aiding in identifying inefficiencies.

*utilized synthetic data

Optimization Strategies - Recommendation

01

Dynamic Resource Allocation

- Use tools like AWS CloudWatch or Azure Monitor to automate resource scaling, balancing loads, and minimizing idle or overloaded systems.
- Netflix optimized global server utilization to 75%-80% using dynamic resource allocation.

02

Automation and Smart Tools

- Use machine learning to analyze performance data and predict failures, and deploy AI tools like TensorFlow or PyTorch for forecasting and proactive maintenance.
- GE's AI-driven predictive maintenance cut unplanned downtime by 30%, boosting asset reliability and efficiency.

03

Dynamic Load Balancing

- Use Kubernetes for dynamic load balancing to evenly distribute workloads, prevent overloading, and reduce idle resources.
- Netflix uses Kubernetes to maintain 75%-80% server utilization, preventing overloads and ensuring stable performance.

Security

“Benchmarking security in IT infrastructure involves assessing the effectiveness of security measures, policies, and practices against industry standards, regulatory requirements, or peer organizations. Identifies gaps, ensures alignment with best practices, and **enhances resilience** against evolving threats and protecting critical assets.”

Security

USD 4.88M

Average Cost of a Data Breach

10% Increase Over Last Year



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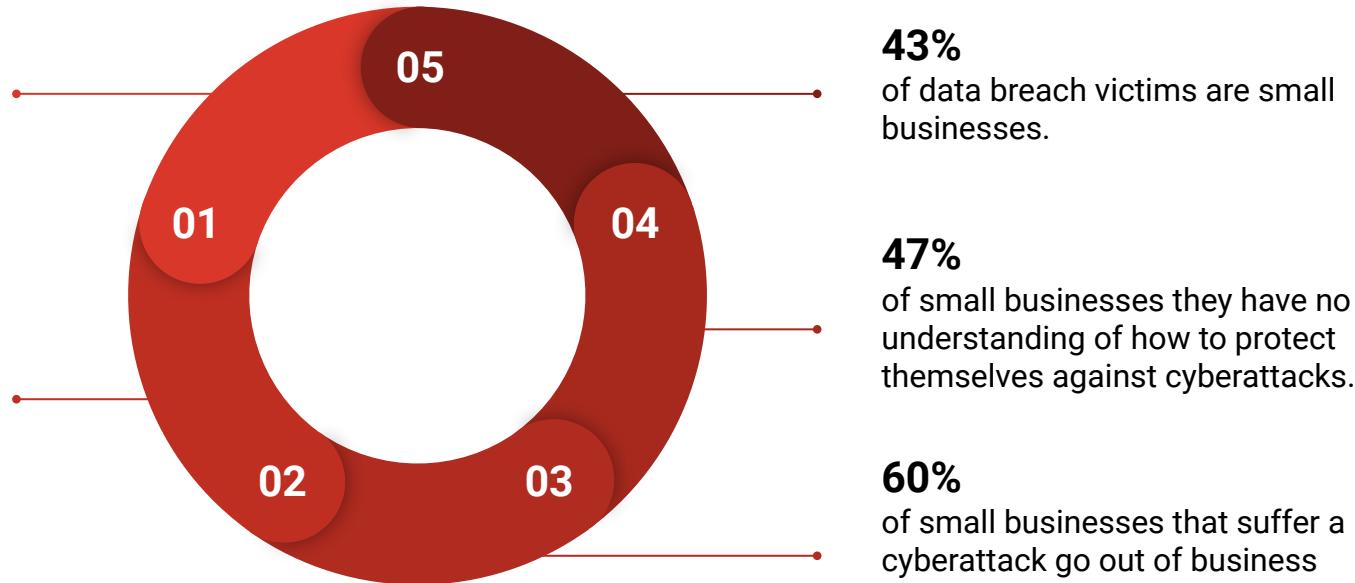
Security

\$2.2 billion

Cybercrimes cost small and medium-sized businesses more than 2.2 billion dollars every year.

95%

of cybersecurity attacks happen because of human error.

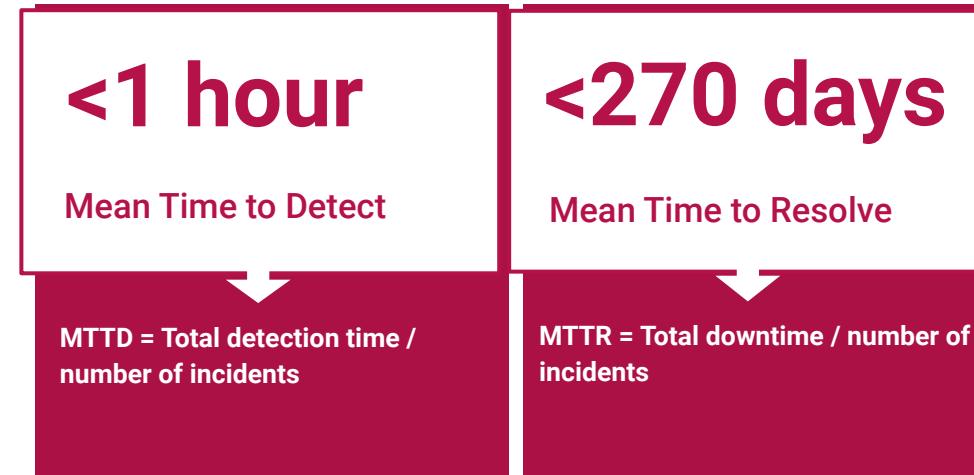


Security

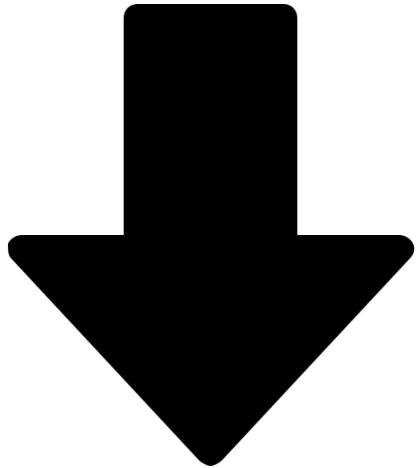
Threat Detection and Response Time:

1. Mean Time to Detect
2. Mean Time to Acknowledge
3. Mean Time to Contain
4. Mean Time to Resolve
5. Virus Infection Monitoring
 - i. Frequency of scans
 - ii. Detection rate of virus, malware, malicious code

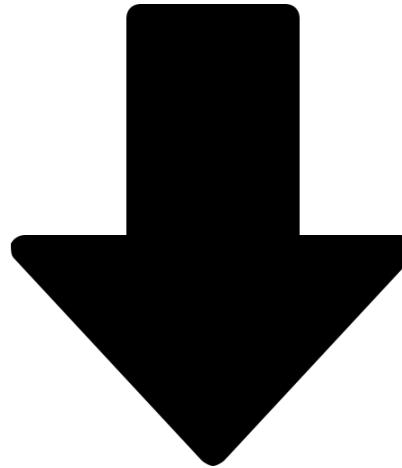
Threat Detection & Response - Target Values



Threat Detection & Response



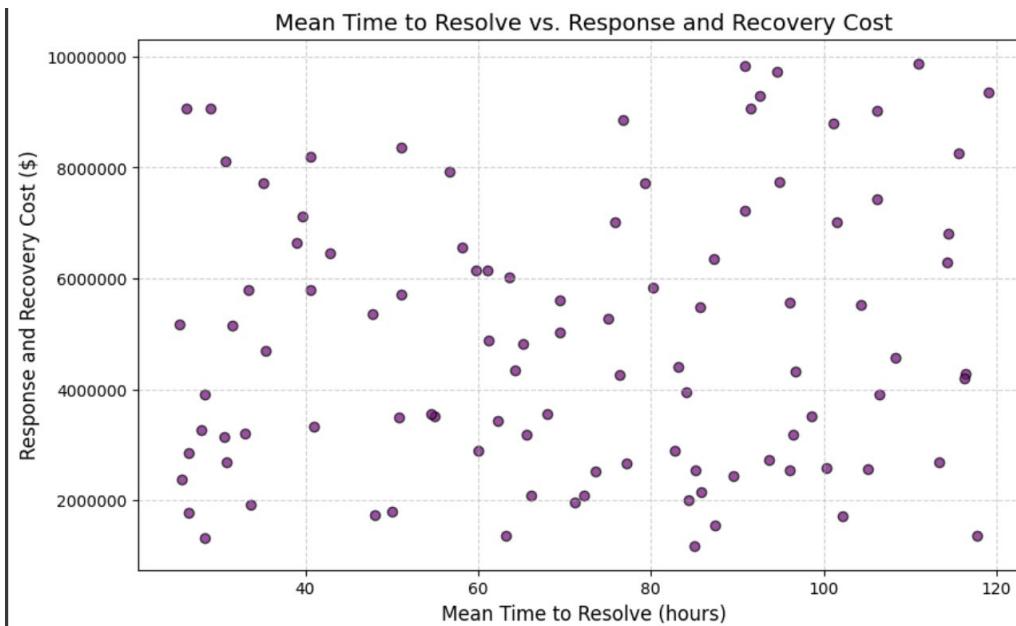
MTTD



MTTR

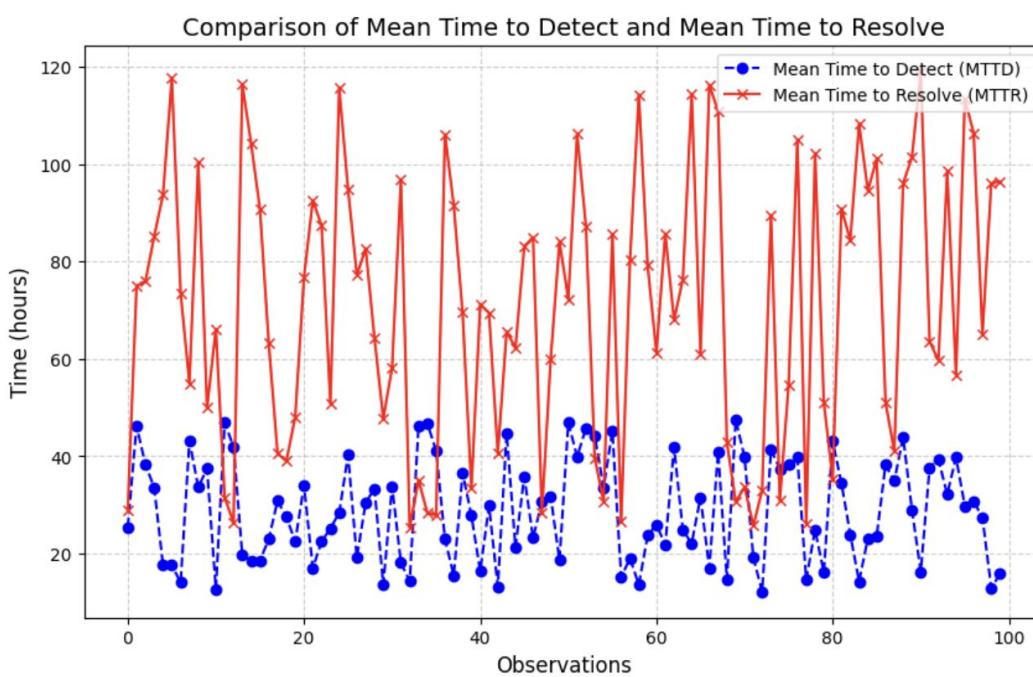


Threat Detection & Response



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Threat Detection & Response



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Security - Other Categories

Vulnerability and Patch Management

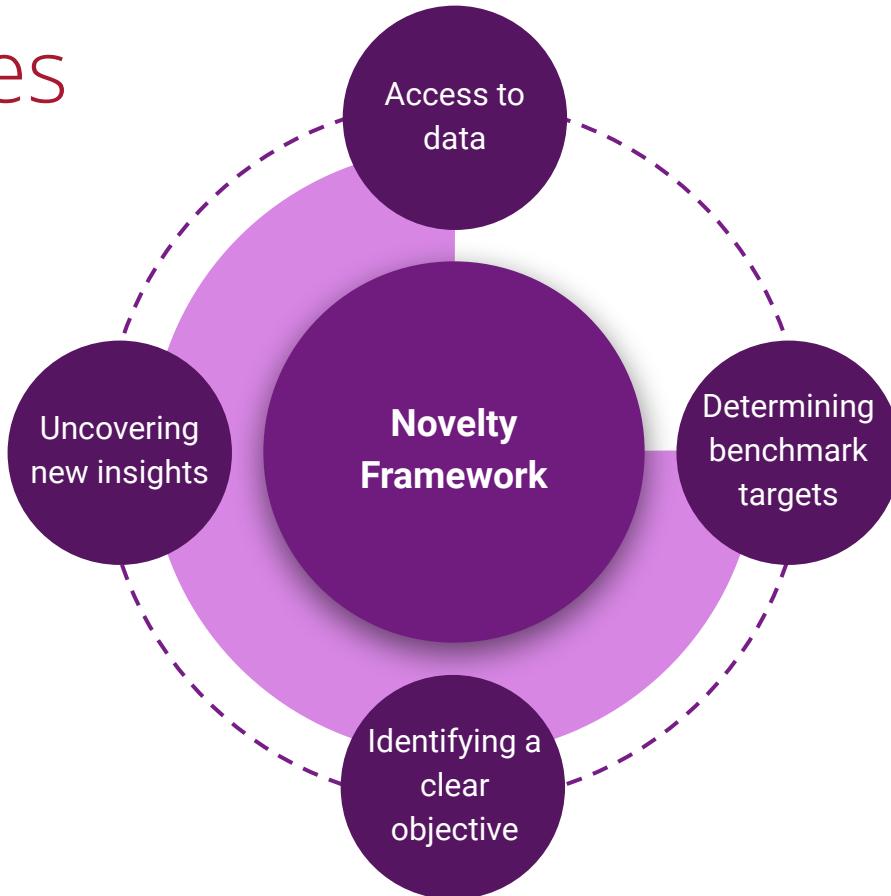
Data Loss Prevention and Access Control

Network and Endpoint Security

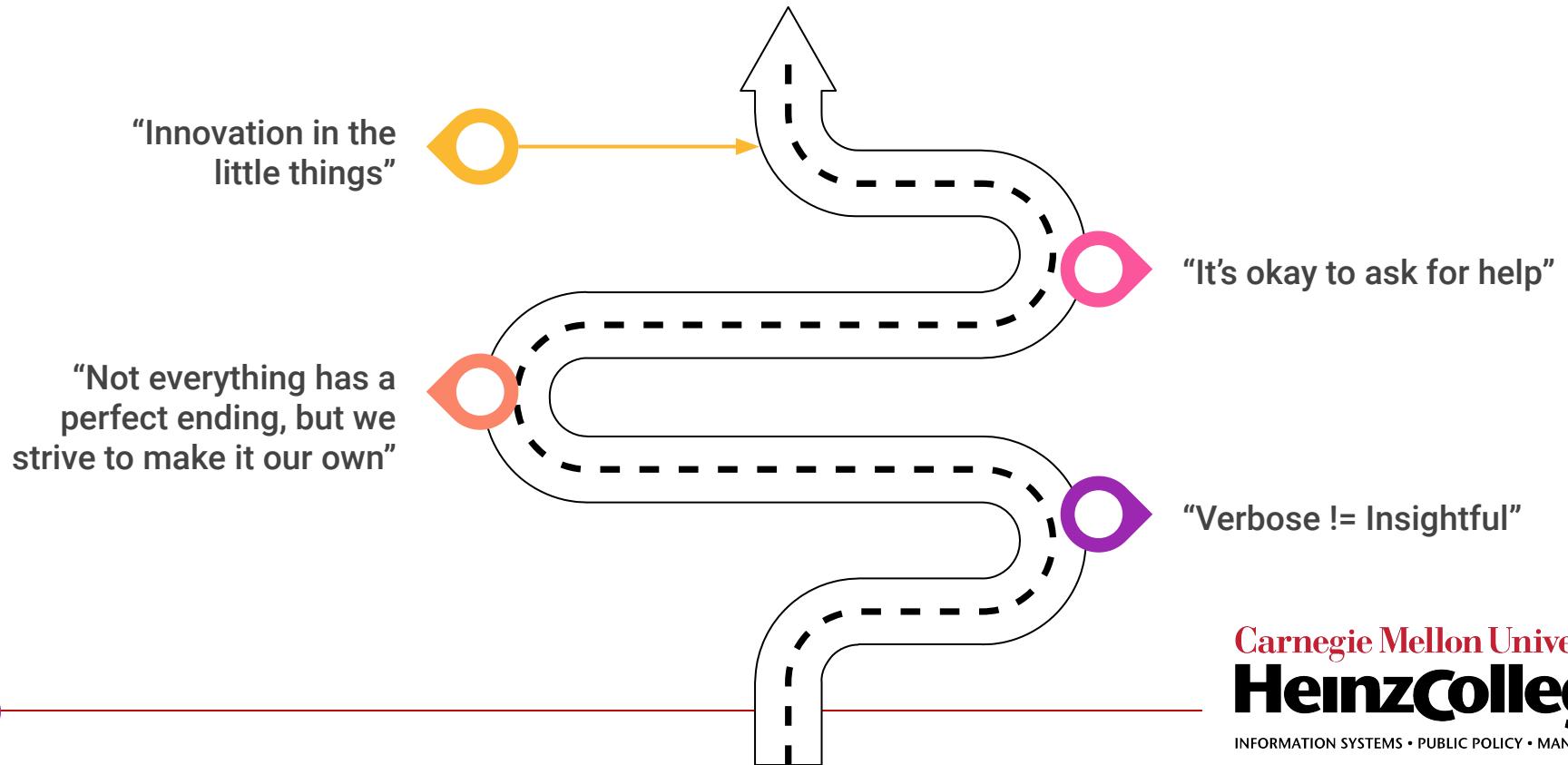
Security Awareness and Policy Compliance



Challenges



Lessons Learned - Reflections



Next Steps

Utilization of Industry Data

- Incorporate industry data into the benchmarking framework, aligning it with internal metrics to enable meaningful comparisons.

Continued Development

- Develop the framework to handle variations across industries, organizational sizes, and technological landscapes.
- Integrate tools and automation to facilitate real-time benchmarking and reporting.

Training of Framework Model

- Train the model using historical and real-time data to establish benchmarks, detect anomalies, and predict trends.

Testing & Deployment

- Test the framework with simulated data scenarios to ensure it accurately identifies performance gaps and provides actionable insights.
- Roll out the framework organization-wide.



x

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Thank you!

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Q&A

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- [How to Measure the ROI of GenAI Investments? - Analytics Vidhya](#)
- [The path to generative AI value: Setting the flywheel in motion](#)
- [Index Insider: Generative AI Use Cases – Where's the Top Line? | ISG](#)

APPENDIX

Purpose Continued

Application Performance

- **Tool:** SPECjEnterprise2010
- **Purpose:** Performance of a representative Java EE application
- **Workload:** Automobile dealership simulation
- **Metric:** Enterprise jAppServer Operations Per Second ("SPECjEnterprise2010 EjOPS")
 - SPECjEnterprise2010 EjOPS = Dealer Transactions/sec + Workorders/sec

Purpose Continued

Application Performance

SPECjEnterprise®2010 Result			
Copyright © 2009-2017 Standard Performance Evaluation Corporation			
Oracle WebLogic Server Standard Edition Release 12.2.1.2 on SPARC T8-1	Submitter: Oracle Corporation	SPEC license # 73	34,259.69 SPECjEnterprise2010 EjOPS Test date: Sep-2017
Software Products Oracle WebLogic Server Standard Edition Release 12.2.1.2 Java HotSpot™ 64-Bit Server VM on Solaris, version 1.8.0_144 Oracle JDBC Driver 12.2.0.1(Thin) Oracle Database 12c Enterprise Edition Release 12.2.0.1 Oracle Grid Infrastructure 12c Release 12.2.0.1	Software Configurations Java EE Application Server Emulator Software Config Database Software Config Driver Software Config	Hardware Systems Java EE AppServer HW Database Server HW Load Driver HW Emulator HW System Configuration Diagram	Benchmark Modifications Configuration Bill of Materials Other Info General Notes Full Disclosure Archive
JEE Server Nodes: 1 JEE Server CPUs: 32 cores, 1 chip JEE Instances: 4 Other SUT Components:	SUT Configuration 32 cores, 1 chip 4	DB Server Nodes: 1 DB Server CPUs: 32 cores, 1 chip DB Instances: 1	1 3,600 seconds 300 seconds
Benchmark Settings			
Dealer Injection Rate: 21,500	DB Load Injection Rate: 30,000	Ramp Up Time: Steady State Time: Ramp Down Time:	600 seconds 3,600 seconds 300 seconds
# of Dealer Agents: 215,000	# of Manufacturing Agents: 64,500		

Purpose Continued

Application Performance

Detailed Results					
		Count	Tx. Mix	Failure Count	
Dealer Transaction Mix					
Purchase		19,474,375	25.00%	5	
Manage		19,464,921	24.99%	3	
Browse		38,946,549	50.00%	0	
Total # Dealer Transactions		<u>77,885,845</u>			
Manufacturing Transaction Mix		Count	Tx. Mix	Failure Count	
CreateVehicleEJB		22,721,766	49.99%	1,677	
CreateVehicleWS		22,727,276	50.01%	1,669	
Total # Manufacturing Transactions		<u>45,449,042</u>			
Response Times		Average	Standard Deviation	Maximum	90th %
Purchase		0.098	0.31	25.186	0.170
Manage		0.059	0.16	16.436	0.110
Browse		0.120	0.36	25.551	0.200
CreateVehicleEJB		0.228	0.28	24.825	0.475
CreateVehicleWS		0.217	0.19	9.186	0.425
Reproducibility Run (SPECjEnterprise2010 EjOPS)		34,275.46			

Oracle WebLogic Server Standard Edition Release 12.2.1.2			
Vendor:	Oracle Corporation	Availability:	Oct-2016
CTS Version:	7.0	Date Passed CTS:	Oct-2015
OS Name:	Oracle Solaris 11.3 SRU 23.5		
EJB Protocol:	RMI/T3		

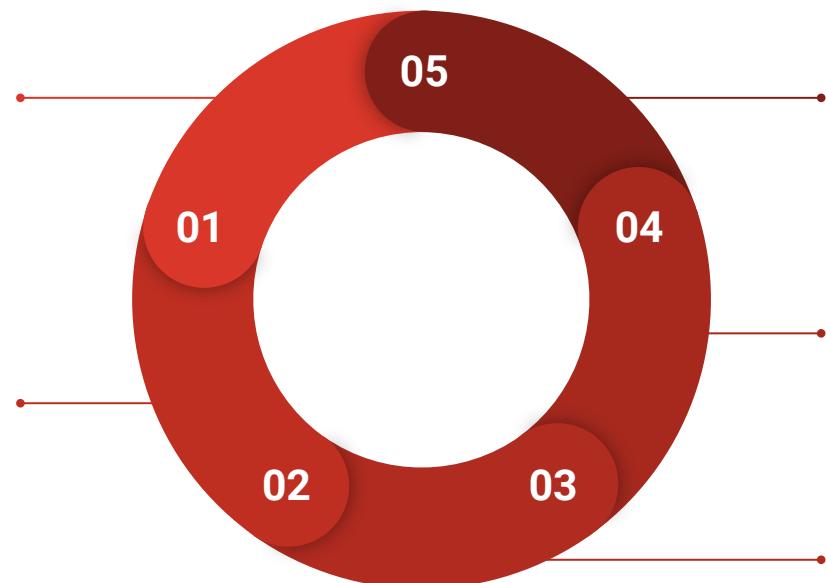
Purpose Continued

Performance Comparison

Enables organizations to assess their performance against industry standards and competitors.

Identify Gaps and Opportunities

Highlights specific areas for improvement and potential growth based on performance metrics.



Support Decision-Making with Data

Provides data-driven insights to guide strategic planning and operational decisions.

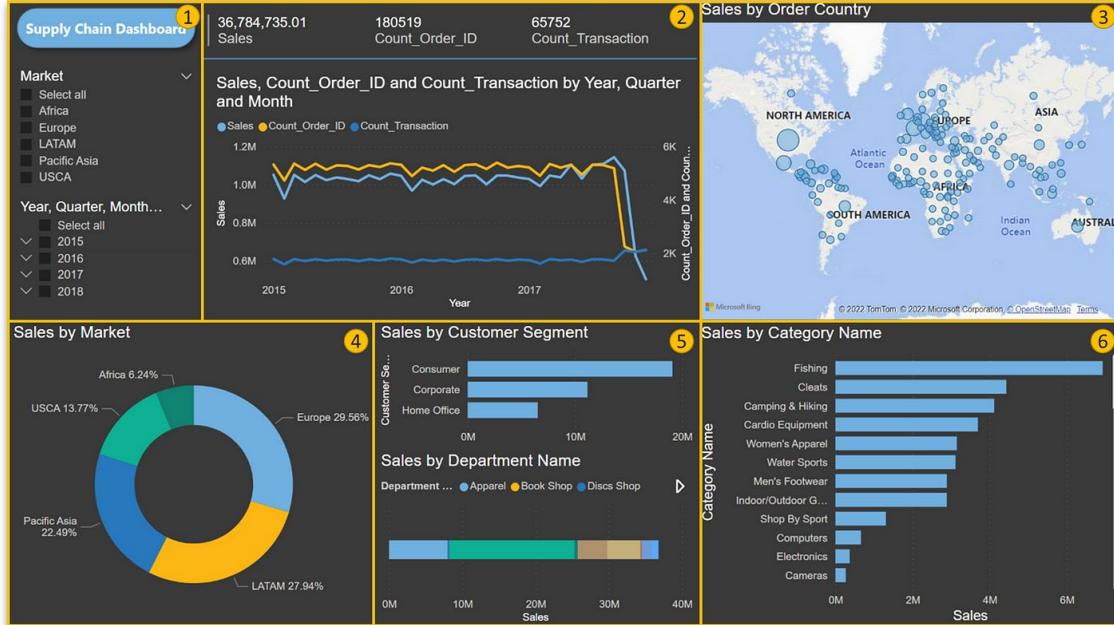
Monitor Progress Over Time

Tracks performance trends to evaluate improvements or declines over specific periods.

Personalized Suggestions

Provide actionable recommendations based on the KPIs

Industry Benchmarking Tool Features



- Analytical
- Competitive Intelligence
- User Testing
- Extract Transform Loading (ETL)
- Predictive Analysis
- Data Visualization
- Machine Learning (ML)

Benchmarking Research

BENCHMARKING AREAS	RESEARCH TOPICS
Product	<ul style="list-style-type: none">• External vs. Internal Analysis
Operations	<ul style="list-style-type: none">• Current Benchmarking Tools
Financial	<ul style="list-style-type: none">• Key Metrics
IT Infrastructure	<ul style="list-style-type: none">• Key Performance Indicators (KPIs)
Performance	<ul style="list-style-type: none">• Public Data Reports• Benchmarking Goals• Industry Leaders

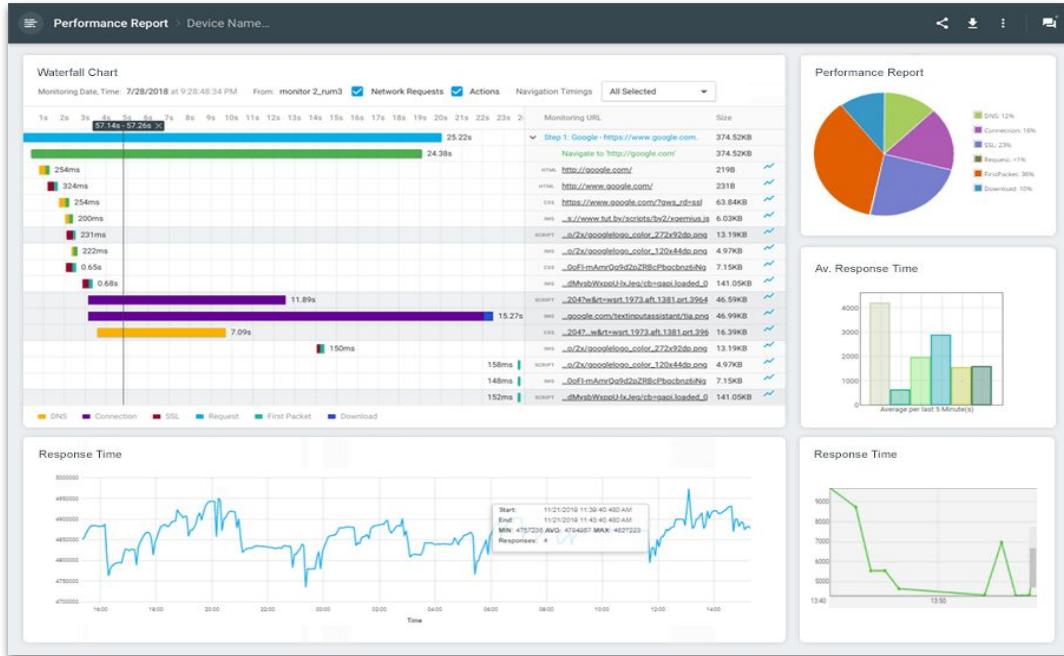
Industry Benchmarking Tools

Some notable benchmarking tools available on the market.

BENCHMARKING AREAS	TOOLS
Product	Mixpanel, Flurry, Crayon, Asana
Operations	PowerBI, ARIMA, XGBoost
Financial	Sage Intacct, Yahoo Finance, Dun and Bradstreet
IT Infrastructure	Apptio Cloudability, ServiceNow, Qualys
Performance	SPEC CPU 2017, PassMark Software - MemTest86

IT Infrastructure Benchmarking

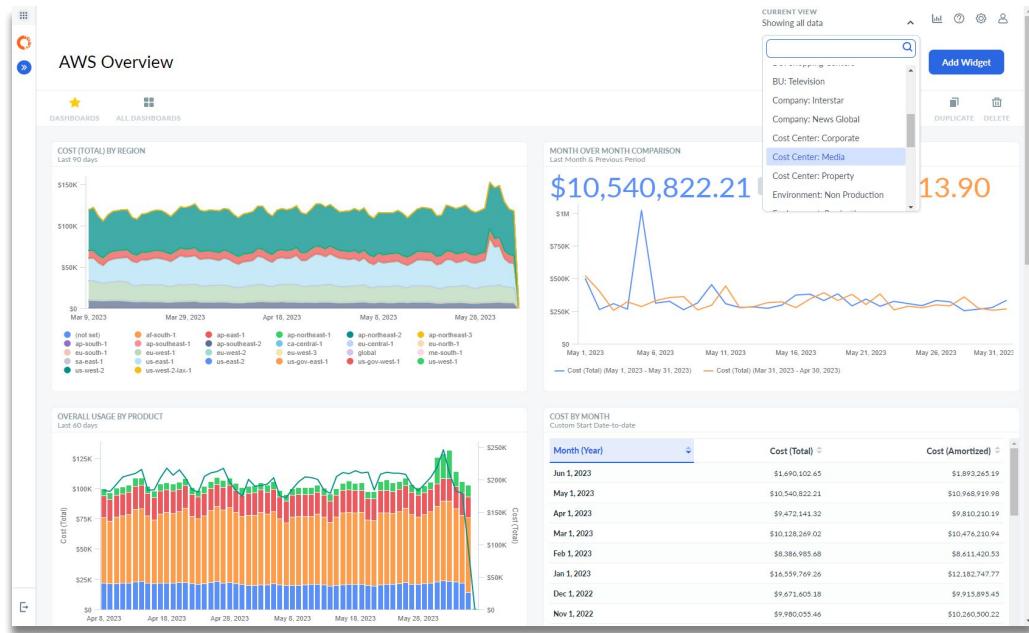
- **Performance Benchmarking**
 - Measures the speed, uptime, or efficiency of IT systems
 - Metrics:
 - Availability
 - Consistency
 - Incident Resolution
 - Transactional Volume
 - Response Time
- Common Benchmarking Tools:
 - Sysbench
 - Iperf
 - Geekbench



IT Infrastructure Benchmarking

- **Cost Efficiency Benchmarking**

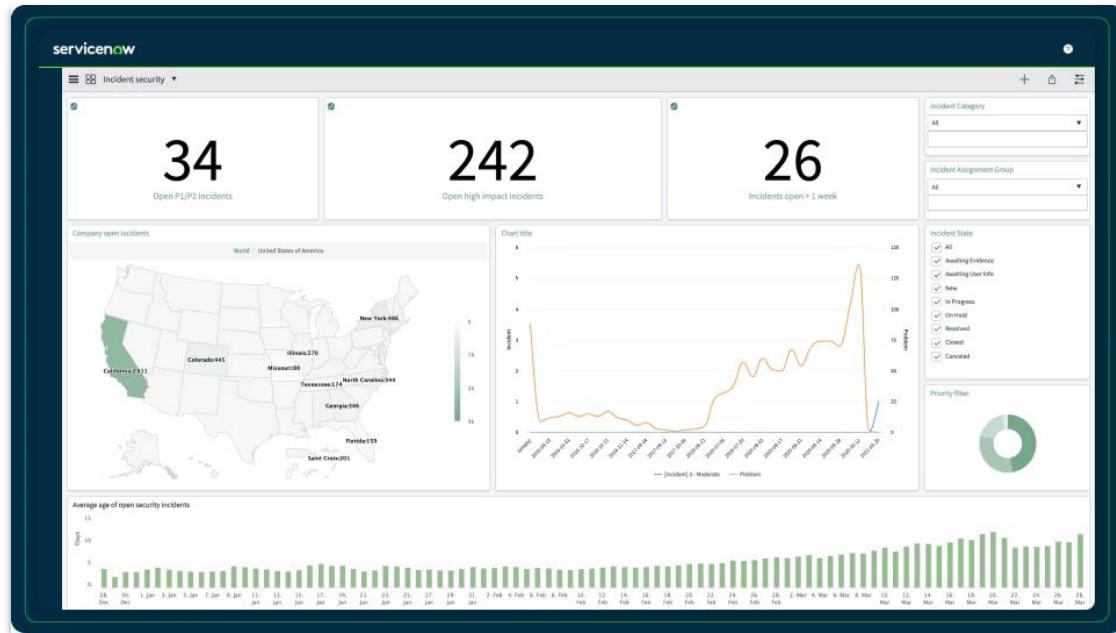
- Compares IT spending and budgeting against industry norms to ensure cost-effectiveness
- Metrics:
 - **Budget Variance**
 - **Average Resource Cost**
 - **Costs per activity**
 - **Labor Cost**
- Common Benchmarking Tools:
 - **Apptio**
 - **CloudHealth by VMware**
 - **Ternary FinOps**



IT Infrastructure Benchmarking

- **Process Benchmarking**

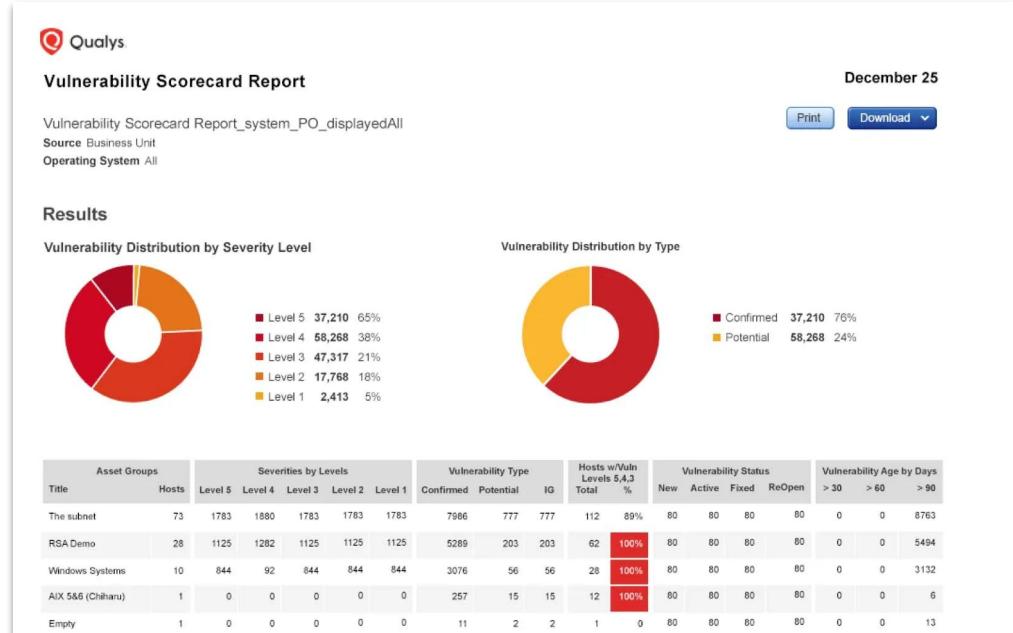
- Looks at the efficiency of IT workflows and processes
- Metrics:
 - **Value realization**
 - **Delivery timelines**
- Common Benchmarking Tools:
 - **ServiceNow**



IT Infrastructure Benchmarking

- **Security Benchmarking**

- Evaluates security measures and adherence to industry best-practices
- Metrics:
 - **Encryption Standards**
 - **Vulnerability Management**
- Common Benchmarking Tools:
 - **Nessus**
 - **Qualys**



Security

Vulnerability Patch Management:

1. Patching Rate
2. Average Open vs Closed Vulnerabilities based on severity rate
 1. Vulnerability ratings: Critical, High, Medium, Low, and None
3. Scan Rate
4. Mean Time to Detect
5. Mean Time to Resolve
6. Business Unit Risk Score
7. Vulnerability Maturity
8. Average Number of Granted Exceptions
9. Average Audit Score
10. Patch Prioritization Based on Vulnerability Rating

Security

Data Loss Prevention and Access Control

- a. Data Loss Prevention Effectiveness
 - i. Incident Prevention Ratio
 - ii. DLP response time
 - iii. False positives and negatives
- b. Access Management

Security

Network Endpoint Security

- a. Non-human traffic
- b. Network Security Rating (a score between A and F)
- c. Intrusion attempt vs. actual incidents

Security

Security Awareness and Policy Compliance

- a. Number of cybersecurity incidents reported
- b. Security awareness training completion
- c. Incorrect SSL configurations
- d. Data Transferred via corporate network

Purpose Continued

- **Comprehensive Research for KPIs:** KPIs vary depending on the domain within the selected industry, ensuring that each performance metric is tailored to its specific context.
 - Application Performance: # transactions / second
 - System Scalability: Memory, Throughput
- **Prevent duplication of tasks:** Once the KPIs for a particular industry are determined, they only need periodic updates, avoiding repetitive efforts in re-establishing metrics.

Purpose Continued

- **Eliminate Manual Errors:** The tool ensures no KPIs or metrics are overlooked, avoiding costly manual mistakes and test redesigns.
 - Eg: **SPECjEnterprise2010** which is meant to test the application server stresses the database server as well
- **Instant feedback:** Provides real-time performance insights, showing where organizations excel or need improvement, with industry benchmark comparisons.

Business Impact Continued

- **Increased operational efficiency:** Automating research and testing streamlines operations, minimizing manual intervention and reallocating resources to high-priority tasks.
- **Cost savings and resource optimization:** By eliminating manual errors and redundant processes, organizations achieve significant cost savings and optimize manpower usage.

Business Impact Continued

- **Enhanced Strategic Planning:** The tool delivers actionable insights that empower companies to align their improvement strategies with industry benchmarks and long-term goals.
- **Competitive Advantage:** Continuous monitoring of performance metrics helps organizations identify improvement areas swiftly, ensuring they remain ahead of industry trends.

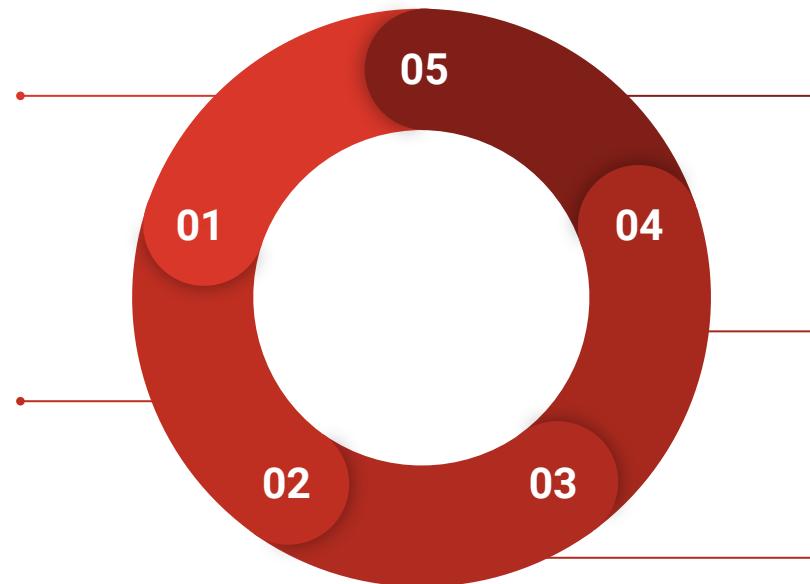
Business Impact Continued

Increased Efficiency

The tool automates tasks to streamline processes, enhancing overall operational efficiency.

Cost Reduction

The tool reduces operational costs by minimizing resource utilization and manpower.



Time Savings for Key Resources

The tool saves time for key resources by automating repetitive tasks and allowing focus on strategic initiatives.

Improved Decision-Making

The tool enhances decision-making by delivering accurate insights and analytics.

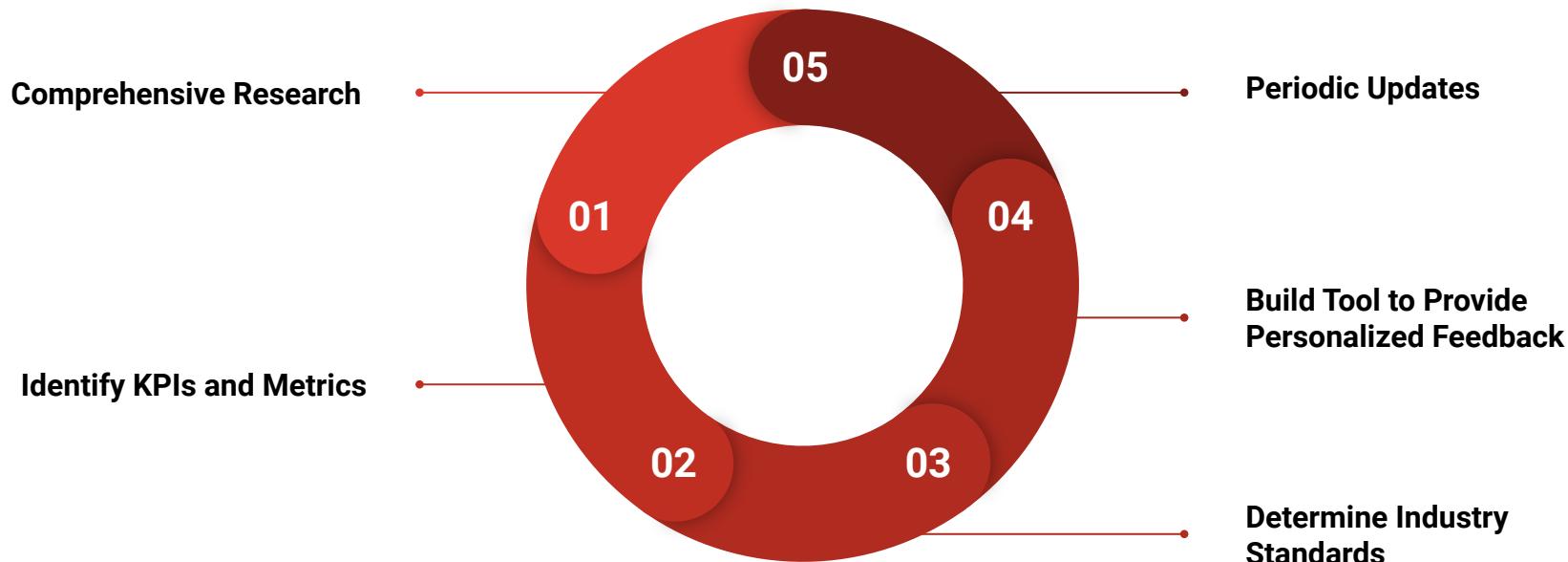
Minimized Manual Errors

The tool decreases the likelihood of human errors through automated data handling.

Solution

"Develop a novel framework surrounding IT Infrastructure benchmarking by analyzing how the data is utilized. Through data and metric **evaluation**, determine where **missing** intel may exist that is currently not being considered in today's benchmarking landscape."

Solution Continued



Benchmarking Areas, Metrics & KPIs

Product

- Activation Rate
- Free-to-Paid Conversion
- User Retention
- Feature Adoption
- Product stickiness
- Net Promoter Score (NPS)
- Churn Rate

Operations

- Inventory Turnover Rate
- Production Efficiency
- Order Fulfillment Time
- Operational Costs
- Supply Chain Efficiency
- Delivery Time
- Downtime
- Maintenance Time

Financial

- Revenue Growth Rate
- Profit Margin
- Return on Equity (ROE)
- Debt-to-Equity Ratio
- Return on Investment (ROI)
- Operating Expenses to Revenue Ratio

IT Infrastructure

- Availability
- Incident Resolution
- Transactional Volume
- Value Realization
- Delivery Timelines
- Encryption Standards
- Vulnerability Management

Performance

- Application Performance
- System Scalability
- Memory Diagnostics

Selection of a Benchmarking Focus

