The Value Chain Framework and KPIs in the Traditional Economy vs. AI Industry

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Data-Driven Organization and Management
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1. The Value Chain in Traditional Economy

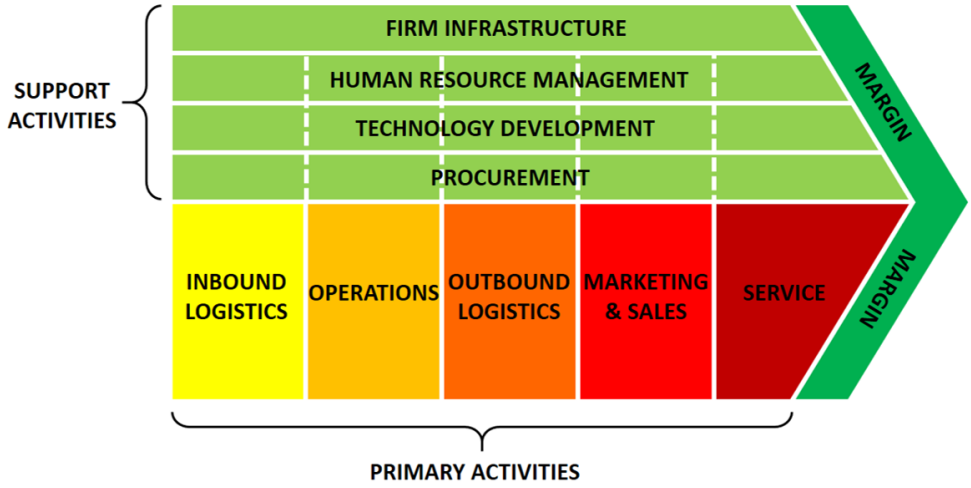

Figure 1: Michael Porter's Value Chain

The concept of the value chain, introduced by Michael Porter, describes the full range of activities required to create a product or service. These activities are categorized into **primary** and **support activities**, which collectively contribute to delivering value to the customer and achieving competitive advantage.

Primary Activities

1. **Inbound Logistics**: Receiving, storing, and managing inputs like raw materials.
2. **Operations**: Transforming inputs into finished products through manufacturing or processes.
3. **Outbound Logistics**: Distributing the final product to customers.
4. **Marketing and Sales**: Creating demand and promoting the product to target markets.
5. **Service**: Post-sale support and maintenance to ensure customer satisfaction.

Support Activities

1. **Firm Infrastructure**: Organizational management, planning, and strategy.
2. **Human Resource Management**: Recruitment, training, and development of personnel.
3. **Technology Development**: Innovation and improvement in products or processes.
4. **Procurement**: Sourcing resources, materials, and services.

In the traditional economy, the value chain typically revolves around physical goods and relies on structured, well-defined processes to ensure efficiency in production, logistics, and customer service.

2. The Value Chain in the AI Industry

In the AI industry, the value chain takes a digital and data-driven approach, incorporating processes such as data collection, model development, and continuous deployment. This represents a modern adaptation of Porter's value chain to the AI domain.

Primary Activities

1. **Inbound Logistics**:
    - Data acquisition from diverse sources like third-party companies, structured/unstructured databases, and cloud storage (e.g., Google Cloud, AWS).
    - Use of data warehouses and simple storage services to organize data.
2. **Operations**:
    - Includes Extract, Transform, Load (ETL) processes, exploratory data analysis (EDA), and model development cycles.
    - Continuous feedback loop between monitoring, evaluation, and deployment ensures iterative improvements in AI models.
3. **Outbound Logistics**:
    - Distribution of AI solutions such as web or mobile applications to end-users.
    - Efficient scaling and deployment mechanisms ensure rapid delivery.
4. **Marketing and Sales**:
    - Adopting a funnel approach: attract users with targeted messaging, generate interest, and drive conversions.
    - AI-driven analytics improve targeting and personalization.

5. **Service**:

    - Customer training, help desk support, and ongoing maintenance of AI solutions.
    - Ensuring adaptability of solutions through updates and user feedback.

Support Activities

1. **Procurement**:

    - Purchasing essential infrastructure like GPUs, servers, and cloud resources.

2. **Technology Development**:

    - Innovation in algorithms, AI tools, and frameworks to enhance efficiency and scalability.

3. **Human Resource Management**:

    - Training AI engineers and maintaining a skilled workforce to drive operations.

4. **Firm Infrastructure**:

    - Strategic management of data governance, compliance, and operational workflows.

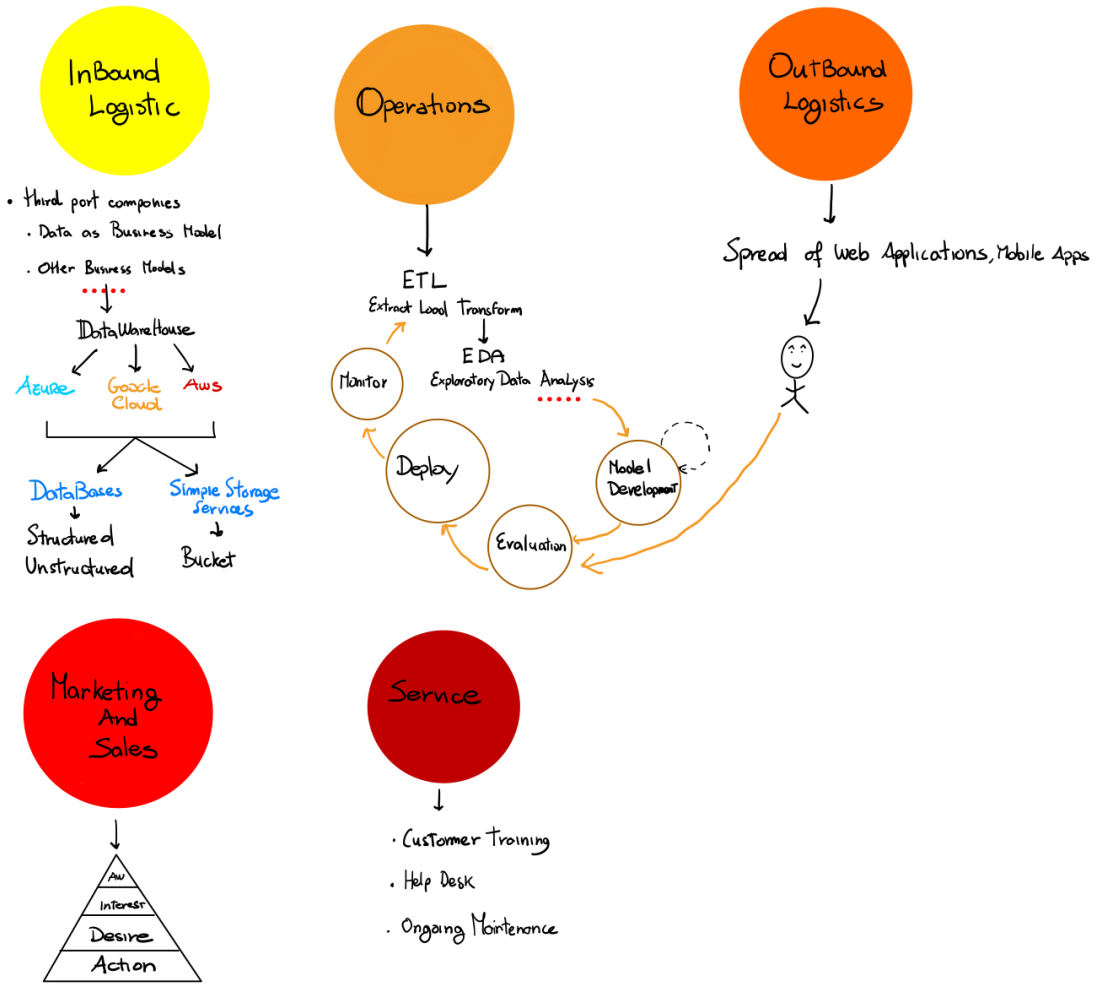

Figure 2: AI Value Chain

3. Comparison Between Traditional Economy and AI Industry

Key Differences

1. **Focus on Data vs. Physical Goods**:
   - The traditional economy emphasizes raw materials and physical goods, while the AI industry revolves around data as the primary resource.
   - Inbound logistics in AI focuses on acquiring and organizing data rather than tangible goods.
2. **Role of Technology Development**:

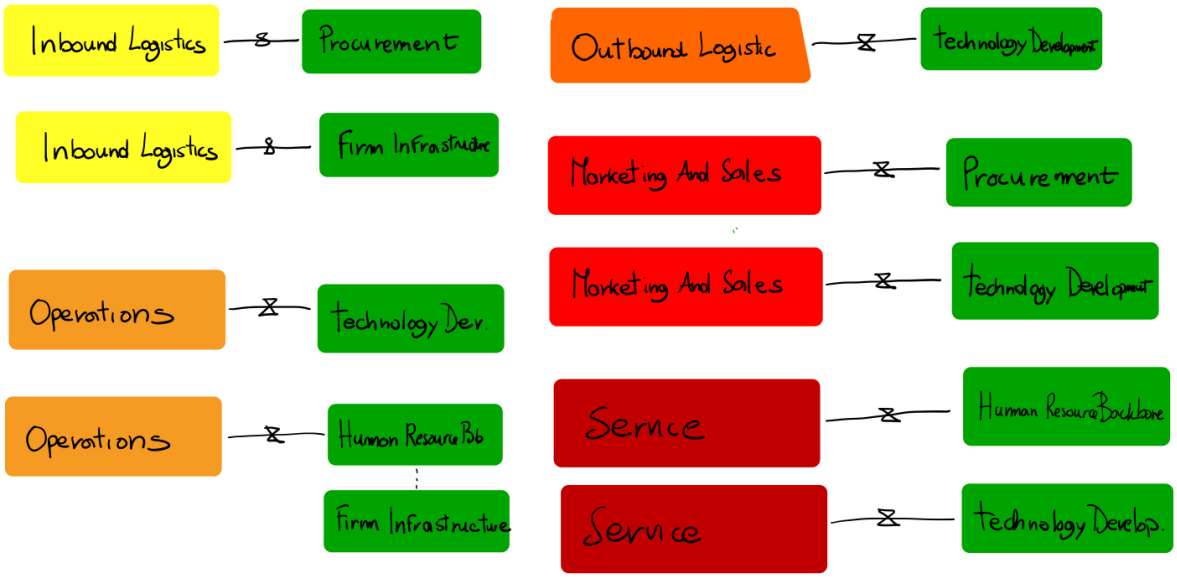

Figure 3: Primary Activities - Secondary Activities

- In traditional value chains, technology development supports production efficiency.
- In AI, it becomes a central activity, driving innovation in algorithms, data management, and model deployment.

3. **Feedback and Iteration**:
   - Traditional value chains are largely linear, moving from raw materials to the final product.
   - AI value chains are cyclical, with continuous feedback loops for refining models and solutions.

4. **Customization and Scalability**:
   - The traditional economy often faces constraints in customization and scalability.
   - AI solutions are inherently scalable and tailored to individual customer needs through dynamic models and personalized experiences.

5. **Customer Engagement**:
   - Traditional marketing relies on broad campaigns.
   - AI leverages targeted, data-driven insights for precision marketing.

Discussion

The transition from the traditional economy to the AI industry represents a paradigm shift from physical goods to digital solutions. While traditional value chains focus on manufacturing and logistics, the AI industry emphasizes data, technology, and iterative development. Understanding these differences is vital for businesses looking to navigate and thrive in the evolving landscape of AI-driven economies.

KPIs in AI Economy

Key Performance Indicators (KPIs) are measurable metrics used to evaluate the success of an organization in achieving its strategic and operational goals. They provide actionable insights into performance, enabling businesses to assess progress, optimize processes, and make data-driven decisions. In the context of value chains, KPIs play a critical role in ensuring that every activity, whether primary or support, contributes effectively to overall value creation.

4. **KPIs and Their Connections with Secondary Activities**

Inbound Logistics

- **Data Acquisition Efficiency (Procurement):**

$$\text{Efficiency} = \frac{\text{Number of Data}}{\text{Time}}$$

  Measures the speed of acquiring usable data.

- **Infrastructure Utilization (Procurement):** Tracks the use of computational resources during data acquisition and storage. (CPU time and memory usage)

Operations

- **Exploratory (Technology Development):**

$$\text{Data Quality} = \frac{\text{Data Requiring Ad-Hoc Analysis}}{\text{Total Data}}$$

Evaluates the need for custom analysis during data exploration.

- **Model Development (Technology Development):**

$$\text{Accuracy} = \frac{\text{Correct Predictions}}{\text{Total Predictions}}$$
$$\text{Precision} = \frac{\text{True Positives}}{\text{True Positives + False Positives}}$$
$$\text{Recall} = \frac{\text{True Positives}}{\text{True Positives + False Negatives}}$$
$$\text{Sensitivity} = \frac{\text{True Positives}}{\text{Condition Positive}}$$
$$\text{Specificity} = \frac{\text{True Negatives}}{\text{Condition Negative}}$$

These metrics evaluate the effectiveness and reliability of AI models.

- **Deploy (Technology Development):**

$$\text{Training Cost (FLOPS Efficiency)} = \frac{\text{FLOPS}}{\text{theoretical FLOPS}}$$

Tracks the computational cost of deploying AI models.

- **Monitor (Technology Development):**
  - Proxy Metric
  - Distribution Shift
  - Opportunity Cost

Monitors the health of the deployed AI models and detects shifts in performance.

Outbound Logistics

Client-Side Metrics :

- Total Users
- Active Users

- Bounce Rate
- Inference Times

Server-Side Metrics (Technology Development):

- Latency
- First Contentful Paint
- Total Blocking Time
- Speed Index
- Largest Contentful Paint
- Cumulative Layout Shift

These KPIs measure the performance and responsiveness of AI-driven applications.

Marketing and Sales

- **Impressions (Procurement):** Measures the total visibility of marketing campaigns.
- **Return on Investment (Procurement):**

$$\text{ROI} = \frac{\text{Revenue from Campaign}}{\text{Campaign Costs}} \times 100$$

Tracks the profitability of marketing efforts.

- **User Lifetime Value :** Projects the total value generated by a user during their lifetime.
- **Acquisition Cost:**

$$\text{Acquisition Cost} = \frac{\text{Marketing Spend}}{\text{New Users Acquired}}$$

- **User Retainment (Technology Development):** Measures the percentage of users retained over time.

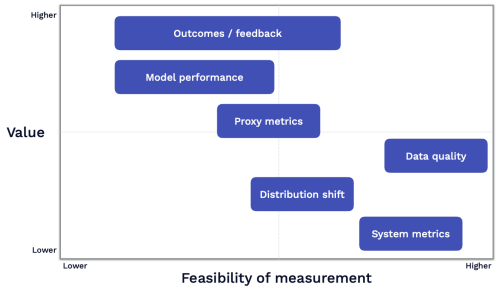

Figure 4: Feasibility of measurements

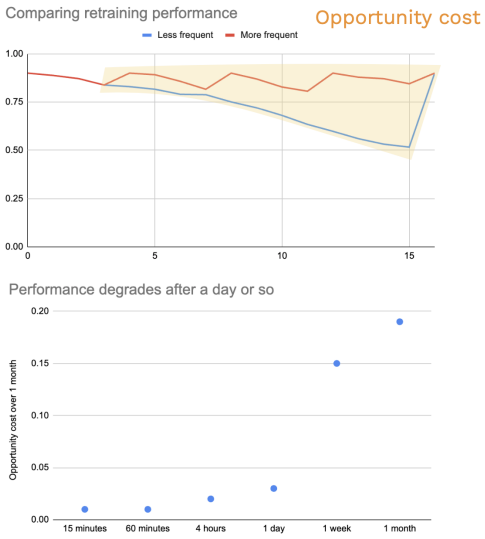

Figure 5: Opportunity Cost

Service

- **User Retention (Human Resources Backbone):** Measures the percentage of returning customers.
- **User Sentiment (Human Resources Backbone):** Evaluates customer satisfaction and sentiment.
- **Number of Issues and Resolution Times (Human Resources Backbone):** Tracks the number of issues raised and the average resolution time.
- **Waiting Times (Human Resources Backbone):** Measures the time customers spend waiting for assistance.
- **Ticket Cost (Human Resources Backbone):**

$$\text{Cost per Ticket} = \frac{\text{Total Support Costs}}{\text{Tickets Resolved}}$$

Tracks the cost-efficiency of support services.

Macroscopic Level KPIs

Human Resources Evaluation:

- **Revenue per Employee:**

$$\text{Revenue per Employee} = \frac{\text{Total Revenue}}{\text{Number of Employees}}$$

- **Average Task Completion Rate:** Measures the average number of tasks completed per employee.
- **Overtime per Employee:** Tracks the average overtime hours worked by employees.

General Evaluation Metrics

- **Revenue:** Tracks the total revenue generated by the organization.
- **Margin:** Measures the profit margin, reflecting the efficiency of operations.

Discussion

The KPIs presented in this document enable a detailed evaluation of the AI value chain, connecting primary and secondary activities to optimize performance. By aligning specific metrics with procurement, technology development, human resources, and infrastructure, organizations can achieve strategic goals while ensuring efficiency, scalability, and innovation.