

## ***Artificial Intelligence for Strategic Improvement***

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**May 1, 2025**

### **Abstract**

An organization's Executive Team members are the *Strategists* who are accountable for improving organizational performance. These *Strategists* conduct knowledge work with existential consequences including organizational survival for some. They often use one or more strategic improvement approaches such as Strategic Management, Strategic Planning, Policy Management, Balanced Scorecard, Lean Six Sigma, and Big Data Analytics. These approaches involve the core activities of learning, analyzing, synthesizing, decision making, and creating all leading to organizational actions. Artificial Intelligence (AI) has emerged as a new strategic improvement approach. This research report compares AI with the other strategic improvement approaches and identifies its unique characteristics and potential benefits and risks. Emergent models, application cases, and themes are introduced which show how Generative AI (Gen AI) Assistants based on "Text Input > Text Output" large language models (LLMs) can be used during a Strategic Improvement Cycle. Gen AI—skillfully used—can potentially help *Strategists* by increasing the pace, scale, and scope of learning; increasing productivity; enhancing creativity; and improving decision making. Potential risks include the *Strategists* failing to think critically; becoming disengaged from learning, analyzing, synthesizing, and creating; failing to grow and develop; failing to discover causal mechanisms; failing to evaluate outputs; machine hallucinations; and decision errors. Some *keys to success* are knowing how to evaluate Gen AI outputs, having organizational touchstones for grounding decisions and actions, and strategically evolving Gen AI practices. *Strategists* will inevitably be working more with machines and that work should be carefully planned and not *uncontrolled haphazard experimentation*.

**Key Words:** Strategy, Strategists, Organizational Performance, Strategic Improvement, Large Language Models, Generative AI, Generative AI Strategy Assistant, Panel of Generative AI Strategy Assistants

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**Note 1:** The anthropomorphic convention of ascribing human qualities to organizations and AI is used.

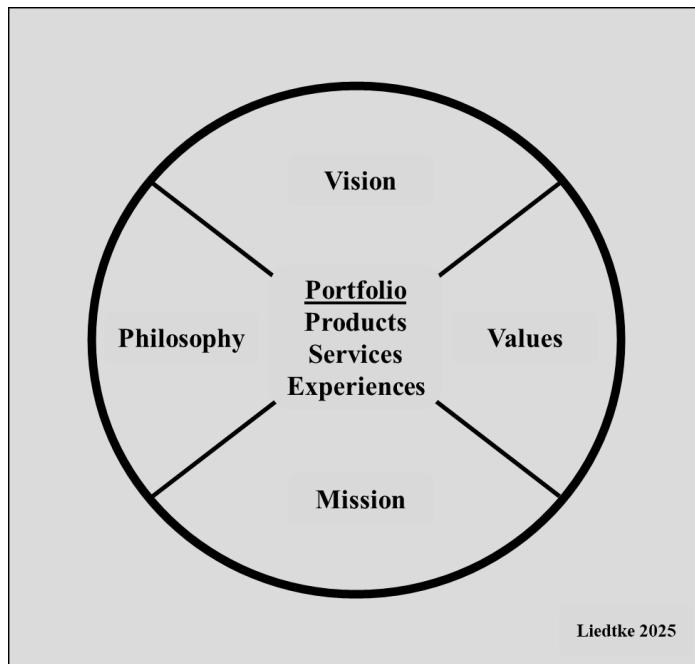
**Note 2:** "AI" means different things to different people. "AI" will be used broadly unless otherwise noted.

**Note 3:** All aspects of this research report were written by the author except for content marked by .

**Note 4:** No organizations, products, or services are being endorsed by the author in this research report.

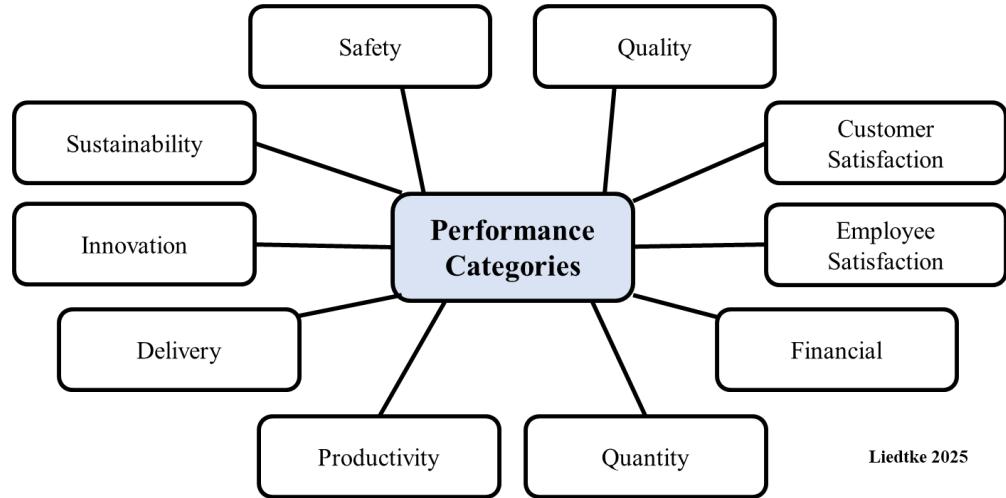
## I. Organizational Performance

An organization's Executive Team members are the *Strategists* who are accountable for improving organizational performance. The *Strategists* conduct knowledge work with existential consequences including organizational survival for some. *Strategists* create *foundational strategy elements* to guide their strategic improvement activities. These include a mission, organizational philosophy, values, vision, and a portfolio of products, services, and experiences. These *strategy elements* collectively represent implicit and explicit assumptions about the *Theory of the Business*. Drucker (1994) stated that a “*Theory of the Business*” has three parts: (1) assumptions about the environment of the organization, (2) assumptions about the specific mission of the organization, and (3) assumptions about the core competencies needed to accomplish the organization’s mission. *Strategists* can start to create their “*Theory of the Business*” by developing the *strategy elements* depicted in Figure 1. AI concepts, models, tools, and techniques can play a role in (1) developing these *strategy elements* and (2) confirming or disconfirming *Theory of the Business* assumptions.



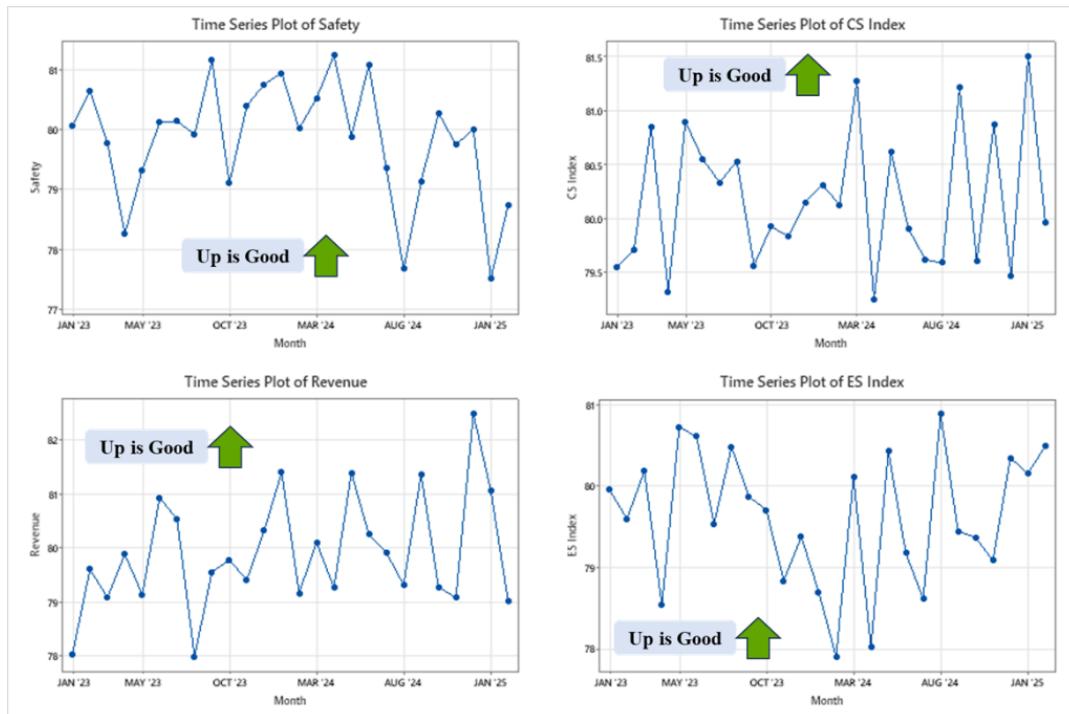
**Figure 1. Foundational Strategy Elements.**

The *Strategists* evaluate organizational performance using performance categories such as Safety, Quality, Customer Satisfaction, Employee Satisfaction, Productivity, and Financial to name a few (see, e.g., Ishikawa, 1990; Kaplan & Norton, 1992, 1996; Rummler & Brache, 2013). Some common organizational performance categories are depicted in Figure 2. The *Strategists* can develop multiple performance metrics in each performance category: “*The metrics that matter*.” For example, the Customer Satisfaction performance metrics could include Market Share, Customer Satisfaction Top Box Percentage, Number of New Customers, Customer Loyalty Index, Customer Retention Rate, Number of Customer Complaints, and the Net Promoter Score (NPS).



**Figure 2. Organizational Performance Categories.**

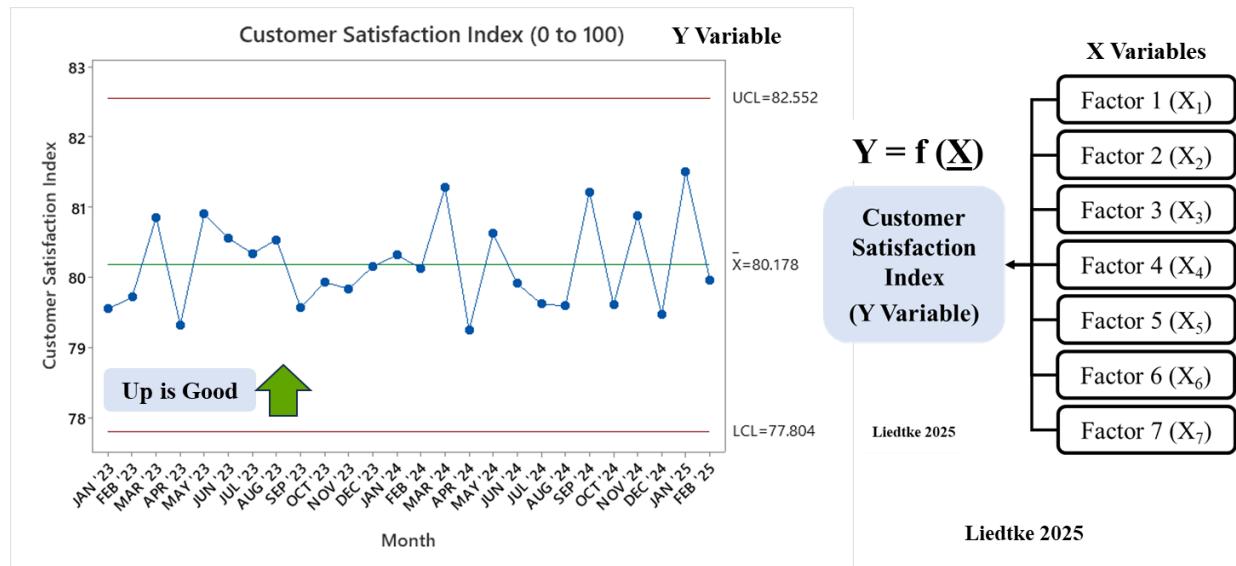
Organizational performance metrics—also referred to as Y Variables, Response Variables, or Key Performance Indicators (KPIs)—can be visually displayed using an organizational performance dashboard. A partial organizational performance dashboard is depicted in Figure 3. *Strategists* can periodically evaluate their organizational performance metrics with a performance dashboard. The performance metrics can be analyzed using Time Series Charts, Statistical Control Charts (Shewhart, 1931; Kume, 1985), and ARIMA Time Series Models (Box & Jenkins, 1976).



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**Figure 3. Organizational Performance Dashboard (Metrics are Y Variables).**

A Statistical Control Chart for a Customer Satisfaction Index (Y Variable or Response Variable) is depicted in Figure 4. The Index is measured on a scale ranging from “0 to 100” where a “100” is the ideal performance level. “*Up Is Good*” for this performance metric. To the right of the Statistical Control Chart are hypothetical “X Variables” (also referred to as Factors, Explanatory Variables, or Independent Variables). The set of X Variables answers the question: “What are the most important factors that affect the Customer Satisfaction Index?” The X Variables could potentially be related to customer experiences, perceived value, product quality, ease of product use, service quality, service reliability, responsiveness to issues, and staff friendliness.



**Figure 4. Customer Satisfaction Index (Y Variable) & Factors (X Variables).**

AI can help (1) discover, prioritize, and target the Y Variables, (2) discover the important X Variables, and (3) model the relationships between the Y Variables (performance metrics) and the X Variables. The models can assume various forms and will generally be denoted as “ $Y = f(\underline{X})$ .”

## II. Strategic Improvement Approaches

A **Strategic Improvement (SI)** approach is defined here as “*a pattern of intentional organizational activities that are conducted to positively impact one or more organizational performance metrics.*” *Strategists* can use a strategic improvement approach in two situations: **emergent situation** and **deliberate situation**. An emergent situation is when an unanticipated issue or opportunity occurs whereby the *Strategists* must formulate a rapid organizational response (see, e.g., Ansoff, 1984). For example, when a *Black Swan* event (Talib, 2007) occurs such as a natural disaster or geopolitical crisis and the *Strategists* must rapidly analyze the situation and then formulate and implement an organizational response. AI can be used during emergent situations, but this research report focuses on the deliberate situation. The deliberate situation involves using

one or more strategic improvement approaches in a pre-meditated and planned manner. For example, an annual strategic planning process is both pre-meditated and planned. The specific strategic improvement activities can be conducted in the context of a *Strategic Improvement Cycle* which will be introduced later.

One important outcome for the use of any strategic improvement approach is for targeted organizational performance metrics to be *noticeably improved* because of the pattern of intentional strategic improvement activities. For example, Market Share increases year-on-year from 28.5% to 39.4%; the Customer Satisfaction Index increases quarter-on-quarter from 79.1% to 90.2; or the Number of Customer Website Visits increases quarter-on-quarter from 1,239,550 to 2,136,002. Machine Learning—and more narrowly Deep Learning—can be used to model relationships between Y Variables (the “ends” or “labels”) and X Variables (the “means” or “data inputs”). The field of Statistics has long involved modeling relationships between Y Variables and X Variables (see, e.g., Box, Hunter, & Hunter, 1978; Box & Draper, 1987; Krzanowski, 1988; Snedecor & Cochran, 1989; Myers & Montgomery, 1995; Draper & Smith, 1998; Fisher, 2003; Hair *et al.*, 2010; Johnson & Wichern, 2014; Harville, 2018).

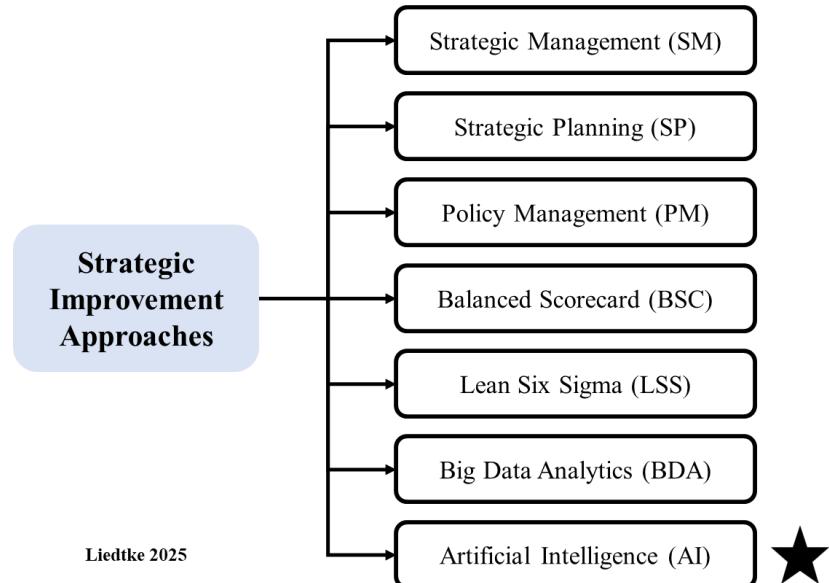
One shouldn’t be overconfident when using statistical methods and AI. Polanyi (1966) discussed the importance of tacit knowledge and commented: “I shall reconsider human knowledge by starting from the fact that *we can know more than we can tell*.” Deming (1982) cautioned that some of the most important things to know are *unknown* and *unknowable*. *Genchi genbutsu*—which basically means “*on-site, hands-on experience*” in Japanese—is still widely practiced at Toyota (Toyota Motor Corporation, 2024): “*Go and see with your own two eyes*.”

The acquisition of knowledge over time involves the interplay between *observing the world* (data) and *hypothesizing about the world* (theories) (see, e.g., Box, 1976; Box & Draper, 1987). It is important to keep in mind *best scientific practices* when making decisions and taking actions based on various forms of data analysis and synthesis (see, e.g., Deming, 1953; Beveridge, 1957; Popper, 1959; Campbell & Stanley, 1963; Deming, 1975; Deming, 1994; Pearl & Mackenzie, 2018). Are the outputs of an AI model accurate and repeatable? On what basis can we claim a cause-and-effect relationship? What is our confidence level in any prediction? The *Theory of the Business* described by Drucker (1994) can be the result of the application of the scientific method at the Executive Team level of the organization. Poor assumptions, decisions, and subsequent organizational actions can adversely affect one or more organizational performance metrics and jeopardize the survival and prosperity of the organization. Some statistical and AI models are based on assumptions which should be verified when appropriate in order to help interpret results.

“Underfitting” and “overfitting” a model are two mistakes in AI work (Goodfellow, Bengio, & Courville, 2016; Bishop & Bishop, 2024). Box (1976) described one challenge when using models:

“Since all models are wrong the scientist cannot obtain a ‘correct’ one by excessive elaboration. On the contrary following William of Occam he should seek an economical description of natural phenomena. Just as the ability to devise simple but evocative models is the signature of the great scientist so overelaboration and overparameterization is often the mark of mediocrity.”

There are various strategic improvement approaches used by *Strategists* such as Strategic Management (SM), Strategic Planning (SP), Balanced Scorecard (BSC), Policy Management (PM), Lean Six Sigma (LSS), and Big Data Analytics (BDA) to name a few. AI has emerged as a new formal strategic improvement approach that can be used for both the emergent and deliberate situations. The seven strategic improvement approaches are depicted in Figure 5.

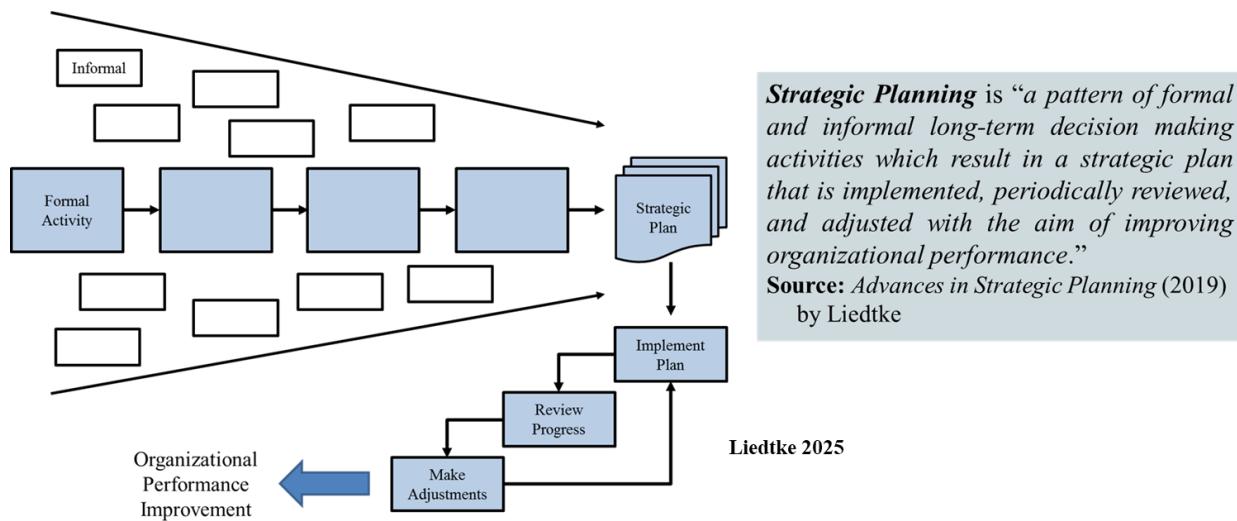


**Figure 5: Seven Strategic Improvement Approaches.**

The strategic improvement approaches and their associated activities are typically directed and resourced by the Executive Team (the *Strategists*). These activities involve (1) learning about the environment, (2) conducting analyses and syntheses, (3) making decisions and creating strategy elements, (4) developing and deploying action plans, (5) implementing the action plans and observing the results, and (6) periodically reviewing and adjusting the action plans. The primary question for the *Strategists* to answer is the following: “Which of our organizational performance metrics should we target for improvement?” In the near term, AI will rely on “*being told*” which organizational performance metrics are targeted for improvement. AI (“machines”) could possibly—and maybe routinely—be granted autonomous decision rights related to performance metrics in the next few years. The strategic improvement approaches will now be introduced.

The **Strategic Management (SM)** approach is decades old and is defined here as “A set of formal strategic decision-making activities for determining an organization’s *strategy elements* including its mission, philosophy, values, vision, organization structure, business model, platform, target geographies, target markets, target customers, product/service/experience portfolio, core processes, core competencies, and resource allocations.” Some of the representative books include Chandler, 1962; Ansoff, 1965; Andrews, 1971; Porter, 1980; Ohmae, 1982; Porter, 1985; Rumelt, Schendel, & Teece, 1994; Bower *et al.*, 1995; Moore, 2001; Kim & Mauborgne, 2005; Barney & Clark, 2007; Lafley & Martin, 2013; Johnson *et al.*, 2017; and Kim & Mauborgne, 2017.

The **Strategic Planning (SP)** approach has also been used for decades and is still popular (see, e.g., Steiner, 1979; Mintzberg, 1994; Liedtke, 2019). One definition of Strategic Planning is shown in Figure 6 (Liedtke, 2019). The major output of an annual strategic planning process is a strategic plan which is then implemented, periodically reviewed, and adjusted.

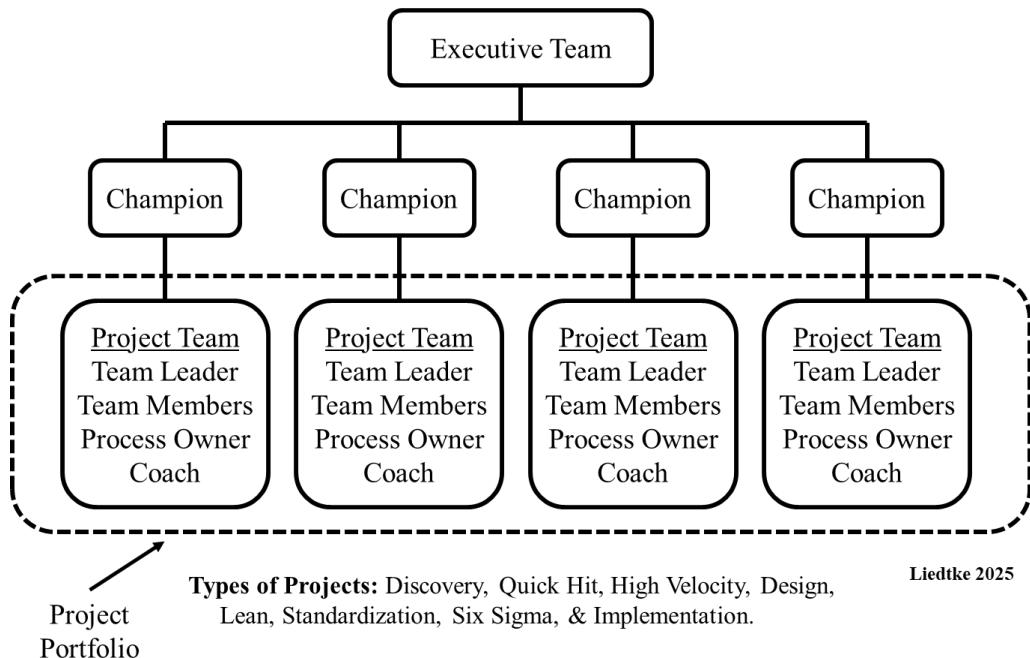


**Figure 6: Strategic Planning Model and Definition.**

The **Balanced Scorecard (BSC)** approach was introduced in 1992 (Kaplan & Norton, 1992, 1996) and it involves creating and using a diverse set of interrelated organizational performance metrics to measure and manage business strategy and to translate strategy into action. The BSC Framework is based on four perspectives: Financial Perspective; Customer Perspective; Learning and Growth Perspective; and Internal Business Process Perspective. The Balanced Scorecard concept involves “*thinking beyond the financials*.” A key question with the BSC approach is the following: “What affects our financial metrics?” A simplified view of the BSC theory is that the financial performance metrics will improve if the relationships with the performance metrics in the other three perspective categories are known, the proper analyses are conducted, and the appropriate organizational actions are developed and implemented.

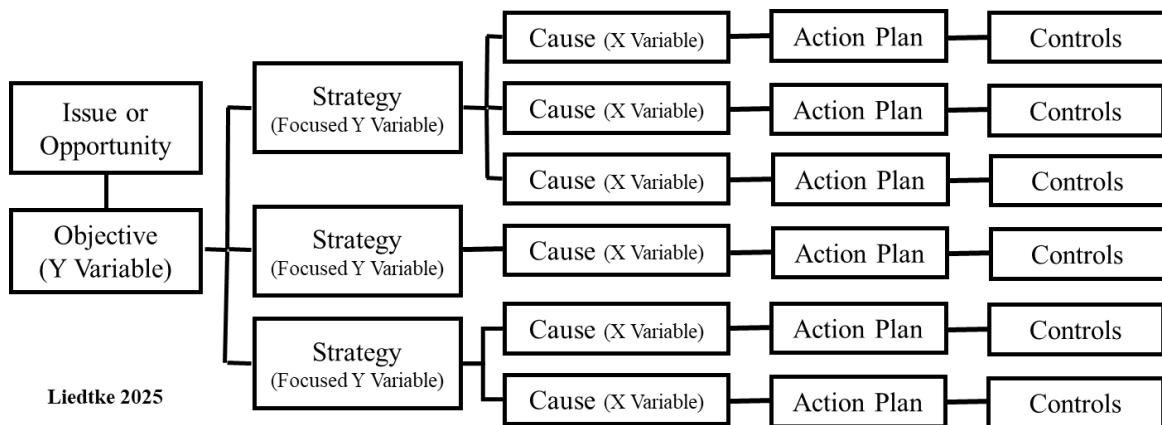
Some Executive Teams use a strategic improvement approach that originated in Japan called **Policy Management (PM)**—also known as *Hoshin Kanri* (see, e.g., Akao 1991; Ando & Kumar, 2011; Liedtke, 2012, 2017; Japanese Society for Quality Control, 2017). Liedtke (2012) defined Japanese-Style Hoshin Kanri (Policy Management) as “. . . a systematic annual process led by senior executives—and preceded by strategic management activities—for developing, deploying, and accomplishing policies through coordinated organization-wide activities and the rigorous application of the PDCA cycle.” Osada (1998) introduced the concept of *Strategic Management By Policy in Total Quality Management* which combines Strategic Management activities (mentioned earlier) and Policy Management activities. This is an example of “integrating” two strategic improvement approaches—Strategic Management and Policy Management.

The **Lean Six Sigma (LSS)** strategic improvement approach is the integration of two established approaches. *Lean* involves the identification and elimination of waste (“*inefficiencies*”) using a customer value perspective (see, e.g., Ohno, 1988; Liker, 2004). *Six Sigma* originated in Motorola in the mid-1980s (Slater, 1999). It involves the creation of a special organization structure and the rigorous application of a problem-solving method named DMAIC (Define > Measure > Analyze > Improve > Control). According to Schroeder *et al.* (2008), “Six Sigma is an organized parallel-meso structure to reduce variation in organizational processes by using improvement specialists, a structured method, and performance metrics with the aim of achieving strategic objectives.” The classic “Organization Chart” identifies the reporting relationships associated with managing the day-to-day operations of an organization. The “Six Sigma Structure” consists of formal Project Teams that are formed to improve organizational performance from a strategic perspective. This structure is depicted in Figure 7. Such a structure is now commonly created to manage all types of strategic improvement projects which are identified in Figure 7.



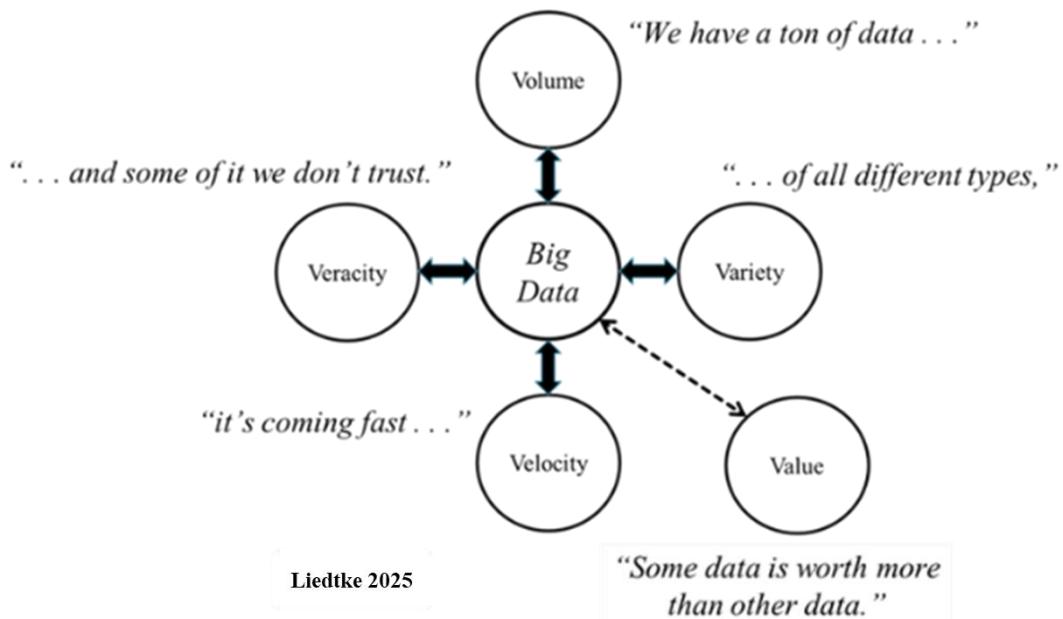
**Figure 7: Six Sigma Strategic Improvement Structure.**

The critical outputs of a strategic improvement project can be documented using an Improvement Tree Diagram. A conceptual Improvement Tree Diagram is depicted in Figure 8. The project process involves identifying an **issue or opportunity**; developing an **objective**; developing **strategies** to accomplish the objective; identifying the **causes** associated with each strategy; developing and implementing **action plans** to address the causes; and developing and implementing **controls** to sustain the new level of performance. The outputs are typically created “left-to-right” as the Project Team executes the project. The Improvement Tree Diagram is best suited for a Six Sigma project, but it can be customized for the other types of projects.



**Figure 8. Improvement Tree Diagram.**

**Big Data Analytics (BDA)** is a strategic improvement approach that involves the collection and analysis of massive amounts of highly diverse data for decision making and organizational action (see, e.g., Davenport & Harris, 2007; Mayer-Schonberger & Cukier, 2013; Davenport, 2014; Liedtke, 2016; Marr, 2016). The collection and analysis of *Big Data* was made easier with advances in data acquisition, data storage, and data processing capabilities. BDA can be traced back to the 1990s (Laney, 2001) and it emerged as a formal strategic improvement approach in part because of the widespread popularity of the book and movie “*Moneyball*” (Lewis, 2003). We can describe BDA using the “5V” Framework (see, e.g., Laney, 2001; Liedtke, 2016; Laney, 2018) which consists of Volume, Variety, Velocity, Veracity, and Value. A *Big Data Framework* is depicted in Figure 9. Some perceived AI as a subset of *Big Data* as late as 2016 (Liedtke, 2016).



**Figure 9: Big Data “5V” Framework.**

**Artificial Intelligence (AI)** is several decades old and its history will be described later. AI has emerged in the past few years as a new formal strategic improvement approach. Unfortunately, there does not exist a globally-accepted standard definition of AI—it means different things to different people. AI is existential, pervasive, rapidly advancing, and its future generally—and as a strategic improvement approach—is unpredictable. The Strategic Management Journal (SMJ) (2024) described AI as the following: “AI refers to any computer system that perceives its environment (e.g., numerical data, speech, text, and images), learns from past behavior, and takes action to maximize the likelihood of attaining its goals.” AI includes expert systems, Large Language Models (LLMs), autonomous vehicles, and robots to name a few.

The seven strategic improvement approaches are summarized in Figure 10. It should be noted that the definitions and interpretations of these approaches vary considerably.

Approach	Description
<b>Strategic Management (SM)</b>	“A set of formal strategic decision-making activities for determining an organization’s <i>strategy elements</i> including its mission, philosophy, values, vision, organization structure, business model, platform, target geographies, target markets, target customers, product/service/experience portfolio, core processes, core competencies, and resource allocations (Liedtke, 2025).”
<b>Strategic Planning (SP)</b>	“A pattern of formal and informal long-term decision-making activities which result in a strategic plan that is implemented, periodically reviewed, and adjusted with the aim of improving organizational performance (Liedtke, 2019).”
<b>Policy Management (PM)</b>	“A systematic annual process led by senior executives—and preceded by strategic management activities—for developing, deploying, and accomplishing policies through coordinated organization-wide activities and the rigorous application of the PDCA cycle (Liedtke, 2012).”
<b>Balanced Scorecard (BSC)</b>	The Balanced Scorecard consists of four sets of interrelated organizational performance metric categories based on four perspectives (Financial; Customer; Learning and Growth; and Internal Business Process) to translate strategy into action (Kaplan & Norton, 1992, 1996).
<b>Lean Six Sigma (LSS)</b>	Integrates the Lean “ <i>waste out</i> ” concepts, tools, and techniques with the Six Sigma organization structure and problem-solving concepts, tools, and techniques to accomplish strategic objectives (see, e.g., Liker, 2004; Schroeder <i>et al.</i> , 2008).
<b>Big Data Analytics (BDA)</b>	“The collection and analysis of massive amounts of highly diverse data for strategic decision-making and organizational action. Sometimes described using the “5V” Framework (Volume, Variety, Velocity, Veracity, & Value) (Liedtke, 2025).”
<b>Artificial Intelligence (AI)</b>	“AI refers to any computer system that perceives its environment (e.g., numerical data, speech, text, and images), learns from past behavior, and takes action to maximize the likelihood of attaining its goals (Strategic Management Journal, 2024).”

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**Figure 10. Strategic Improvement Approaches.**

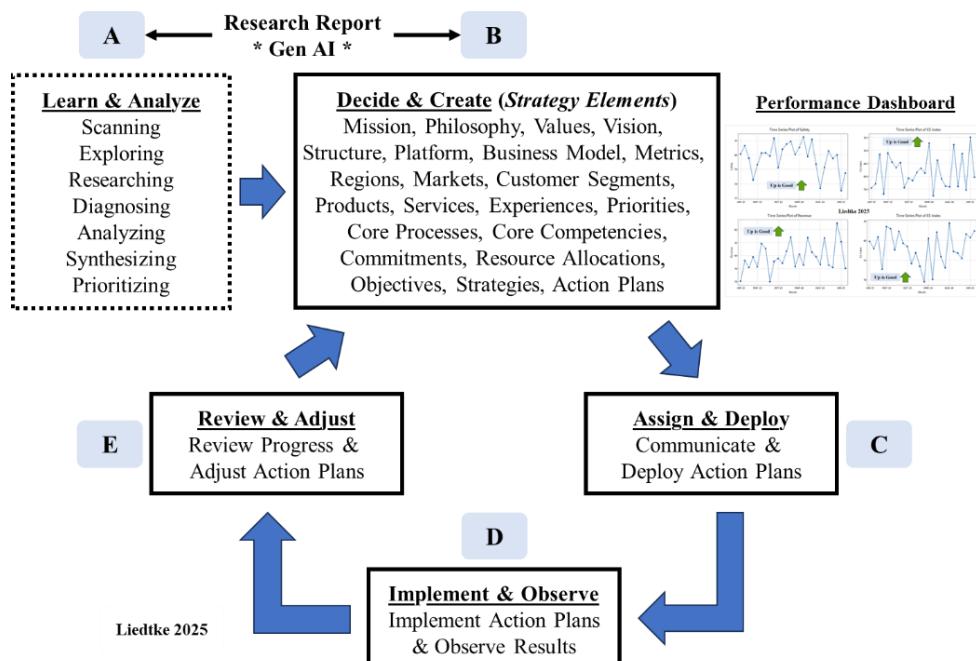
Each of the seven strategic improvement approaches has its own unique characteristics. They all generally share some **common characteristics** (partial list):

- A primary aim is to improve organizational performance from a strategic perspective.
- The important organizational performance metrics are known and communicated.
- Data are extensively used for analysis, synthesis, and decision making.
- The *ends* and *means* related to organizational performance improvement are identified.
- Decisions are made followed by the development and implementation of action plans.

AI has some **unique characteristics** compared to the other approaches (partial list):

- It is technology-oriented and much of the technology is rapidly advancing.
- Machines conduct some of the work either directed by humans or autonomously.
- Machines can search, analyze, synthesize, evaluate, create, and make comparisons.
- Applications range from “anyone asking a question” to “we built our own AI model.”
- It involves the use of massive data sets leading to models.
- It can discover hidden intricate data structures and patterns that are unknown to humans.
- Humans may not know “why” an AI model works or underlying causal mechanisms.
- It might be impossible for an organization to keep a sustainable AI advantage.
- There are risks related to security, safety, privacy, legal, and ethics.
- The future of AI is unknown and unpredictable.

The Strategic Improvement Cycle depicted in Figure 11 will be used as an illustrative framework for discussing strategic improvement activities. It is not prescriptive, but will be used for structuring the AI conversation.



**Figure 11. Strategic Improvement Cycle as Five Phases (Deliberate Situation).**

The focus of the research was on the application of Gen AI in the **Learn & Analyze Phase** and the **Decide & Create Phase** which are denoted as A and B in Figure 11. Phases C, D, and E were out of scope for the research. Each of the five phases will now be introduced and described:

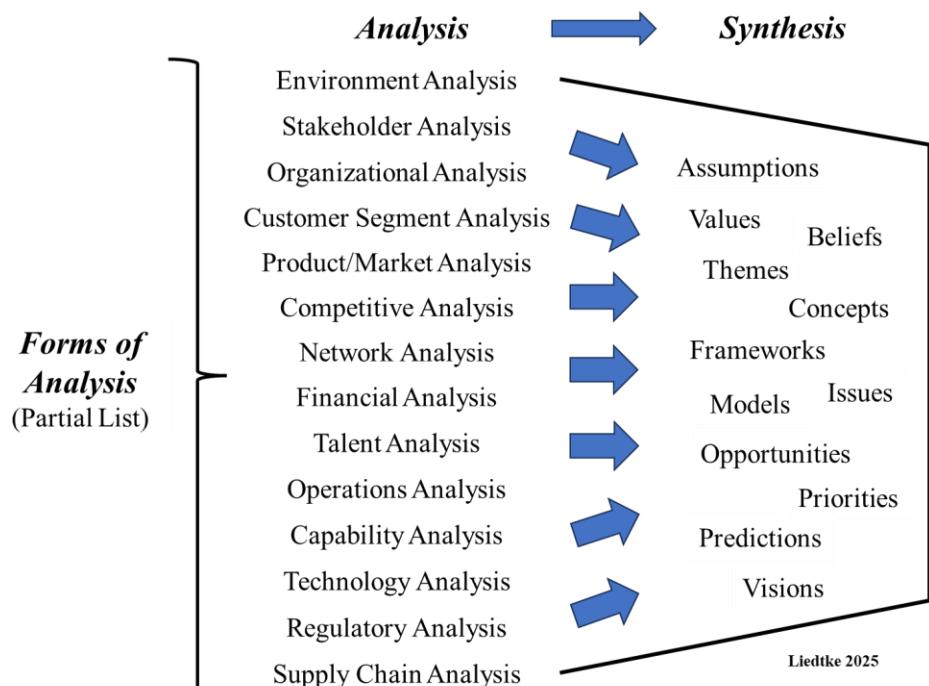
### Strategic Improvement Cycle – Five Phases

- Phase A:** Learn & Analyze (In Scope)
- Phase B:** Decide & Create (In Scope)
- Phase C:** Assign & Deploy (Out of Scope)
- Phase D:** Implement & Observe (Out of Scope)
- Phase E:** Review & Adjust (Out of Scope)

#### Phase A: Learn & Analyze (In Scope)

The primary purpose of Phase A is for the *Strategists* to learn about the organization and its environment through various forms of analysis (“*identifying the dots*”) and synthesis (“*connecting the dots*”). This is accomplished—sometimes in person—through such activities as scanning, exploring, researching, diagnosing, analyzing, synthesizing, and prioritizing. Some of the frameworks and techniques used in Phase A include Drucker’s Theory of the Business, Porter’s Five Forces Model Analysis, Stakeholder Analysis, Network Analysis, Customer Segmentation Analysis, Product/Market Analysis, SWOT Analysis, and Scenario Analysis. AI—and Gen AI—concepts, models, tools, and techniques can be used in Phase A which will be discussed later.

The *Strategists* conduct various forms of analysis (“*identify the dots*”) followed by synthesis (“*connect the dots*”) during a Strategic Improvement Cycle. This is depicted in Figure 12 below.



**Figure 12. Analysis (*Identify the Dots*) to Synthesis (*Connect the Dots*).**

## **Phase B: Decide & Create (In Scope)**

The primary purpose of Phase B is to make decisions and create *strategy elements* such as the mission, organizational philosophy, values, vision, performance metrics, organization structure, business model, platform, product/service/experience portfolio, objectives, strategies, and action plans. It will be shown later how Gen AI can be used in their creation.

### **Phase B Questions (Partial List)**

- What should be our mission, organizational philosophy, values, and vision?
- What should be our organization structure?
- What should be our business model?
- What should be our organizational performance metrics?
- What geographic regions, markets, and customers should we target?
- What should be our portfolio of products, services, & experiences?
- What are our priorities?
- How should we allocate our resources?

Those questions—and others—are typically posed and discussed by the *Strategists* during a series of Executive Team retreats, workshops, and meetings. It is primarily about **learning** and **analyzing** in Phase A leading to **decision making** and **creating** in Phase B related to the “*ends and means*” of the organization. “*Ends*” can be a vision, objectives, goals, and targets and “*means*” can be strategies, projects, methods, and action plans. In essence, *Strategists* make decisions and create *strategy elements* based on what was learned in Stage A.

## **Phase C: Assign & Deploy (Out of Scope)**

The primary purpose of Phase C is to assign objectives, strategies, and action plans and then deploy them as appropriate throughout the organization. The *Strategists* must communicate such items as the mission, philosophy, values, vision, objectives, strategies, and action plans. Communication tools could include roadmaps, process flows, schedules, Gantt charts, action lists, and checklists. AI can be used during this phase, but it is out of the research scope.

## **Phase D: Implement & Observe (Out of Scope)**

The primary purpose of Phase D is to implement the action plans and to carefully observe the results of the implementations. AI can be used during this phase, but it is out the research scope.

## **Phase E: Review & Adjust (Out of Scope)**

The primary purpose of Phase E is to formally review progress on the action plan implementations. These reviews are typically conducted monthly or quarterly to evaluate progress on the action plan implementations. The Four Students Model can be used as a framework to structure the conversations during the reviews (see, e.g., Ando and Kumar, 2011). AI can be used during this phase, but it is out of the research scope.

The performance of the *Strategists* can be evaluated from both *effectiveness* and *efficiency* perspectives. Here are some performance evaluation items:

**Performance - Effectiveness: The Strategists are effective if . . . (desired outcomes)**

- The organization survives and prospers.
- Decisions are made and actions are taken that strengthen the organization.
- Stakeholders are happy.
- Targeted organizational performance metrics noticeably improve.
- The organization accomplishes its objectives and moves closer to its vision.
- All activities and results are consistent with the mission, philosophy, vision, and values.
- They improve their knowledge, skills, and abilities.

**Performance - Efficiency: The Strategists are efficient if . . . (how the outcomes were achieved)**

- They are productive.
- They use minimal resources (time, attention, money, energy, etc.) to achieve desired outcomes.
- Action plans are implemented, reviewed, and adjusted with the minimum resources necessary.

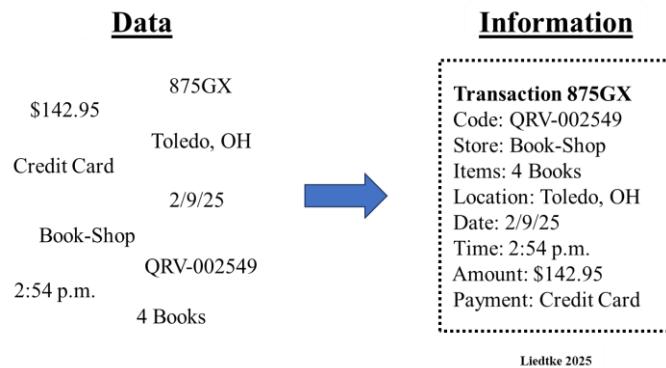
### **III. Data & Mathematics Foundations**

The seven strategic improvement approaches are *analytics-based approaches* to improving organizational performance because strategic improvement decisions are rarely made—and the subsequent action plans are rarely developed and implemented—without extensive data collection and analysis. Data are necessary for (1) measuring organizational performance, (2) determining which organizational performance metrics to target for improvement, and (3) determining if organizational performance improvement has occurred. Mathematics knowledge, skills, and abilities are necessary to apply some of the AI techniques and to understand model outputs.

Organizations have been operating in a new data and information era since the emergence of *Big Data* in the 1990s. It is now relatively easy to collect/acquire, store, process, sort, manipulate, and transfer data. Masayoshi Son—the founder and CEO of Softbank—believes that we continue to experience an *information revolution* (Barber, 2025). Data and information have been identified as a potential source of competitive advantage (see, e.g., Davenport & Harris, 2007; Marr, 2016; Laney, 2018). Information has long played an important role in human and organizational activities (see, e.g., Chandler & Cortada, 2000; Varian *et al.*, 2004; Gleick, 2011; Laney, 2018; Liedtke, 2018). Data can be viewed as an invisible asset which can be mobilized (Itami, 1987).

Data are sometimes distinguished from information and knowledge (Rainer & Prince, 2022). We see the disorganized “*raw data*” on the left in Figure 13 and that same data organized as “*information*” on the right. Information is important because it can “*reduce uncertainty*” (Pierce, 1980). Data by itself can be meaningless if we are unable to *extract the information* from it.

One of the primary conceptual flows is that we search for patterns, insights, outliers, and meaning in data which hopefully results in information that can be used for making high quality decisions leading to the development of effective and efficient organizational actions.



**Figure 13. Data to Information.**

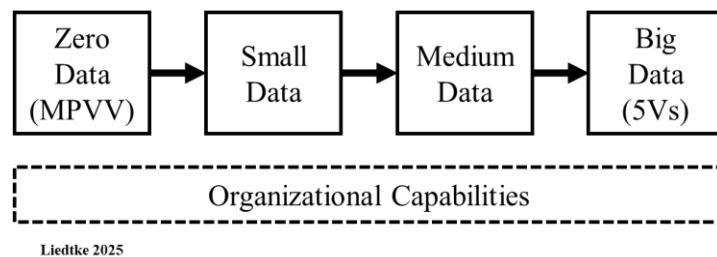
There are two types of knowledge according to Nonaka and Takeuchi (1995): tacit knowledge and explicit knowledge. Tacit knowledge is knowledge that humans possess, but is difficult to communicate (Polanyi, 1966). Some of the “intricate patterns and structures” discovered by Deep Learning models might (*conjecture*) confirm human tacit knowledge. There are four knowledge conversion modes (SECI Model) according to Nonaka and Takeuchi (1995): **socialization** converts tacit knowledge to tacit knowledge, **externalization** converts tacit knowledge to explicit knowledge, **combination** converts explicit knowledge to explicit knowledge, and **internalization** converts explicit knowledge to tacit knowledge. Anecdotal evidence suggests that AI can be used during each of these knowledge conversion modes which is out of the scope of this research.

Data—in the form of numbers, text, images, videos, and audio—are inputs in Machine Learning (ML) and its subset Deep Learning (DL). Several data quality characteristics are important including the accuracy and stability of the data. “Bad data” can lead to “bad models” which can lead to “bad decisions and actions.” Some relevant data items are shown in Figure 14.

Data Measurement	Data Concepts	Data Types	Data Activities
Sensor	Representation	Decimal	Collect/Acquire
Validity	Feature	Count	Enter
Accuracy	Response (Y) Variable	Binary	Search
Reliability	Explanatory (X) Variable	Language (“Text”)	Store
Bias	Label	Categorical – Unordered	Sort
Linearity	Target	Categorical – Ordered	Process
Stability	Univariate	Image	Calculate
	Bivariate	Video	Transfer
	Multivariate	Audio	Transform
	Real & Synthetic	Olfactory	Vectorize
	Qualitative & Quantitative	Texture	Code
<b>Data Terms</b>			
Datum	Structured & Unstructured	Transaction	Encode & Decode
Data	Uncensored & Censored	Location	Analyze
Bit	Training & Testing Data	Movement	Synthesize
Byte	Validation Data		Triangulate
Megabyte	Point-In-Time Data		Estimate
Gigabyte	Longitudinal Data		Predict
Terabyte	Original Data		Forecast
Zettabyte	Transformed Data		Mine
Pixel	Standardized Data		Create Theory
Tag	Vectorized Data		Test Theory
Wavelength	Objective Function		Build Model
	Activation Function		Train Model
	Loss (Cost) Function		Test Model
Liedtke 2025	Gradient Descent		Validate Model
			Modify Model
		<b>Sampling Terms</b>	
		Census	
		Population	
		Sample	
		Population Coverage	
		Enumerative Study	
		Analytic Study	

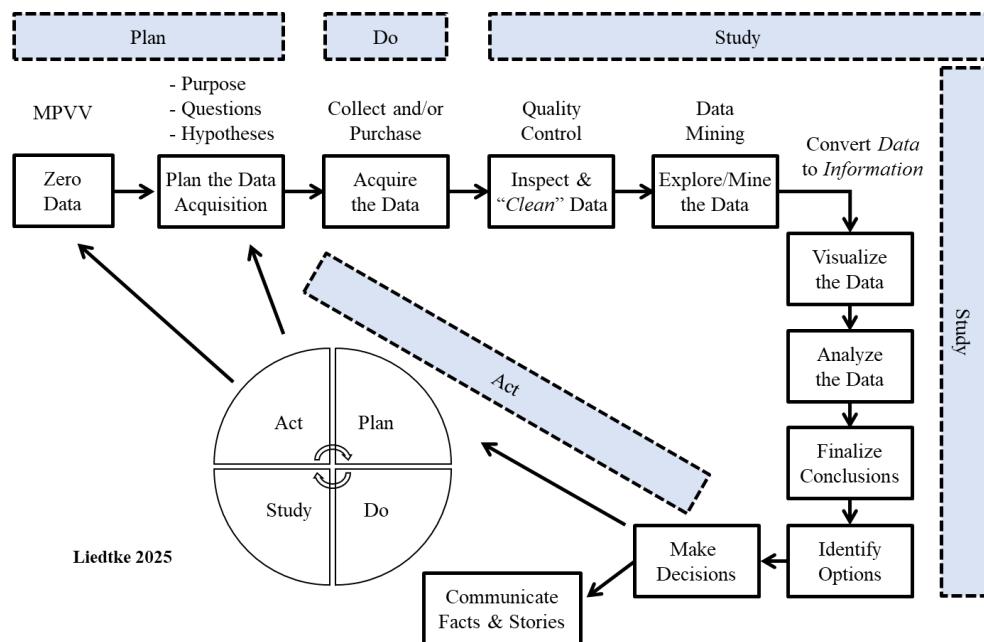
**Figure 14. Partial Listing of Data Items.**

The emergence of the Big Data Analytics strategic improvement approach allowed for the conceptualization of different *data sizes*. If there are Big Data situations, then it is possible for there to exist Medium Data and Small Data situations. An example of a Medium Data situation would be the responses from 150 people to ten survey questions. An example of a Small Data situation would be the golf scores for 15 rounds of golf for one person. Zero Data is meant to refer to an organization's mission, philosophy, values, and vision (MPVV). It is used jokingly to suggest that all "data" activities should be *grounded in Zero Data*. Zero Data (MPVV) can provide a valuable **touchstone** for grounding strategic decisions and organizational actions. Many of the AI models, tools, and techniques use Big Data, but it is important for an organization to develop knowledge, skills, and abilities for performing effectively in all of the "sizes" of data situations (Liedtke, 2016). Techniques like Regression and Classification can be applied on Small Data and Medium Data. The Data Continuum is depicted in Figure 15.



**Figure 15. Data Continuum: Zero Data to Big Data.**

Analytics work—whether it involves Big Data or not—can involve the use of a formal analytics process. An example of an analytics process is shown in Figure 16. Those familiar with the PDSA Cycle (Deming, 1982, 1994) will notice that cycle represented twice in the analytics process.



**Figure 16: Example of an Analytics Process as a PDSA Cycle.**

An analytics process can be integrated with the periodic formal reviews that use organizational performance dashboards—like the Monthly Organizational Performance Review. AI can be integrated extensively into the analytics process. Some organizations develop and implement an information/digital strategy and infrastructure (see, e.g., Davenport & Harris, 2007; Marr, 2017; Gupta, 2018). Data are created through measurement processes. Some of the measurement concepts that are relevant in AI work include validity, accuracy, reliability, consistency, stability, and bias. This is important because AI applications use data—real and/or synthetic—to build and test models for generating outputs (results). AI Quality will be discussed later.

Much of the technical AI-related work requires knowledge, skills, and abilities in Mathematics. For example, some of the mathematics topics that are necessary to understand Deep Learning concepts, models, tools, and techniques include the following: scalars, vectors, matrices, tensors, matrix algebra, objective functions, loss (cost) functions, activation functions, derivatives of functions, chain rule for derivatives, partial derivatives, and gradient descent to name a few. Individuals who perform analytics-based work—and AI in particular—need advanced knowledge of mathematics to be successful. The book sections from “*Essential Computer Mathematics*” by Lipschutz (1987) are shown in Figure 17. The sections provide a partial list of mathematics topics that are necessary to understand some of the AI concepts, models, tools, and techniques.

Book Sections
1. Binary Number System
2. Computer Codes
3. Computer Arithmetic
4. Logic, Truth Tables
5. Algorithms, Flowcharts, Pseudocode Programs
6. Sets and Relations
7. Boolean Algebra, Logic Gates
8. Simplification of Logic Circuits
9. Vectors, Matrices, Subscripted Variables
10. Linear Equations
11. Combinatorial Analysis
12. Probability
13. Statistics, Random Variables
14. Graphs, Directed Graphs, Machines

**Figure 17. Sections of the Book “*Essential Computer Mathematics*.”**

Additional AI-related mathematics topics that are covered in the textbooks by Cormen *et al.* (2022) and Goodfellow *et al.* (2016) are shown in Figure 18.

Mathematics Topics	Sources
Summations	<i>Introduction to Algorithms</i> by Cormen, Leiserson, Rivest, & Stein
Sets, Etc.	<i>Introduction to Algorithms</i> by Cormen, Leiserson, Rivest, & Stein
Counting and Probability	<i>Introduction to Algorithms</i> by Cormen, Leiserson, Rivest, & Stein
Matrices	<i>Introduction to Algorithms</i> by Cormen, Leiserson, Rivest, & Stein
Linear Algebra	<i>Deep Learning</i> by Goodfellow, Bengio, & Courville
Probability and Information Theory	<i>Deep Learning</i> by Goodfellow, Bengio, & Courville
Numerical Computation	<i>Deep Learning</i> by Goodfellow, Bengio, & Courville
Machine Learning Basics	<i>Deep Learning</i> by Goodfellow, Bengio, & Courville

**Figure 18. Some AI-Related Mathematics Topics.**

## IV. Artificial Intelligence (AI)

The label “Artificial Intelligence” was reportedly first used in 1955 by McCarthy, Minsky, Rochester, and Shannon in the title of their research project proposal that eventually led to the famous Dartmouth Conference in 1956 (McCarthy *et al.*, 1955). There does not exist a globally-accepted standard definition of AI which makes the phenomenon difficult to research and discuss. AI means different things to different people. “What do you mean by AI?” AI currently encompasses a wide range of “*machine-performing*” tasks from algorithms, expert systems, regression, classification, and language translation to autonomous vehicles and robots.

The Strategic Management Journal (SMJ) (2024) announced in 2024 a “Call for Papers” for a Special Issue on *Strategy and Artificial Intelligence*. AI was defined in the announcement as the following: “AI refers to any computer system that perceives its environment (e.g., numerical data, speech, text, and images), learns from past behavior, and takes action to maximize the likelihood of attaining its goals.” Rainer and Prince (2022) defined AI: “We define **artificial intelligence** as the theory and development of information systems that are capable of performing tasks that normally require human intelligence. That is, we define AI in terms of the tasks that humans perform, rather than how humans think.” ChatGPT defined AI as the following (ChatGPT by OpenAI, April 12, 2025):

❖ Artificial Intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think, learn, and make decisions. It encompasses a wide range of technologies and techniques, including machine learning, natural language processing, computer vision, and robotics, enabling systems to perform tasks that typically require human cognition—such as recognizing speech, understanding language, solving problems, and adapting to new situations. AI systems improve over time through data-driven learning, and their applications span across industries, from healthcare and finance to transportation and entertainment. ❖

The inspiration for many of the concepts, models, tools, and techniques in AI has—and continues to be—the human brain (Goodfellow, Bengio, & Courville, 2016) and the human body as evidenced by recent advancements in humanoids. Two references on the human brain are a summary of the brain work of Santiago Ramón y Cajal (Swanson *et al.*, 2017) and a magazine on “*The Brain: Discover the Ways Your Mind Works*” by National Geographic (Sklar, 2022).

The field of AI is several decades old and it has experienced many eras/stages/waves (see, e.g., Nilsson, 2010; Kelleher, 2019; Wooldridge, 2020; Russell & Norvig, 2022; Wade, 2023; Bishop & Bishop, 2024; Charniak, 2024). Charniak (2024) identified ten eras—some overlapping—from an *intellectual history* perspective: Beginnings (1956-1970), Reasoning and Knowledge Representation (1970-1985), Reasoning Under Uncertainty (1980-1990), Chess (1965-1997), Computer Vision (1970-2000), Speech Recognition (1971-1985), Learning Language (1985-2010), Deep Learning (1989-2016), Reinforcement Learning and the Game of Go (1990-2017), and Learning Writ Large (2017-2023). Goodfellow, Bengio, and Courville (2016) identified Three Waves of Deep Learning Development: (1) Cybernetics: 1940s – 1960s (Wiener, 1948);

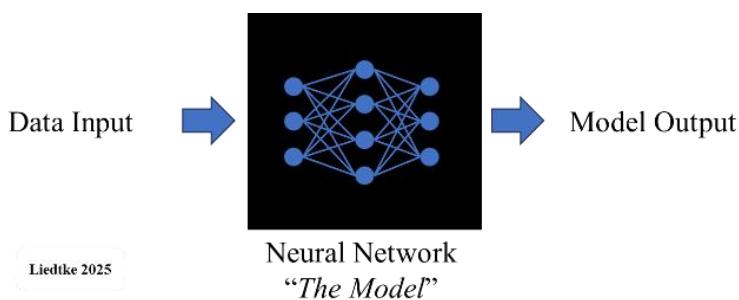
(2) Connectionism: 1980s – 1990s; and (3) Deep Learning: 2006+. Jensen Huang (2025), the CEO of Nvidia, identified four eras which includes the future: Perception AI, Generative AI, Agentic AI, and Physical AI (NVIDIA GTC 2025). AI has evolved over time through alternating periods of *relative quiet* each followed by a *disruptive technological breakthrough* (Wooldridge, 2020).

Numerous factors converged to cause the widespread popularity of AI over the last two decades including the increased ease of acquiring massive amounts of diverse data; increased data storage and processing capabilities; and the invention of new models and techniques. The release of ChatGPT by OpenAI in November of 2022 stimulated global interest in large language models (LLMs)—sometimes referred to as Generative AI (Gen AI) or chatbots—which enabled almost anyone with a computer or smart phone to “*use AI*.” The event was referred to as a “*Sputnik Moment*” because it *changed the AI paradigm*. Kuhn (1970) described scientific revolutions:

“Each of them {scientific revolutions} necessitated the community’s rejection of one time-honored scientific theory in favor of another incompatible with it. Each produced a consequent shift in the problems available for scientific scrutiny and in the standards by which the profession determined what should count as an admissible problem or as a legitimate problem-solution. And each transformed the scientific imagination in ways that we shall ultimately need to describe as a transformation of the world within which scientific work was done.”

New breakthrough AI events have been referred to as a “*ChatGPT Moment*.” More recently, DeepSeek’s release of its R1 model was one such *moment* because it challenged the prevailing technological and economic assumptions (*paradigm*) about what it takes to create a world class LLM. Future groundbreaking AI events might be referred to as a “*DeepSeek Moment*.”

Deep Learning—using neural networks—is an important subset of AI because it is an underlying technology of ChatGPT (see, e.g., Charniak, 2018; Kelleher, 2019; Goodfellow, Bengio, & Courville, 2016; Haykin, 2016; Patterson & Gibson, 2017; Aggarwal, 2018; Sejnowski, 2018; Bernard, 2021; Bishop & Bishop, 2024). Goodfellow, Bengio, and Courville (2016) described *Deep Learning* as a subset of *Representation Learning* which is a subset of *Machine Learning* which is a subset of AI. They identified three components of a machine learning algorithm: (1) **Task (T)** - Classification, Classification With Missing Inputs, Regression, Transcription, Machine Translation, Structured Output, Anomaly Detection, Synthesis and Sampling, Imputation of Missing Values, Denoising, & Density Estimation or Probability Mass Function Estimation; (2) **Performance Measure (P)** - Accuracy & Error Rate; and (3) **The Experience (E)** - Unsupervised & Supervised. A simplistic representation is shown in Figure 19.



**Figure 19. Simplistic Representation of a Deep Learning Model.**

Organizations currently use AI in three general ways: (1) **Existentially** in that AI is fundamental to the mission of the organization and is integrated into almost all aspects of the organization (e.g., Anthropic, DeepSeek, OpenAI, Safe Superintelligence, Thinking Machines Lab, & xAI); (2) **Operationally** in that AI is integrated deeply into various organizational operations (e.g., Alphabet, Amazon, Apple, Meta, Microsoft, Nvidia, Salesforce, & Tesla); and (3) **Experimentally** in that AI is being experimented with in various areas of the organization. It is safe to say that Gen AI is being experimented with in tens of thousands of organizations in the U.S. if not more.

Marr (2019) described the AI practices in fifty companies which were organized into five categories: Artificial Intelligence Trailblazers (e.g., Alibaba & Amazon); Retail, Consumer Goods and Food and Beverage Companies (e.g., Coca-Cola & Walmart); Media, Entertainment and Telecom Companies (e.g., LinkedIn & Netflix); Services, Financial and Healthcare Companies (e.g., Salesforce & Uber); and Manufacturing, Automotive, Aerospace and Industry 4.0 Companies (e.g., BMW & John Deere).

Davenport and Mittal (2023) discussed several companies who are “All in on AI” including Alphabet, Airbus, Deloitte, Ping An, and Unilever. In their discussion of Alphabet: “No one was terribly surprised when Sundar Pichai, the CEO of Alphabet (parent company of Google), announced at a 2017 Google customer event that the company would be moving to ‘AI first.’”

Jamie Dimon (2025), the CEO of JPMorgan Chase, has often mentioned his company’s commitment to AI and he recently commented (YouTube Video – “Jamie Dimon on AI Impact”): “We’ve been doing AI since 2012.” Teresa Heitsenrether—the Chief Data & Analytics Officer at JPMorgan Chase who oversaw the company’s AI strategy in 2023—described the importance of Gen AI (Saeedy, 2025): “When the generative AI wave started to really take off, we wanted to make sure that there was somebody really focused on this as a fulltime job at {CEO} Jamie Dimon’s table because of the strategic importance that we see for the future of the firm,’ she says. . . . ‘We now have 200,000 people in the firm who have the tool on their desk.’”

Moody’s—the financial services company—has fully embraced AI and GenAI according to its website (Moody’s, 2025): “AI and GenAI: By leveraging cutting-edge GenAI technologies and Moody’s expansive data estate, we are redefining the boundaries of what is achievable for our clients. Our solutions deliver results, powerful automations, and unlock fast, tangible insights across credit analysis, research origination, monitoring, and much more.”

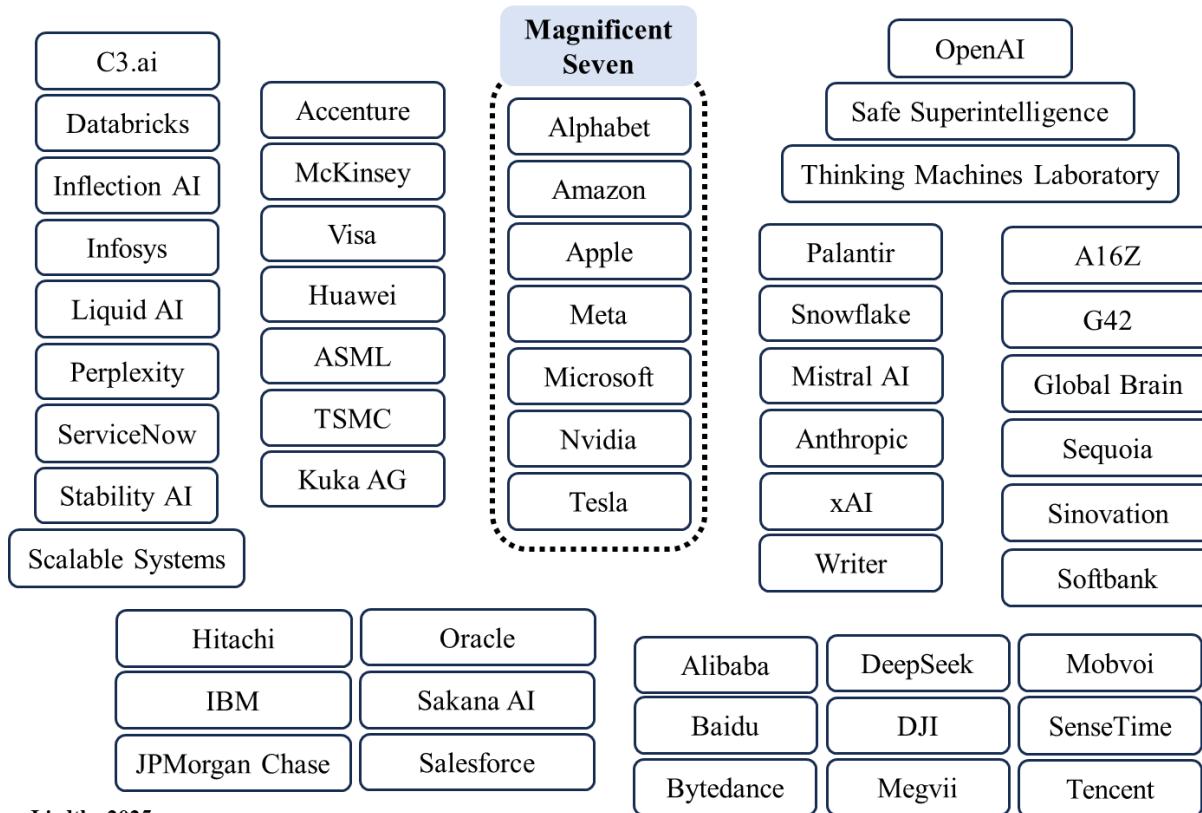
Salesforce has fully embraced AI and is at the forefront of using Agentic AI. Marc Benioff (2025), the CEO of Salesforce, announced a “pivot” to AI and discussed his company’s Agentforce which is a form of Agentic AI (YouTube, Introducing Agentforce 2.0 with Marc Benioff | Salesforce). Hitachi has fully embraced AI (Hitachi, 2025). According to Hosokawa (2024): “Hitachi plans to train 50,000 employees by 2027 who will be capable of developing new services using generative artificial intelligence. The program will cover about 20% of Hitachi’s 270,000 employee workforce.” IBM is hard at work on AI and hopes to increase its presence (Fitch, 2025).

Masayoshi Son, the CEO of Softbank, is “All in on AI” and Softbank has built a portfolio of AI-related companies consisting of controlled companies and companies with which Softbank has a minority ownership position. Son—along with Larry Ellison of Oracle, Sam Altman of OpenAI,

and the Emerati state-owned investment firm MGX—formed a company to execute the Stargate Project: “The Stargate Project is a new company which intends to invest \$500 billion over the next four years building new AI infrastructure for OpenAI in the United States. We will begin deploying \$100 billion immediately. This infrastructure will secure American leadership in AI, create hundreds of thousands of American jobs, and generate massive economic benefit for the entire world. This project will not only support the re-industrialization of the United States but also provide a strategic capability to protect the national security of America and its allies (OpenAI Website, January 21, 2025).”

Govindarajan and Venkatraman (2024) described manufacturing companies who have adopted a “*fusion strategy*” which integrates real-time data and AI with manufactured products. Tesla is one of those companies: “Tesla enjoys an advantage over rivals because it gathers more data than other automobile manufacturers. Each of the more than four million Tesla cars on the road sends back video feeds from eight cameras, and over one thousand employees label those images to help train the network (Govindarajan & Venkatraman, 2024).” The authors prescribed four steps for creating a *fusion system*: architect, organize, accelerate, and monetize.

There is a sample of AI-related organizations depicted in Figure 20. Included in the sample are the so-called *Magnificent Seven*, leading Chinese AI companies, AI startups, AI laboratories, AI infrastructure suppliers, consulting firms, venture capital firms, and others.



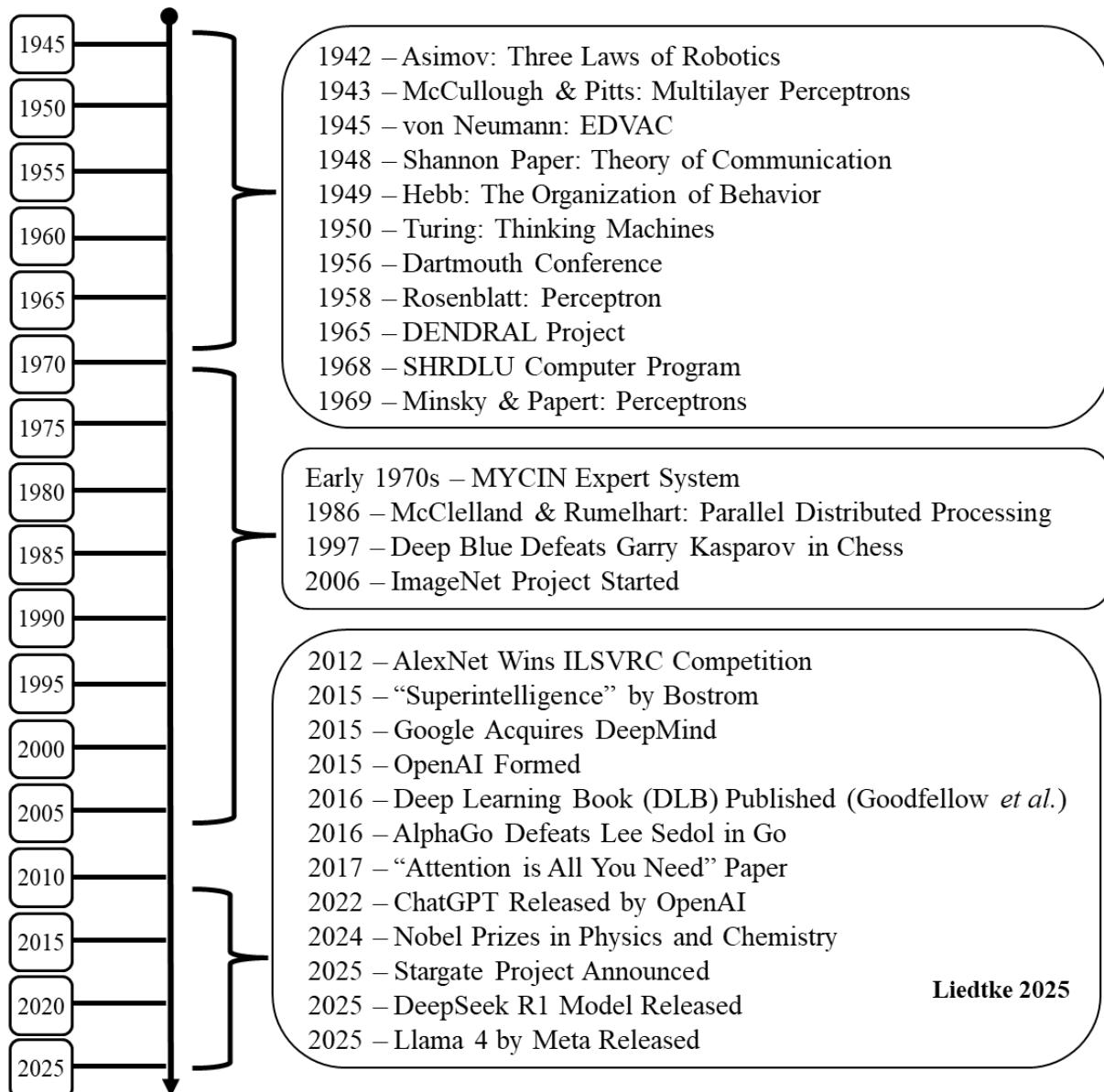
**Figure 20. Sample of AI-Related Organizations.**

A timeline of AI-related events was created to show AI's evolution. It is depicted in Figure 21. The AI Timeline begins in 1764 with the publication of a classic essay by Thomas Bayes and ends with the publication of the "2025 AI Index" by the Stanford Institute for Human-Centered AI.

Year	Person(s)   Organization(s)	Event
1764	Thomas Bayes	Publication of "An Essay Towards Solving a Problem in the Doctrine of Chances."
1818	Mary Shelley	Publication of "Frankenstein"
1854	George Boole	Publication of "An Investigation of the Laws of Thought"
1920	Karel Čapek	Publication of "R.U.R. (Rossum's Universal Robots)"
1940	Bletchley Park	The First Enigma Machine Arrives
1942	Isaac Asimov	Mentioned the "Three Laws of Robotics"
1943	Warren McCullough & Walter Pitts	Publication of "A Logical Calculus of Ideas Immanent in Nervous Activity"
1945	John von Neumann	Publication of "First Draft of a Report on the EDVAC"
1948	Claude Shannon	Publication of "The Mathematical Theory of Communication"
1948	Norbert Wiener	Publication of "Cybernetics or the Control and Communication in the Animal and the Machine."
1949	Donald Hebb	Publication of "The Organization of Behavior: A Neuropsychological Theory"
1949	George Orwell	Publication of "1984"
1950	Isaac Asimov	Publication of "I, ROBOT"
1950	Alan Turing	Publication of "Computing Machinery and Intelligence"
1955	McCarthy, Minsky, Rochester, & Shannon	Submission of "A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence"
1956	John McCarthy <i>et al.</i>	Dartmouth Conference
1958	Frank Rosenblatt	Publication of "The Perceptron: A Probabilistic Model for Information Storage and Organization in the Brain"
1965	Edward Feigenbaum & Joshua Lederberg	DENDRAL Expert System Project Started
1968	Arthur C. Clarke	Publication of "2001: A Space Odyssey"
1968-1970	Terry Winograd	SHRDLU Natural-Language Understanding Computer Program
1969	Marvin Minsky & Seymour Papert	Publication of "Perceptrons"
1969	Arthur Bryson & Yu-Chi Ho	Method for Computing Gradients in Dynamic Systems First Described
Early 1970s	Stanford University	MYCIN Expert System Started
1979	Douglas Adams	Publication of "Hitchhiker's Guide to the Galaxy"
1984	James Cameron	Release of the Movie "Terminator"
1986	James McClelland & David Rumelhart	Publication of "Parallel Distributed Processing" (Volume 1 & Volume 2)
1987	Neural Information Process Systems Foundation	First Conference on Neural Information Processing Systems (Now NeurIPS Conference)
1990	LeCun, Y. <i>et al.</i>	Publication of "Handwritten Digit Recognition with a Back-Propagation Network" *
1997	Hochreiter, S. & Schmidhuber, J.	Publication of "Long Short-Term Memory" *
1997	IBM & Garry Kasparov	Deep Blue (IBM) Defeats Garry Kasparov in Chess
1998	LeCun, Y., Bottou, L., Bengio, Y., & Haffner, P.	Publication of "Gradient-Based Learning Applied to Document Recognition" *
2001	Bengio, Y., Ducharme, R., & Vincent, P.	Publication of "A Neural Probabilistic Language Model" *
2005	Ray Kurzweil	Publication of "The Singularity is Near: When Humans Transcend Biology"
2006	Hinton, G., Osindero, S., & Teh, Y. W.	Publication of "A Fast Learning Algorithm for Deep Belief Nets" *
2006	Bengio, Lamblin, Popovici, & Larochelle	Publication of "Greedy Layer-Wise Training of Deep Networks" *
2006	Fei-Fei Li	ImageNet Database Created / Project Started
2010	Apple	Apple Releases Siri as an iPhone "App"
2011	Glorot, X., Bordes, A., & Bengio, Y.	Publication of "Deep Sparse Rectifier Neural Networks" *
2012	Krizhevsky, A., Sutskever, I., & Hinton, G.	Publication of "ImageNet Classification with Deep Convolutional Neural Networks" *
2012	Krizhevsky, A., Sutskever, I., & Hinton, G.	AlexNet Wins ILSVRC Competition
2012	Hinton, G. <i>et al.</i>	Publication of "Deep Neural Networks for Acoustic Modeling in Speech Recognition" *
2014	Nick Bostrom	Publication of "Superintelligence"
2014	Google (Alphabet) & DeepMind	DeepMind Acquired by Google (Alphabet)
2014	Sutskever, I., Vinyals, O., & Le, Q. V.	Publication of "Sequence to Sequence Learning with Neural Networks" *
2014	Amazon	Release of Amazon Echo (Smart Speaker)
2015	OpenAI	OpenAI Founded
2015	LeCun, Y., Bengio, Y., & Hinton, G.	Publication of "Deep Learning"
2016	Goodfellow, I., Bengio, Y., & Courville, A.	Publication of "Deep Learning" Book (DLB)
2016	DeepMind & Lee Sedol	AlphaGo (DeepMind) Defeated Lee Sedol in Go
2017	DeepMind & Ke Jie	AlphaGo (DeepMind) Defeated Ke Jie in Go
2017	Vaswani <i>et al.</i>	Publication of "Attention Is All You Need"
2019	Waymo (Alphabet)	Waymo Becomes the First Autonomous Car Service
2021	Bengio, Y., LeCun, Y., & Hinton, G.	Publication of "Deep Learning for AI"
2022	OpenAI	ChatGPT Released
2023	Google (Alphabet)	Gemini Released
2023	xAI	xAI Founded & Grok (LLM) Released
2023	Google DeepMind	Google Brain & DeepMind Merged to Form Google DeepMind
2024	Apple	Apple Intelligence Announced
2024	Kissinger, H. A., Mundie, C., & Schmidt, E.	Publication of "Genesis: Artificial Intelligence, Hope, and the Human Spirit"
2024	Nobel Foundation	Nobel Prize in Physics to John J. Hopfield & Geoffrey Hinton
2024	Nobel Foundation	Nobel Prize in Chemistry to David Baker, Demis Hassabis, & John Jumper
2025	Son, M., Ellison, L., & Altman, S.	Announcement of Stargate AI Project
2025	DeepSeek	DeepSeek R1 Model Released
2025	Anthropic	Claude 3.7 Sonnet Model Released
2025	Amazon	Upcoming Release of Alexa+ Announced
2025	Apple	Apple Delays Enhanced Siri (Enhanced by AI)
2025	Nvidia	Jensen Huang, CEO of Nvidia, Suggests an AI Inflection Point
2025	X & xAI	X is Acquired by xAI
2025	Meta	Meta Launches Llama 4
2025	Stanford Institute for Human-Centered AI	Publication of "2025 AI Index" <span style="float: right;">Liedtke 2025</span>
		* Reference Received Special Annotation in the Paper "Deep Learning" by LeCun, Bengio, & Hinton

**Figure 21. Timeline of AI-Related Events.**

A condensed timeline of historical AI-related events was created to make it easier to visualize the evolution of AI. The timeline is depicted in Figure 22. The AI Timeline begins with the “Three Laws of Robotics” by Asimov and ends with the release of Llama 4 by Meta.



**Figure 22. Condensed Timeline of AI Events.**

The two timelines reveal the long and storied history of AI. There have been multiple eras consisting of AI Winters (pauses) and AI Summers (growths). There have also been “*Disruptive Moments*” which changed the prevailing paradigm and stimulated thinking on new possibilities. We are now in an era of both optimism (boom) and pessimism (gloom and doom) towards AI. AI will continue to advance unpredictably in part because “AI can improve itself.”

Two significant AI-related events occurred in 2024 when the Nobel Prize Committee (Nobel Foundation, 2024) awarded Nobel Prizes to five people for their achievements in the Categories of **Physics** (2 people) and **Chemistry** (3 people). John J. Hopfield and Geoffrey Hinton were awarded the Nobel Prize in Physics “for foundational discoveries and inventions that enable machine learning with artificial neural networks.” More specifically, John J. Hopfield “for foundational discoveries and inventions that enable machine learning with artificial neural networks” and Geoffrey Hinton “for foundational discoveries and inventions that enable machine learning with artificial neural networks.” David Baker, Demis Hassabis, and John Jumper were awarded the Nobel Prize in Chemistry “for computational protein design” (Baker) and “for protein structure prediction (Hassabis & Jumper) (Nobel Foundation, 2024).”

The AI Landscape—AI at 50,000 Feet—is depicted in Figure 23. It provides a “big picture” view of some of the components of the AI phenomenon.

Players	Organizations	Relevant Fields	Concepts	Leading Universities
McCullough & Pitts Claude Shannon John McCarthy Frank Rosenblatt Marvin Minsky Seymour Papert James McClellan David Rumelhart John Hopfield Geoffrey Hinton David Baker John Jumper Demis Hassabis Yoshua Bengio Yann LeCun Sam Altman Ilya Sutskever Fei-Fei Li Liang Wenfeng Mira Murati Masayoshi Son	<b>Magnificent Seven</b> Alphabet Amazon Apple Meta Microsoft Nvidia Tesla <b>Others</b> Alibaba Anthropic Bytedance DeepSeek OpenAI Palantir Perplexity Safe Superintelligence Tencent Thinking Machines Lab xAI	Mathematics Philosophy Statistics Data Science Computer Science Computer Engineering Electrical Engineering Mechanical Engineering Neuroscience Psychology Chemistry Physics	Neural Networks Deep Learning Objective Function Input Data & Labels Training & Test Data Activation Function Outcomes/Outputs Loss Function Optimization Gradient Descent Forward-Forward Backpropagation	1. University of California at Berkeley 2. Massachusetts Institute of Technology 3. Stanford University 4. Swiss Federal Institute of Technology Zurich 5. King Abdulaziz University 6. National University of Singapore 7. Carnegie Mellon University 8. University of Cambridge 9. University of Chinese Academy of Sciences 10. University of Technology Sydney Source: <i>AI Research Index</i> by Lee Seunghwan
Tools & Techniques	Use Cases (“Tasks”)		LLMs/AI Assistants	Leading Countries
Search Algorithms Natural Language Processing Large Language Models Neural Networks Machine Learning Deep Learning Backpropagation Computer Vision Image Recognition Steepest Gradient Descent Generative AI Agentic AI	Classification Classification - Missing Inputs Regression Transcription Machine Translation Structured Output Anomaly Detection Synthesis and Sampling Imputation of Missing Values Denoising Density Estimation Probability Mass Function Estimation Source: Goodfellow <i>et al.</i> , 2016		Alexa+ (Amazon) ChatGPT (OpenAI) Claude (Anthropic) Copilot (Microsoft) DeepSeek R1 (DeepSeek) Gemini (Google) Grok (xAI) Llama (Meta) Siri (Apple)	1. United States 2. China 3. United Kingdom 4. Israel 5. Canada 6. Germany 7. France 8. Japan 9. South Korea 10. Singapore Source: <i>Microsoft Copilot</i> , 9/8/2024
		Historical Players/Events		Books
		1764 – Thomas Bayes 1854 - George Boole 1943 – McCullough & Pitts 1956 – Dartmouth Conference 1958 – Frank Rosenblatt 1997 – Deep Blue Chess Victory 2016 – AlphaGo Go Victory 2015 – OpenAI Founded 2022 – ChatGPT Launched 2024 – Nobel Prizes Awarded 2025 – Stargate Announced 2025 – DeepSeek R1 Released	<i>Deep Learning</i> by Goodfellow <i>et al.</i> <i>Deep Learning</i> by Bishop & Bishop <i>The Quest for AI</i> by Nilsson <i>AI: A Modern Approach</i> by Russell & Norvig <i>A Brief History of AI</i> by Wooldridge <i>Superintelligence</i> by Bostrom <i>Deep Learning Revolution</i> by Sejnowski	
				Liedtke 2025

**Figure 23. AI Landscape (Partial Lists).**

The most plausible near-term model is “Humans + AI” and not “Fully-Autonomous AI.” The former involves humans interacting with an LLM through a chatbot – “Question/Command” as the input and then the model produces the “Output.” ChatGPT and other similar AI Assistants can be viewed as Gen AI. In the not-to-distant future we can expect semi-autonomous or autonomous AI Agents—possibly functioning in humanoids. We look next at what universities are teaching.

The University of California, Berkely in Berkeley, CA has a long history of exceptional research and teaching in AI and its related areas. The AI topics listed on the Electrical Engineering and Computer Science Department website are shown in Figure 24.

Link: [Research Area: AI | EECS at UC Berkeley](#)

<b>Electrical Engineering and Computer Sciences Department</b>	
<b>University of California, Berkeley</b>	
<b>AI Topics</b>	
<b>Learning and Probabilistic Inference</b>	
- Graphical Models	
- Kernel Methods	
- Nonparametric Bayesian Methods	
- Reinforcement Learning	
- Problem Solving	
- Decisions	
- Games	
<b>Knowledge Representation and Reasoning</b>	
- First Order Probabilistic Logics	
- Symbolic Algebra	
<b>Search and Information Retrieval</b>	
- Collaborative Filtering	
- Information Extraction	
- Image and Video Search	
- Intelligent Information Systems	
<b>Speech and Language</b>	
- Parsing	
- Machine Translation	
- Speech Recognition	
- Context Modeling	
- Dialog Systems	
<b>Vision</b>	
- Object Recognition	
- Scene Understanding	
- Human Activity Recognition	
- Active Vision	
- Grouping and Figure-Ground	
- Visual Data Mining	
<b>Robotics</b>	
- Deep Learning	
- Perception	
- Manipulation	
- Locomotion	
- Human Robot Interaction	
- Motion Planning	
- Applications to Logistics, Healthcare, Home and Service Robots, Agriculture	

**Figure 24. University of California, Berkeley EECS AI Topics.**

The Massachusetts Institute of Technology (MIT) in Cambridge, MA also has a long history of exceptional AI research and teaching. The course offerings for the Bachelor of Science in *Artificial Intelligence and Decision Making* are shown in Figure 25.

Link: [Artificial Intelligence and Decision Making \(Course 6-4\) | MIT Course Catalog](#)

<b>Bachelor of Science in AI and Decision Making</b>	
<b>Massachusetts Institute of Technology (MIT)</b>	
<b>AI Course Offerings</b>	
<b>Fundamentals</b>	<b>Course Number</b>
Introduction to Computer Science Programming in Python	6.100A
Introduction to Computer Science	6.100L
Introduction to Algorithms	6.1210
Fundamentals of Programming	6.1010
Mathematics for Computer Science	6.1200[J]
Linear Algebra and Optimization	18.C06[J]
Linear Algebra	18.06
Introduction to Probability	6.3700
Introduction to Inference	6.3800
Introduction to Probability and Statistics	18.05
<b>Centers</b>	
<b>Data-centric</b>	
Introduction to Statistical Data Analysis	6.3720
Introduction to Machine Learning	6.3900
<b>Model-centric</b>	
Signal Processing	6.3000
Representation, Inference, and Reasoning in AI	6.4110
Computer Graphics	6.4400
<b>Decision-centric</b>	
Dynamical System Modeling and Control Design	6.3100
Representation, Inference, and Reasoning in AI	6.4110
Optimization Methods	15.C571[J]
<b>Computation-centric</b>	
Design and Analysis of Algorithms	6.1220[J]
Computability and Complexity Theory	6.1400[J]
Computer Graphics	6.4400
Optimization Methods	15.C571[J]
<b>Human-centric</b>	
Networks	6.3260[J]
AI, Decision Making, and Society	6.3950
Computational Cognitive Science	6.4120[J]
Foundations of Information Policy	6.4590[J]
Interactive Data Visualization and Society	6.C35[J]
<b>Communication-intensive in the Major</b>	
Robotics: Science and Systems (CI-M)	6.4200[J]
Robotic Manipulation (CI-M)	6.4210
Advances in Computer Vision (CI-M)	6.8301
Quantitative Methods for Natural Language Processing (CI-M)	6.8611

**Figure 25. Massachusetts Institute of Technology (MIT) AI Course Offerings.**

The Stanford School of Engineering in Palo Alto, CA is world-renowned for its AI research and teaching. The AI course offerings for an AI Graduate Certificate are shown in Figure 26.

**Link:** [Artificial Intelligence Graduate Certificate | Program | Stanford Online](#)

AI Graduate Certificate	
Stanford School of Engineering	
AI Course Offerings	Course Number
Machine Learning	CS229
Artificial Intelligence: Principles and Techniques	CS221
Mining Massive Data Sets	CS246
Deep Multi-task and Meta Learning	CS330
Principles of Robot Autonomy II	CS237B
Deep Generative Models	CS236
Reinforcement Learning	CS234
Deep Learning for Computer Vision	CS231N
Computer Vision: From 3D Reconstruction to Recognition	CS231A
Deep Learning	CS230
Probabilistic Graphical Models: Principles and Techniques	CS228
Machine Learning with Graphs	CS224W
Natural Language Understanding	CS224U
Deep Reinforcement Learning	CS224R
Natural Language Processing with Deep Learning	CS224N
Introduction to Robotics	CS223A
Continuous Mathematical Models with an Emphasis on Machine Learning	CS205L
Computational Logic	CS157
Principles of Robot Autonomy I	CS237A
Decision Making Under Uncertainty	AA228

**Figure 26. Stanford School of Engineering AI Course Offerings.**

AI research occurs in several academic fields and there are numerous journals—including interdisciplinary journals—where AI-related research is published. Some of the academic journals include the Artificial Intelligence Journal (AIJ), Artificial Intelligence Review (AIR), IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI), International Journal of Computer Vision (IJCV), IEEE Transactions on Neural Networks and Learning Systems (INNLS), and the Journal of Machine Learning Research (JMLR). One of the premier AI-related annual conferences is the Conference on Neural Information Processing Systems (NeurIPS) which started in 1987. The Thirty-Ninth Annual Conference on Neural Information Processing Systems (“NeurIPS 2025”) will be held in San Diego, CA on December 9-15, 2025.

There are several textbooks on *Deep Learning*. Two oft-mentioned textbooks include “*Deep Learning*” by Goodfellow, Bengio, and Courville (2016) and “*Deep Learning: Foundations and Concepts*” by Bishop and Bishop (2024). The Table of Contents of the chapter titles for those two textbooks are shown in Figure 27.

<i>Deep Learning</i>		<i>Deep Learning: Foundations and Concepts</i>	
Ian Goodfellow, Yoshua Bengio, & Aaron Courville		Bishop & Bishop	
Chapter #	Chapter Title	Chapter #	Chapter Title
1	Introduction	1	The Deep Learning Revolution
<b>Section I</b>	<b>Applied Math and Machine Learning Basics</b>	2	Probabilities
2	Linear Algebra	3	Standard Distributions
3	Probability and Information Theory	4	Single-layer Networks: Regression
4	Numerical Computation	5	Single-layer Networks: Classification
5	Machine Learning Basics	6	Deep Neural Networks
<b>Section II</b>	<b>Deep Networks: Modern Practices</b>	7	Gradient Descent
6	Deep Feedforward Networks	8	Backpropagation
7	Regularization for Deep Learning	9	Regularization
8	Optimization for Training Deep Models	10	Convolutional Networks
9	Convolutional Networks	11	Structured Distributions
10	Sequence Modeling: Recurrent and Recursive Nets	12	Transformers
11	Practical Methodology	13	Graph Neural Networks
12	Applications	14	Sampling
<b>Section III</b>	<b>Deep Learning Research</b>	15	Discrete Latent Variables
13	Linear Factor Models	16	Continuous Latent Variables
14	Autoencoders	17	Generative Adversarial Networks
15	Representation Learning	18	Normalizing Flows
16	Structured Probabilistic Models for Deep Learning	19	Autoencoders
17	Monte Carlo Methods	20	Diffusion Models
18	Confronting the Partition Function	Appendix A	Linear Algebra
19	Approximate Inference	Appendix B	Calculus of Variations
20	Deep Generative Models	Appendix C	Lagrange Multipliers

**Figure 27. Chapter Titles of Two Deep Learning Textbooks.**

The “AI Industry” is complex and hard to describe because it is *all-pervasive* and *constantly changing*. The following are some of the characteristics of the AI Industry (partial list):

**System of Components:** The AI Industry can be thought of as a *system of components* which includes the following: Data, Data Centers, Clouds, Supercomputers, Platforms, Hardware, Software, Algorithms, Models, Integrated Circuits, Semiconductor Chips, CPUs, GPUs, Rare-Earth Minerals, Satellites, Mobile Networks, Real Estate, Water, Electricity, Talent, Capital, Countries, Companies, Alliances, Laboratories, Universities, Investors, Suppliers, Customers, etc.

**Scope:** AI encompasses almost every country, organization, industry, and person.

**Research & Innovation:** Technological advances are necessary and routinely announced.

**Applications:** Practical applications in the form of use cases are numerous and increasing.

**Geopolitics:** Some countries are vying for global AI dominance for security and economic reasons.

**Conflicting Visions:** There are conflicting AI visions, goals, values, and ethics.

**Dynamic:** The industry is dynamic in that it is constantly changing.

**Hypercompetitive:** There is fierce competition in numerous AI-related industries.

**Competitive Advantage:** It is unlikely for any organization to sustain a competitive advantage.

**Exaggerated Claims/Misinformation:** New “breakthroughs” can be exaggerated or untrue.

**Talent:** It is difficult to acquire, develop, and retain talent.

**Commoditization:** Some of the AI Assistants are relatively inexpensive or free.

**Investing:** Investors must “make bets” with unknown and/or incalculable odds.

**Risks:** There are considerable safety, security, legal, privacy, ethics, and model accuracy risks.

**Existential:** The industry might determine who humans become.

There are numerous AI books and papers of varying quality – here are some recommendations:

### Pioneering References

- McCullough & Pitts (1943) – *A Logical Calculus of the Ideas Immanent in Nervous Activity*
- von Neumann (1945) – *First Draft of a Report on the EDVAC*
- Shannon (1948) – *A Mathematical Theory of Communication*
- Hebb (1949) – *The Organization of Behavior: A Neuropsychological Theory*
- Turing (1950) – *Computing Machinery and Intelligence*
- McCarthy *et al.* (1955) – *A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence*
- Rosenblatt (1958) – *The Perceptron: A Probabilistic Model for Information Storage and Organization in the Brain*
- Minsky & Papert (1969) – *Perceptrons: An Introduction to Computational Geometry*
- McClelland & Rumelhart (1986) – *Parallel Distributed Processing: Explorations in the Microstructure of Cognition*

### Historical Development

- Nilsson (2010) – *The Quest for Artificial Intelligence*
- Wooldridge (2020) – *A Brief History of Artificial Intelligence*
- Russell & Norvig (2022) – *Artificial Intelligence: A Modern Approach* (4th Ed.)
- Wade (2023) – *A Brief History of Artificial Intelligence*
- Charniak (2024) – *AI & I: An Intellectual History of Artificial Intelligence*

### Technical References

- Knuth (1997) – *The Art of Computer Programming: Vol. 1 – Fundamental Algorithms* (3<sup>rd</sup> Edition).
- LeCun, Bengio, & Hinton (2015) – *Deep Learning* (Classic Paper in Nature)
- Goodfellow, Bengio, & Courville (2016) - *Deep Learning Book* (“DLB”)
- Haykin (2016) – *Neural Networks and Learning Machines* (3<sup>rd</sup> Edition)
- Patterson & Gibson (2017) - *Deep Learning: A Practitioner’s Approach*
- Aggarwal (2018) - *Neural Networks and Deep Learning*
- Charniak (2018) – *Introduction to Deep Learning*
- Sejnowski (2018) - *The Deep Learning Revolution*
- Kelleher (2019) - *Deep Learning*
- Alpaydin (2021) – *Machine Learning* (Revised & Updated Edition)
- Bengio, LeCun, & Hinton (2021) – *Deep Learning for AI* (Excellent Paper)
- Bernard (2021) – *Introduction to Machine Learning*
- Cormen *et al.* (2022) – *Introduction to Algorithms* (4<sup>th</sup> Edition)
- Wolfram (2023) – *What is ChatGPT Doing . . . and Why Does It Work?*
- Ananthaswamy (2024) – *Why Machines Learn: The Elegant Math Behind Modern AI*
- Bishop & Bishop (2024) – *Deep Learning: Foundations & Concepts* (Excellent Book)
- Sejnowski (2024) – *ChatGPT and the Future of AI: The Deep Language Revolution*

### Famous Literary Books

- Shelley (1818) - *Frankenstein*
- Čapek (1920) – *R.U.R. (Rossum’s Universal Robots)*
- Orwell (1949) - *1984*
- Asimov (1950) – *I, Robot*
- Clarke (1968) – *2001: A Space Odyssey*
- Adams (1979) – *The Hitchhiker’s Guide to the Galaxy*

### Miscellaneous Books

- Kurzweil (2005) – *The Singularity is Near: When Humans Transcend Biology*
- Lee (2018) – *AI Superpowers: China, Silicon Valley, and the New World Order*
- Kissinger, Schmidt, & Huttenlocher (2021) – *The Age of AI and Our Human Future*
- Lee & Quifan (2021) – *AI 2041: Ten Visions for Our Future*
- Suleyman & Bhaskar (2023) – *The Coming Wave: Technology, Power, and the 21<sup>st</sup> Century’s Greatest Dilemma*
- Daugherty & Wilson (2024) – *Human + Machine: Reimagining Work in the Age of AI*
- Kissinger, Mundie, & Schmidt (2024) – *Genesis: Artificial Intelligence, Hope, and the Human Spirit*
- Olson (2024) – *Supremacy: AI, ChatGPT, and the Race That Will Change the World*
- Hoffman & Beato (2025) – *Superagency: What Could Possibly Go Right with Our AI Future*
- Karp & Zamiska (2025) – *The Technological Republic: Hard Power, Soft Belief, And the Future of the West*

Generative AI (Gen AI) will now be discussed. What should we call **AI entities** like ChatGPT? The following are their own answers from April 23, 2025 {Note: **CAL = Charles Allen Liedtke**}:

**ChatGPT (OpenAI) - CAL Prompt:** Is ChatGPT an LLM a chatbot or an AI Assistant?

⌘ Great question — it's actually all three, depending on how you look at it:

1. **LLM (Large Language Model)** — At its core, ChatGPT is powered by a large language model developed by OpenAI (like GPT-4). This is the *underlying* tech — a neural network trained on vast amounts of text to predict and generate human-like language.
2. **Chatbot** — When that LLM is wrapped in a conversational interface (like what you're using right now), it becomes a chatbot. So, when you're chatting with ChatGPT on a website or app, you're interacting with it as a chatbot.
3. **AI Assistant** — When it goes beyond just chat—helping with tasks like writing code, summarizing docs, generating images, booking things (in integrations), or even just keeping up a productive convo—it acts more like an AI assistant. This term emphasizes its *usefulness* rather than its format.

So in short:

- **LLM** = the brain,
- **Chatbot** = the face,
- **AI Assistant** = the job it does. ⌘

**Copilot (Microsoft) - CAL Prompt:** Is Copilot an LLM or a chatbot or an AI assistant?

⌘ Microsoft Copilot is an AI assistant, designed to be a knowledgeable and helpful companion for users. While it leverages large language models (LLMs) to process and generate text, it's more than just an LLM—it incorporates advanced AI capabilities, including web search, image generation, and file analysis, to assist with a variety of tasks. Some might call it a chatbot, but it's much more than just a typical chat interface.

So, in short: I'm an AI assistant powered by LLMs, but I go beyond that with additional smart tools. ⌘

**Gemini (Google/Alphabet) - CAL Prompt:** Is Gemini an LLM a chatbot or an AI Assistant?

⌘ Gemini is best understood as a family of multimodal AI models developed by Google DeepMind. These models are the foundation that powers various applications and services. To answer your question directly:

- **LLM (Large Language Model):** Yes, Gemini is a suite of LLMs. It has been trained on a massive dataset of text and code, enabling it to understand and generate human-like language. Different versions of the Gemini model (like Ultra, Pro, Flash, and Nano) are designed for various capabilities and deployment scenarios.
- **Chatbot:** Yes, the Gemini models power a conversational AI chatbot also named Gemini (formerly known as Bard). This chatbot interacts with users through text and voice, answering questions, generating creative content, and assisting with various tasks. You can access this chatbot via a web interface and mobile apps.
- **AI Assistant:** Yes, Gemini functions as an AI assistant. It aims to help users with a wide range of tasks, including providing information, summarizing text, generating different creative text formats, translating languages, and even assisting with coding. It is being integrated into various Google products and services to enhance their functionality and provide intelligent assistance. For example, it is the default AI assistant on the latest Google Pixel phones.

In summary, Gemini is all three:

- It is a family of Large Language Models (LLMs) at its core.
- It powers the Gemini chatbot, which you can interact with.
- It serves as an AI Assistant, integrated into various Google services to help users.

Think of the Gemini LLM as the engine, and the Gemini chatbot and the AI features in other Google products as applications that utilize this engine to provide assistance to users. ⌘

**Grok (xAI) – CAL Prompt:** Is Grok an LLM or a chatbot or an AI assistant?

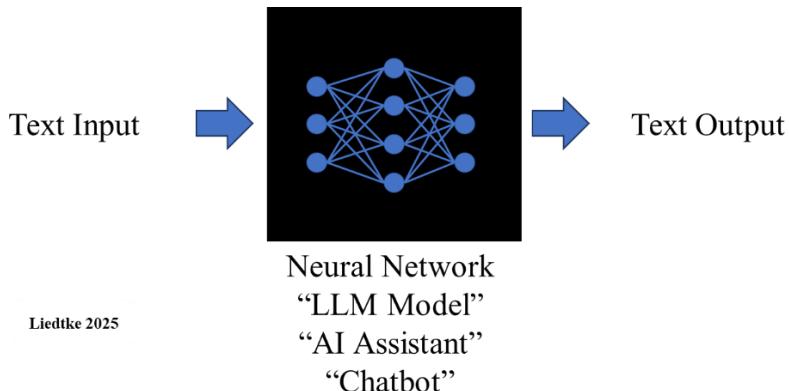
⌘ Grok is all three, depending on how you look at it. It's a large language model (LLM) at its core, built by xAI to process and generate human-like text. It functions as a chatbot when you interact with it conversationally, like on grok.com or the X app. And it's an AI assistant when it helps with tasks, answers questions, or provides insights, often with tools like web search or content analysis. The lines blur, but it's designed to be a versatile conversational AI. ⌘

**Meta AI (Meta) - CAL Prompt:** Is Meta AI an LLM a chatbot or an AI Assistant?

⌘ I'm Meta AI, powered by Llama 4. You can think of me as an AI assistant, here to help with your questions and tasks. Some people might call me a chatbot, but I'm more than that - I can understand and respond to natural language, and I'm designed to be helpful and informative. I'm not just a simple chatbot, but a more advanced tool built on large language models (LLMs) that can generate human-like text and respond to a wide range of topics and questions.

Meta AI Response: I'm Meta AI, powered by Llama 4. You can think of me as an AI assistant, here to help with your questions and tasks. Some people might call me a chatbot, but I'm more than that - I can understand and respond to natural language, and I'm designed to be helpful and informative. I'm not just a simple chatbot, but a more advanced tool built on large language models (LLMs) that can generate human-like text and respond to a wide range of topics and questions. ⌘

A simplistic Gen AI model is depicted in Figure 28 – it shows the scope of this research report.



**Figure 28. Simplistic Gen AI Model – Scope of the Research Report.**

Gen AI has become extremely popular since ChatGPT was released by OpenAI in November of 2022 in part because it is inexpensive, easy to use, and has impressive capabilities. GPT stands for *Generative Pre-Trained Transformer*. There are now several Gen AI Assistants available for almost anyone to use including Alexa+ by Amazon; ChatGPT by OpenAI; Claude by Anthropic; Copilot by Microsoft; DeepSeek R1 by DeepSeek; Gemini by Google (Alphabet); Grok by xAI; Llama by Meta; and Siri by Apple.

Marr (2024) described current Gen AI practices in several areas: media and entertainment; advertising and marketing; retail; personalized learning; healthcare; video game design and testing; law; banking and financial services; and coding and programming. The Harvard Business Review (2024) published a collection of eleven articles on Gen AI titled “Generative AI.” Two articles in particular merit mention: “*A Framework for Picking the Right Generative AI Project*” by Zao-Sanders and Ramos and “*How Generative AI Can Augment Human Creativity*” by Eapen *et al.* The Harvard Business Review (2024) published a Special Issue on “*How to Thrive in a Gen AI World.*” The article by Finkenstadt *et al.* (2023) was on the “*Use of Gen AI to Improve Scenario Planning.*” Zao-Sanders (2024, 2025) presented findings on “how people are using Generative AI.” The 2025 article is a follow-up to the 2024 article and it shows the year-on-year “use changes.” The “Top 10” Gen AI uses reported in the 2025 article (Zao-Sanders, 2025) were the following: (1) Therapy/companionship, (2) Organizing my life, (3) Finding purpose, (4) Enhanced learning, (5) Generating code, (6) Generating ideas, (7) Fun and nonsense, (8) Improving code, (9) Creativity, and (10) Healthier living.

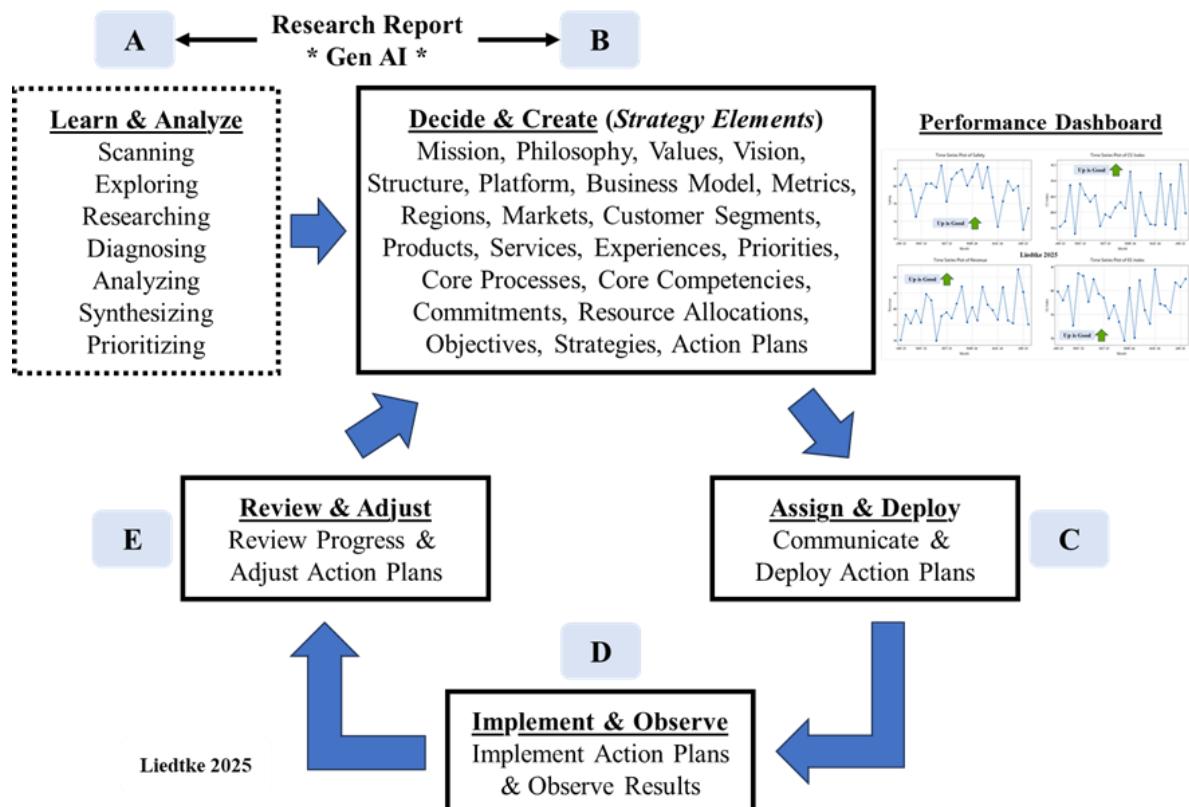
Wolfram (2023) and Sejnowski (2024) contributed in-depth looks at ChatGPT including technical details and thorough explanations of how ChatGPT works. Sejnowski (2024) included numerous conversations with ChatGPT. It is important to remember the cautionary words of Box (1976) when using a model: “Since all models are wrong the scientist must be alert to what is importantly wrong. It is inappropriate to be concerned about mice when there are tigers abroad.” Box is still often quoted as saying, “All models are wrong, but some are useful.” Nobel Prize winner Geoffrey Hinton has publicly expressed numerous times his concerns about AI.

## V. Artificial Intelligence for Strategic Improvement

Numerous AI concepts, models, tools, and techniques can be used during a Strategic Improvement Cycle, but our focus is on the deliberate situation in which Generative AI (Gen AI) (like ChatGPT)—consisting of large language models (LLMs) accessed through prompts that enable dialogue with chatbots—is used by the *Strategists*. We will refer to Gen AI as “AI Strategy Assistants” because of the *strategy* context. The *Strategists* can use AI in general—and Gen AI in particular—individually to improve organizational performance or in combination with other strategic improvement approaches. It was mentioned earlier that AI was defined by the Strategic Management Journal (2024) as “. . . any computer system that perceives its environment (e.g., numerical data, speech, text, and images), learns from past behavior, and takes action to maximize the likelihood of attaining its goals.” We can extract three key activities from the definition:

- Perceives its environment
- Learns from past behavior
- Takes action to maximize likelihood of attaining goals

Ironically, these are the same activities we hope the *Human Strategists* conduct during a Strategic Improvement Cycle which is repeated in Figure 29. It should be remembered that *Strategists* often *perceive their environment and learn in person* (“*I saw it with my own two eyes.*”).



**Figure 29. Strategic Improvement Cycle as Five Phases (Deliberate Situation).**

The Executive Team members—*Strategists*—are ultimately accountable for improving targeted organizational performance metrics. Gen AI's role can range from a *limited role* (“Gen AI in the Back Seat of the Car”) to an *extensive role* (“Gen AI Driving the Car” like Waymo). We will now discuss how Gen AI can be used during Phase A and Phase B of the Strategic Improvement Cycle. Phase A consists of “Learning & Analyzing” and Phase B consists of “Deciding & Creating.” Phases C, D, & E are out of scope for this research report. Here are the Five Phases:

### **Strategic Improvement Cycle – Five Phases**

**Phase A: Learn & Analyze (In Scope):** The primary purpose of Phase A is for the *Strategists* to learn about the organization and its environment through various forms of analysis (“*identifying the dots*”) and synthesis (“*connecting the dots*”). This often involves the *Strategists* conducting some of the work in person (e.g., touring a facility or conducting a town hall meeting) versus conducting all the work “in a chair in an office.”

**Phase B: Decide & Create (In Scope):** The primary purpose of Phase B is to make decisions and create *strategy elements* such as mission, philosophy, values, vision, organization structure, business model, platform, product/service/experience portfolio, objectives, and strategies.

**Phase C: Assign & Deploy (Out of Scope)**

**Phase D: Implement & Observe (Out of Scope)**

**Phase E: Review & Adjust (Out of Scope)**

The use of Gen AI chatbots (like ChatGPT) or “Gen AI Strategy Assistants” was chosen for the research because of their prevalence, accessibility, ease of use, and inexpensiveness. These are *dynamic* large language models because they can change over time and some of them have version numbers. Meta’s Llama 4 was just released on April 5, 2025. The specific models used during the research were ChatGPT by OpenAI; Copilot by Microsoft; Gemini by Google (Alphabet); Grok by xAI; and Llama by Meta (“Meta AI”). Their use in the research was in the form of “Question > Answer” which is different than the more active *Agentic AI* which will be discussed later.

In the remainder of this research report will be a combination of the author’s content and content generated by one of the five Gen AI Strategy Assistants (like ChatGPT). Here are some notes:

**Note 1:** “CAL” stands for Charles Allen Liedtke (the author).

**Note 2:** “CAL Prompt:” is a question or command given to a Gen AI Strategy Assistant.

**Note 3:** Content between two “`” symbols is output from a Gen AI Strategy Assistant.

**Note 4:** Version numbers were not always used (e.g., Grok 2 vs. Grok 3).

**Note 5:** The author is not endorsing any AI company or Large Language Model (LLM).

**Note 6:** All content generated by a Gen AI Strategy Assistant requires evaluation before use.

**Note 7:** All Gen AI application cases are for illustrative purposes – they are not prescriptive.

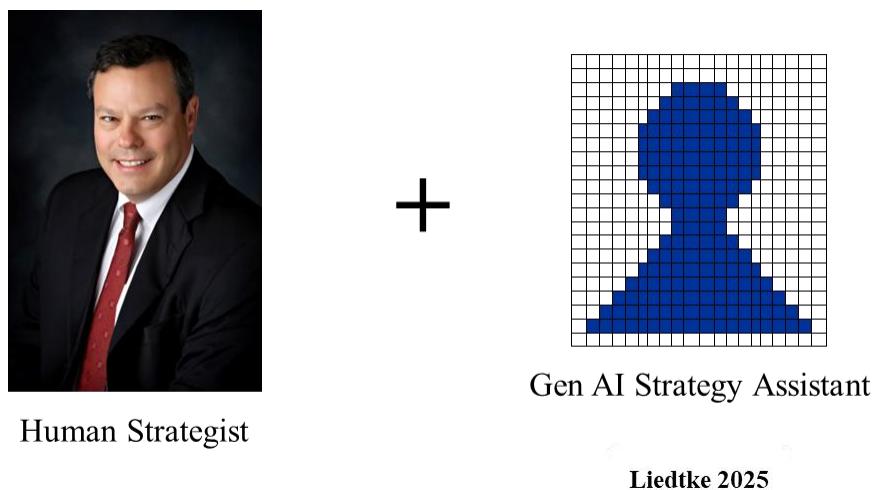
What follows are three sections that show how Gen AI Strategy Assistants can be used during the first two phases of a Strategic Improvement Cycle: (1) Emergent Gen AI Models; (2) Emergent Gen AI Application Cases; and (3) Emergent Gen AI Themes.

## 1. Emergent Gen AI Models

There are numerous ways for how *Human Strategists* can use—and work with—Gen AI Strategy Assistants during a Strategic Improvement Cycle. Three models will now be discussed.

### **Emergent Model #1: One Human Strategist + One Gen AI Strategy Assistant**

Emergent Model #1 consists of one *Human Strategist* who uses one *Gen AI Strategy Assistant*. This model is depicted in Figure 30. The AI Strategy Assistant (LLM) could be ChatGPT (OpenAI), Claude (Anthropic), Copilot (Microsoft), DeepSeek (DeepSeek), Gemini (Google), Grok (xAI), or Llama (Meta) to name just a few of the many alternatives.



**Figure 30. One Human Strategist + One Gen AI Strategy Assistant.**

Here are three of the many possible scenarios for how the work could occur:

- 1) The *Human Strategist* instructs the Gen AI Strategy Assistant to perform a task and then the *Human Strategist* evaluates the output and uses it for decision making and action taking.
- 2) The *Human Strategist* instructs the Gen AI Strategy Assistant to perform a task and then uses the output to stimulate ideas for creating new original content (“*starting point*”).
- 3) The *Human Strategist* and the Gen AI Strategy Assistant perform a task independently and then the outputs are compared before decisions are made and actions are taken.

The three scenarios differ in the following ways:

- Instruction and then evaluation of the output for decision making and organizational action.
- Using the output as a “*starting point*” to enhance an ideation process.
- Independently completing a task (“*replication*”) and then comparing the outputs.

An example of Scenario #2 would be a *Human Strategist* (the author) using Meta AI to summarize the classic *Deep Learning Book* (DLB) by Goodfellow, Bengio, and Courville (2016):

**CAL Prompt:** Please provide a half-page summary of the book *Deep Learning* by Goodfellow, Bengio, and Courville. {**Note:** Opinions vary whether words like “please” should be used.}

⌘ Meta AI (April 17, 2025):

"Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville is a comprehensive textbook on deep learning. Published in 2016, it covers the fundamental concepts, techniques, and applications of deep learning. Here's a summary:

The book is divided into three parts. Part I introduces the basics of deep learning, including linear algebra, probability, and optimization. It also covers traditional neural networks, regularization techniques, and optimization algorithms.

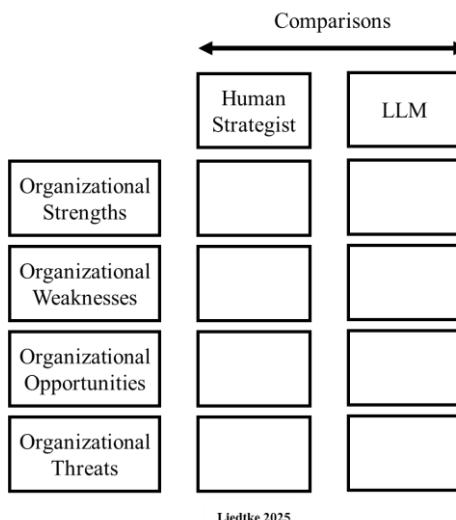
Part II focuses on deep neural networks, including convolutional neural networks (CNNs) for image recognition, recurrent neural networks (RNNs) for sequential data, and long short-term memory (LSTM) networks. It also discusses autoencoders, representation learning, and generative models.

Part III explores advanced topics, such as deep learning for natural language processing, speech recognition, and computer vision. It also covers more complex models like attention mechanisms and memory-augmented networks.

Throughout the book, the authors emphasize the importance of representation learning, where machines learn to represent complex data in a way that's useful for tasks like classification, generation, or prediction. They also highlight the challenges of deep learning, including optimization difficulties, overfitting, and the need for large amounts of labeled data.

Overall, "Deep Learning" provides a thorough introduction to the field, making it a valuable resource for researchers, students, and practitioners. While some sections may feel dated due to the rapid progress in the field, the book remains a foundational text for understanding the principles and techniques of deep learning. ⚡

The task took less than ten seconds to complete and the output is realistic, impressive, and useful. The accuracy of the output cannot be immediately known and so must be used with caution. If the *Human Strategist* and the AI Strategy Assistant completed the task independently, then comparisons could be made. An example for a SWOT—which stands for Strengths, Weaknesses, Opportunities, and Threats—Analysis is shown in Figure 31.



**Figure 31. Comparing SWOT Analysis Outputs.**

## **Potential Benefits & Risks: One *Human Strategist* + One *Gen AI Strategy Assistant***

### **Potential Benefits:**

- The *Human Strategist* can quickly learn about almost any topic.
- The scale and scope of learning is increased.
- The *Human Strategist* is more productive.
- The Gen AI Strategy Assistant can perform various forms of analysis.
- The Gen AI Strategy Assistant can create new “*starting point*” content.
- The Gen AI Strategy Assistant can confirm the *Human Strategist*’s thinking.

### **Potential Risks:**

- The accuracy of the outputs is not immediately known.
- The *Human Strategist* might become lazy – i.e., not growing and developing.
- The *Human Strategist* might not know how the outputs were created or why.
- The *Human Strategist* might become disengaged from the learning process.
- The *Human Strategist* might not acquire any tacit knowledge.
- The *Human Strategist* might use the Gen AI Strategy Assistant too much.
- The *Human Strategist* might abandon critical thinking.
- We don’t know what the Gen AI Strategy Assistant “will say tomorrow.”

## **Emergent Model #2: One *Human Strategist* + Multiple *Gen AI Strategy Assistants***

Emergent Model #2 consists of one *Human Strategist* using multiple Gen AI Strategy Assistants which can be considered a “Panel.” The Gen AI Strategy Assistants could be ChatGPT (OpenAI), Claude (Anthropic), Copilot (Microsoft), DeepSeek (DeepSeek), Gemini (Google), Grok (xAI), or Llama (Meta) to name a few. The model for a panel of three is depicted in Figure 32.



**Figure 32. One *Human Strategist* + Three *Gen AI Strategy Assistants* (Panel).**

**Example 1:** Copilot (Microsoft), ChatGPT (OpenAI), and Grok 3 (xAI) were used to identify the “Top 5” ranked AI-related books by Noam Chomsky. The results appear in Figure 33. There are differences, but all three agreed on the “Top 2” books: “*Syntactic Structures*” (Chomsky, 1957) and “*Aspects of the Theory of Syntax*” (Chomsky, 1965). Seven books were mentioned in total.

March 26, 2025			
CAL Prompt > Please tell me the top five ranked Noam Chomsky books for providing insights into AI.			
	Microsoft - Copilot	OpenAI - ChatGPT	xAI - Grok 3
Number One	Syntactic Structures	Syntactic Structures	Syntactic Structures
Number Two	Aspects of the Theory of Syntax	Aspects of the Theory of Syntax	Aspects of the Theory of Syntax
Number Three	Cartesian Linguistics	Cartesian Linguistics	The Minimalist Program
Number Four	The Minimalist Program	The Chomsky Reader	Language and Mind
Number Five	Language and Mind	Language and Mind	Reflections on Language
<b>Summary of Results</b>			
<u>Noam Chomsky Books</u>	<u>Rankings</u>		
Syntactic Structures	1, 1, 1		
Aspects of the Theory of Syntax	2, 2, 2		
Cartesian Linguistics	3, 3, 0		
The Minimalist Program	4, 0, 3		
Language and Mind	5, 5, 4		
The Chomsky Reader	0, 4, 0		
Reflections on Language	0, 0, 5		

**Figure 33. “Top Five” Noam Chomsky Books Related to AI.**

**Example 2:** Copilot (Microsoft), ChatGPT (OpenAI), and Grok 3 (xAI) were used to identify the five most vital rare-earth minerals for AI. The results appear in Figure 34. All three AI Strategy Assistants agree on the “Top 2” rare-earth minerals: Neodymium (Nd) and Dysprosium (Dy). Six different rare-earth minerals were mentioned.

March 24, 2025			
CAL Prompt > Please tell me the five most vital rare-earth minerals for AI.			
	Microsoft - Copilot	OpenAI - ChatGPT	xAI - Grok 3
Number One	Neodymium (Nd)	Neodymium (Nd)	Neodymium (Nd)
Number Two	Dysprosium (Dy)	Dysprosium (Dy)	Dysprosium (Dy)
Number Three	Praseodymium (Pr)	Terbium (Tb)	Praseodymium (Pr)
Number Four	Yttrium (Y)	Lanthanum (La)	Terbium (Tb)
Number Five	Lanthanum (La)	Yttrium (Y)	Yttrium (Y)
<b>Summary of Results</b>			
<u>Rare-Earth Mineral</u>	<u>Rankings</u>		
Neodymium (Nd)	1, 1, 1		
Dysprosium (Dy)	2, 2, 2		
Praseodymium (Pr)	3, 0, 3		
Yttrium (Y)	4, 5, 5		
Lanthanum (La)	5, 4, 0		
Terbium (Tb)	0, 3, 4		

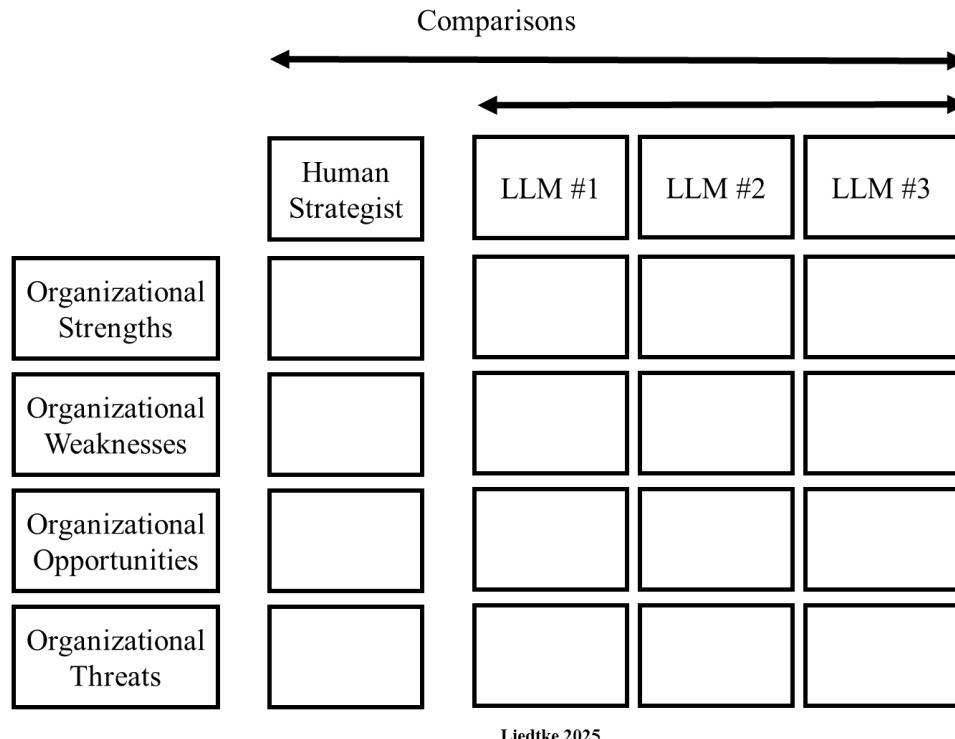
**Figure 34. “Top 5” Rare-Earth Minerals for AI.**

**Example 3:** Copilot (Microsoft) and ChatGPT (OpenAI) were used to identify the “Top 5” ranked Critical Success Factors for a dental practice that specializes in wisdom teeth extraction. The results appear in Figure 35. We notice differences which suggests a person should consider using more than one AI Strategy Assistant. The differences might give the *Strategist* new insights.

March 28, 2025		
CAL Prompt > What are the Top 5 ranked critical success factors for a dental practice that specializes in wisdom teeth extraction?		
	Microsoft - Copilot	OpenAI - ChatGPT
Number One	Comprehensive Pre-Operative Assessments	Maintain a Sterile Surgical Environment
Number Two	Advanced Surgical Techniques	Optimize Patient Preparation and Communication
Number Three	Patient Education and Communication	Implement Effective Pain Management Strategies
Number Four	Efficient Practice Management	Streamline Appointment Scheduling and Patient Intake
Number Five	Compassionate Care	Foster a Skilled and Cohesive Team

**Figure 35. “Top Five” Critical Success Factors for a Specialized Dental Practice.**

All the tasks took less than ten seconds to complete and the outputs are realistic and useful. The accuracy of the outputs cannot be immediately known and so they must be used with caution. If the *Human Strategist* and the AI Strategy Assistants completed the tasks independently, then comparisons could be made. An example for a SWOT Analysis is shown in Figure 36.



**Figure 36. Comparing SWOT Analysis Outputs.**

## **Potential Benefits & Risks: One *Human Strategist* + Three *Gen AI Strategy Assistants***

**Potential Benefits:**

- The *Human Strategist* can quickly learn about almost any topic.
- The scale and scope of learning is increased.
- The *Human Strategist* is more productive.
- The Gen AI Strategy Assistants can perform various forms of analysis.
- The Gen AI Strategy Assistants can create new “*starting point*” content.
- The Gen AI Strategy Assistants can confirm the *Human Strategist*’s thinking.
- The use of multiple Gen AI Strategy Assistants increases the data scope. \***
- The use of multiple AI Strategy Assistants allows for comparisons. \***

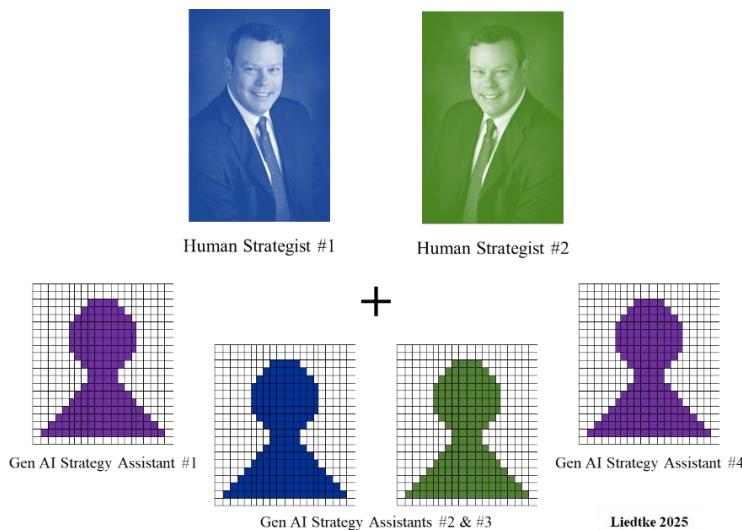
**Potential Risks:**

- The accuracy of the outputs is not immediately known.
- The *Human Strategist* might become lazy – i.e., not growing and developing.
- The *Human Strategist* might not know how the outputs were created or why.
- The *Human Strategist* might become disengaged from the learning process.
- The *Human Strategist* might not acquire any tacit knowledge.
- The *Human Strategist* might use the Gen AI Strategy Assistant too much.
- The *Human Strategist* might abandon critical thinking.
- We don’t know what the Gen AI Strategy Assistants “will say tomorrow.”
- Differences between the outputs might be difficult to interpret. \***
- Consistency amongst the outputs doesn’t mean they represent “the truth.” \***
- More time consuming and potentially more expensive than Model #1. \***

**Note:** A “\*” means something different than Emergent Model #1.

## **Emergent Model #3: Multiple *Human Strategists* + Multiple *Gen AI Strategy Assistants***

Emergent Model #3 consists of multiple *Human Strategists* (two in this case) using multiple Gen AI Strategy Assistants (a “Panel” of four in this case). The Gen AI Strategy Assistants could be ChatGPT (OpenAI), Claude (Anthropic), Copilot (Microsoft), DeepSeek (DeepSeek), Gemini (Google), Grok (xAI), or Llama (Meta) to name a few. The model is depicted in Figure 37.



**Figure 37. Two *Human Strategists* + Four *Gen AI Strategy Assistants* (“Panel”).**

**Example:** Four Gen AI Strategy Assistants were used to define AI. The outputs follow:

**CAL Prompt: Please define Artificial Intelligence in one paragraph.**

**Grok 3 (xAI): April 13, 2025**

⌘ Artificial Intelligence (AI) refers to the development of computer systems that can perform tasks typically requiring human intelligence, such as learning, problem-solving, decision-making, and perception. By leveraging algorithms, data, and computational power, AI enables machines to analyze patterns, adapt to new information, and execute actions with varying degrees of autonomy. From narrow applications like image recognition to broader ambitions like general reasoning, AI aims to replicate or augment cognitive abilities, often raising questions about efficiency, ethics, and societal impact. ⌘

**CAL Prompt: Please define Artificial Intelligence in one paragraph.**

**ChatGPT (OpenAI): April 13, 2025**

⌘ Artificial Intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think, learn, and make decisions. It encompasses a wide range of technologies and techniques, including machine learning, natural language processing, computer vision, and robotics, enabling systems to perform tasks that typically require human cognition—such as recognizing speech, understanding language, solving problems, and adapting to new situations. AI systems improve over time through data-driven learning, and their applications span across industries, from healthcare and finance to transportation and entertainment. ⌘

**CAL Prompt: Please define Artificial Intelligence in one paragraph.**

**Copilot (Microsoft): April 13, 2025**

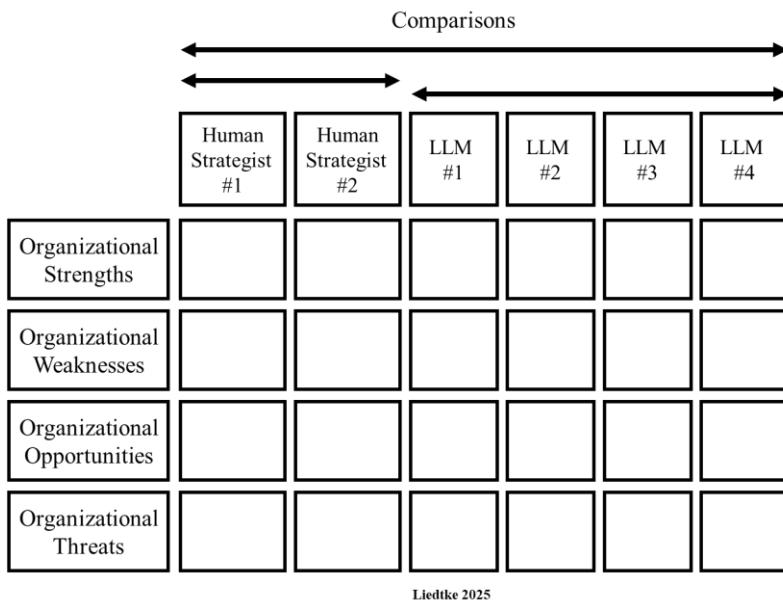
⌘ Artificial Intelligence (AI) refers to the development of computer systems that can perform tasks typically requiring human intelligence. These tasks include learning from data, recognizing patterns, solving problems, understanding language, and making decisions. AI is powered by algorithms and models, such as machine learning and deep learning, that enable computers to adapt and improve over time without explicit programming. AI is widely used across industries, from healthcare and finance to entertainment and autonomous vehicles, enhancing efficiency and innovation. While AI continues to evolve, its ethical implications—such as bias, privacy, and job displacement—remain key topics of discussion. ⌘

**CAL Prompt: Please define Artificial Intelligence in one paragraph.**

**Llama 4 (Meta): April 13, 2025**

⌘ Artificial Intelligence (AI) refers to the development of computer systems that can perform tasks that typically require human intelligence, such as learning, problem-solving, decision-making, and perception. These systems use algorithms and data to make predictions, classify objects, generate insights, and interact with humans in a way that simulates intelligent behavior. AI can range from simple systems that perform specific tasks, like image recognition or language translation, to more complex systems that can learn and adapt over time, like self-driving cars or personal assistants. ⌘

The Gen AI Strategy Assistant tasks took less than ten seconds to complete and the outputs were realistic and useful. The outputs can be easily compared—they are all similar, yet each has its own unique content. None of the definitions necessarily represent the “true” or “correct” definition of AI, but we are now able to identify differences which can provide unique insights into the phenomenon of interest—in this case AI. If the *Human Strategists* defined AI independently, then additional comparisons could be made. An example for a SWOT Analysis is shown in Figure 38.



**Figure 38. Comparison Opportunities for SWOT Analyses.**

**Potential Benefits & Risks: Two *Human Strategists* + Four *Gen AI Strategy Assistants***

**Potential Benefits:**

- The *Human Strategist* can quickly learn about almost any topic.
- The scale and scope of learning is increased.
- The *Human Strategist* is more productive.
- The Gen AI Strategy Assistants can perform various forms of analysis.
- The Gen AI Strategy Assistants can create new “*starting point*” content.
- The Gen AI Strategy Assistants can confirm the *Human Strategist*’s thinking.
- The use of multiple Gen AI Strategy Assistants increases the data scope.
- The use of multiple AI Strategy Assistants allows for comparisons.
- More *Human Strategists* to conduct the work (greater bandwidth). \***
- More comparisons: Human-to-Human, LLM-to-LLM, Human-to-LLM. \***

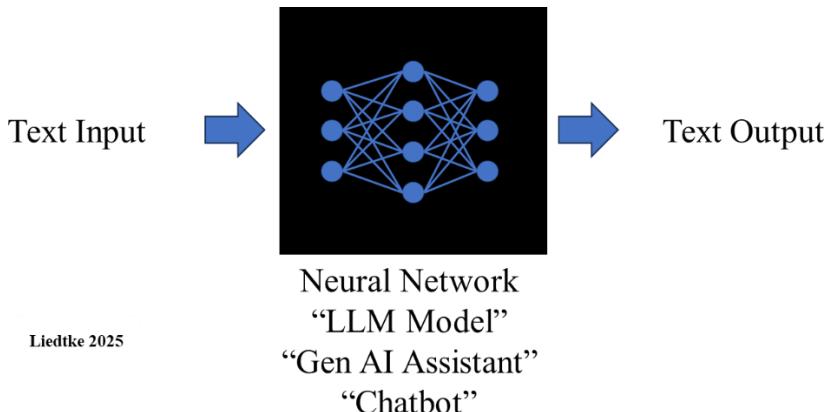
**Potential Risks:**

- The accuracy of the outputs is not immediately known.
- The *Human Strategist* might become lazy – i.e., not growing and developing.
- The *Human Strategist* might not know how the outputs were created or why.
- The *Human Strategist* might become disengaged from the learning process.
- The *Human Strategist* might not acquire any tacit knowledge.
- The *Human Strategist* might use the Gen AI Strategy Assistant too much.
- The *Human Strategist* might abandon critical thinking.
- We don’t know what the Gen AI Strategy Assistants “will say tomorrow.”
- Differences between the outputs might be difficult to interpret.
- Consistency amongst the outputs doesn’t mean they represent “the truth.”
- More time consuming and potentially more expensive than Models #1 & #2. \***
- Interpreting differences might be difficult because of all the comparisons. \***
- Greater opportunity for role confusion. \***

**Note:** A “\*” means something different than Emergent Models #1 & #2.

## 2. Emergent Gen AI Application Cases

Several Gen AI Strategy Assistant examples were already shown: Self-Identification of Gen AI Entities (5 LLMs); Summarization of the Deep Learning Book (1 LLM); Identification of the “Top 5” AI-Related Chomsky Books (3 LLMs); Identification of the “Top 5” Rare-Earth Minerals (3 LLMs); Identification of Critical Success Factors for a Specialized Dental Practice (2 LLMs); and Definition of AI (4 LLMs). The simplistic Gen AI model is repeated in Figure 39.



**Figure 39. Simplistic Gen AI Model – Scope of the Application Cases.**

What follows are twenty Gen AI application cases categorized by the nature of the task: Researched, Compared, Analyzed, and Created. Five Gen AI Strategy Assistants were used: ChatGPT, Copilot, Gemini, Grok, & Meta AI. The application cases are shown in Figure 40.

#	Application Cases
1	Researched Agentic AI at a technology company.
2	Researched an organization's decision to go public.
3	Researched the top three ranked firms in an industry.
4	Researched the five best AI laboratories in the world.
5	Researched the top two issues facing small independent bookstores.
6	Compared two annual documents for the profound differences.
7	Compared the AI courses taught at leading U.S. and Chinese universities.
8	Conducted a "Theory of the Business" Analysis for an AI company.
9	Conducted a Stakeholder Analysis for an AI startup company.
10	Conducted a "Five Forces Model" Analysis for an AI company.
11	Conducted a "Survival Likelihood" Analysis for an AI startup.
12	Conducted a "Survival Likelihood" Analysis for a new flower shop.
13	Conducted a SWOT Analysis for a technology company.
14	Conducted a Competitive Analysis for two AI companies.
15	Conducted a "Playing to Win" Analysis for a vehicle manufacturer.
16	Conducted a Scenario Analysis for an AI organization.
17	Created a Balanced Scorecard Framework for an AI organization.
18	Created actions to address the most important Critical Success Factor.
19	Created a Marketing Plan for a new small flower shop.
20	Created a Business Plan for a specialty dental practice.

**Figure 40. Twenty Gen AI Application Cases.**

## **Application Case #1: Researched Agentic AI at a technology company.**

**CAL Introduction:** *Strategists* often research topics of interest during a Strategic Improvement Cycle. This application case shows how Gen AI can be used to research a specific AI topic—Agentic AI in this case—at a leading technology company in Salesforce. The accuracy of the response cannot be known without verification and so the content must be used with caution.

**CAL Prompt:** Please explain how the company Salesforce is using Agentic AI.

**Response: ChatGPT – March 16, 2025**

⌘ Salesforce is increasingly leveraging agentic AI to enhance its customer relationship management (CRM) capabilities and streamline business processes. Agentic AI refers to AI systems that can act autonomously, make decisions, and perform tasks without direct human intervention, often learning and adapting over time. Salesforce has integrated such AI-driven systems into its suite of products, particularly through its Salesforce Einstein platform, which is designed to automate tasks, enhance decision-making, and personalize experiences for customers.

At the heart of Salesforce's agentic AI is Einstein, an advanced AI engine embedded across various Salesforce applications like Sales Cloud, Service Cloud, Marketing Cloud, and Commerce Cloud. Einstein uses machine learning, natural language processing, and predictive analytics to automate complex workflows and optimize decision-making processes. This AI system analyzes vast amounts of customer data, identifies patterns, and generates actionable insights, allowing businesses to better understand their customers and anticipate their needs.

For example, in Sales Cloud, Salesforce's AI models help sales teams by automatically scoring leads, predicting which opportunities are most likely to close, and suggesting the best next actions based on historical data. This autonomous decision-making reduces manual tasks and helps sales representatives focus on high-value activities. Similarly, in Service Cloud, Einstein assists in creating personalized customer service experiences by routing inquiries to the most appropriate agent, automating responses to common queries, and even predicting potential service issues before they occur.

Moreover, agentic AI in Salesforce extends to marketing automation as well. In Marketing Cloud, Einstein helps businesses craft personalized campaigns by analyzing customer behavior and preferences. It autonomously generates targeted content, determines the optimal timing for communications, and tracks campaign performance. This enables businesses to deliver hyper-relevant content that resonates with individual customers, improving engagement and conversion rates.

Through the use of agentic AI, Salesforce empowers businesses to reduce human effort, increase operational efficiency, and make more data-driven decisions. By allowing AI to autonomously handle repetitive tasks and offer real-time insights, companies can enhance customer experiences, improve productivity, and stay competitive in an increasingly complex market. The ongoing evolution of Salesforce's AI capabilities further ensures that businesses will continue to benefit from cutting-edge technology, enabling them to focus on higher-level strategic goals. ⚡

### **Application Case #2: Researched an organization's decision to go public.**

**CAL Introduction:** *Strategists* often want to analyze the strategic decisions that other organizations must make. This application case describes OpenAI's situation of deciding whether to become a public company or not. The accuracy of the response cannot be known without verification and so the content must be used with caution.

**CAL Prompt:** Please summarize in one page the OpenAI plan to go public.

**Response: Copilot – January 19, 2025**

↳ OpenAI, the AI research organization behind ChatGPT, is planning to go public through an Initial Public Offering (IPO). This move is part of its transition from a nonprofit research lab to a for-profit entity. The company recently closed a historic investment round, raising \$6.6 billion at a \$157 billion valuation.

The plan involves converting OpenAI into a Delaware Public Benefit Corporation (PBC), which will allow it to balance shareholder interests, stakeholder interests, and a public benefit interest. This structure will enable OpenAI to raise the necessary capital while continuing its mission to ensure artificial general intelligence (AGI) benefits all humanity.

OpenAI's new CFO, Sarah Friar, who has experience leading listed companies, will play a key role in this transition. The company aims to complete this transition within two years, as required by the terms of its latest funding round.

Going public will provide OpenAI with the liquidity needed to scale its operations and maintain its competitive advantage. The company believes that AI has the potential to become a multi-trillion dollar business, and going public will allow it to tell its story to a broader audience.

In summary, OpenAI's plan to go public is a strategic move to secure the necessary resources to advance its mission and ensure the responsible and equitable development of AI technology. ↳

### **Application Case #3: Researched the top three ranked firms in an industry.**

**CAL Introduction:** *Strategists* often want to benchmark “*the best.*” This application case shows an example of using Gen AI for benchmarking. The accuracy of the response cannot be known without verification and so the content must be used with caution.

**CAL Prompt:** Can you identify the top three ranked management consulting firms in the world and explain why they are excellent in a half page?

**Response: Gemini – April 21, 2025**

⌘ The top three management consulting firms in the world, often referred to as the "MBB," are McKinsey & Company, Boston Consulting Group (BCG), and Bain & Company. They consistently rank highest in prestige, revenue, and influence, advising a significant portion of the Fortune 500 companies and other prominent organizations globally. Here's why they are considered excellent:

1. McKinsey & Company:

- Prestige and Reputation: McKinsey has held the top position in prestige for many years and is widely considered the gold standard in the industry. Its long history, influential clientele (including a significant portion of the Fortune 1000), and the large number of alumni who have become CEOs of major corporations contribute to this reputation.
- Global Reach and Expertise: With a vast global network of offices and a large number of highly skilled consultants, McKinsey offers deep expertise across various industries and functions. This allows them to provide tailored and innovative solutions to complex business challenges worldwide.
- Commitment to Excellence: McKinsey is known for its rigorous problem-solving approach, data-driven insights, and commitment to delivering impactful results for its clients. The firm invests heavily in research and knowledge development, ensuring its consultants have access to the latest thinking and methodologies.

2. Boston Consulting Group (BCG):

- Intellectual Leadership and Innovation: BCG is renowned for its innovative thinking and contributions to management theory, such as the growth-share matrix. The firm fosters an intellectual and academic culture, encouraging consultants to develop novel perspectives and solutions for clients.
- Strong Industry and Functional Expertise: BCG has developed deep expertise across a wide range of industries and functional areas. They are particularly recognized for their capabilities in digital transformation, technology, and strategy.
- Global Presence and Collaborative Culture: With a significant global footprint, BCG effectively serves clients across numerous markets. The firm is also known for its collaborative and team-oriented culture, fostering strong working relationships both internally and with clients.

3. Bain & Company:

- Client-Centric and Results-Oriented Approach: Bain distinguishes itself through its strong client focus and commitment to achieving measurable results. They prioritize building long-term relationships and often align their fees with client outcomes, demonstrating a deep dedication to client success.
- Expertise in Private Equity: Bain holds a leading position in private equity consulting, providing critical support for due diligence, portfolio management, and exit strategies. This specialization in a high-value sector contributes significantly to its success.
- Collaborative Culture and Practical Solutions: Bain fosters a uniquely collaborative and less hierarchical culture compared to its peers. They are known for their practical approach, focusing on turning strategic decisions into actionable plans and delivering tangible impact.

In summary, these three firms excel due to their strong reputations, global reach, deep industry and functional expertise, commitment to delivering results, and ability to attract and retain top talent. While each has its distinct culture and areas of emphasis, they all provide high-value strategic advice and management consulting services to leading organizations worldwide. ⚡

### **Application Case #4: Researched the five best AI laboratories in the world.**

**CAL Introduction:** This is another example of how Gen AI can be used for benchmarking. The “Top 5” AI laboratories in the world are identified and briefly explained. The accuracy of the response cannot be known without verification and so the content must be used with caution.

**CAL Prompt:** Please write a one-page report that briefly describes the five best AI Laboratories in the world.

**Response: Copilot – December 18, 2024**

⌘ Sure! Here's a brief report on some of the best AI laboratories in the world:

#### **Best AI Laboratories in the World**

Artificial Intelligence (AI) research is a rapidly evolving field, with numerous laboratories around the globe pushing the boundaries of what's possible. Here are some of the top AI research labs:

##### **1. DeepMind (UK)**

Owned by Alphabet (Google's parent company), DeepMind is renowned for its groundbreaking work, including the development of AlphaGo, which defeated the world's best Go players. DeepMind continues to focus on solving humanity's biggest scientific problems, such as protein folding.

##### **2. OpenAI (USA)**

Founded by Elon Musk and others, OpenAI is known for its cutting-edge research in AI and machine learning. It has made significant contributions to natural language processing and has developed models like GPT-3, which powers many AI applications today.

##### **3. Facebook AI Research (FAIR) (USA)**

Established in 2013, FAIR has quickly become one of the most influential AI research labs. It is widely recognized for its work in developing cutting-edge NLP models and open-source technologies, such as Llama.

##### **4. The Alan Turing Institute (UK)**

Named after the famous mathematician, this institute focuses on data science and AI research. It collaborates with 13 universities and the UK Engineering and Physical Science Research Council to advance AI research and address ethical issues in AI use.

##### **5. MIT Media Lab (USA)**

The MIT Media Lab is known for its interdisciplinary approach to AI research. It brings together researchers from diverse fields to explore the human and social implications of AI, working towards creating a transformative future.

These laboratories are at the forefront of AI research, driving innovation and shaping the future of technology. Their work spans various domains, from healthcare and finance to social good and scientific discovery. ⌘

**Application Case #5: Researched the top two issues facing small independent bookstores.**

**CAL Introduction:** *Strategists* often want to identify the major issues facing their organization and then generate ideas for how to address those issues. This application case shows how Gen AI can be used to identify major issues and start developing solutions to address them. The accuracy of the response cannot be known without verification and so the content must be used with caution.

**CAL Prompt:** Can you describe in a half page the top two issues facing a small independent bookstore in rural Minnesota and what the bookstore owner can do to address each of those issues?

**Response: Grok – April 22, 2025**

✿ Top Issues for a Small Independent Bookstore in Rural Minnesota

1. Limited Customer Base Due to Rural Location

In rural Minnesota, a small independent bookstore often struggles with a limited local population, reducing foot traffic and sales potential. The sparse demographic can make it challenging to sustain consistent revenue, especially when competing with online retailers offering lower prices and vast selections.

Solution: The bookstore owner can expand their reach by establishing an online presence. Creating a simple e-commerce website or selling through platforms like Bookshop.org allows the store to serve customers beyond the local area. Additionally, hosting virtual events, such as author talks or book clubs via Zoom, can engage a broader audience. Marketing these efforts through social media and local community boards can attract regional book lovers, while offering unique, curated selections or local interest titles can differentiate the store from larger competitors.

2. Financial Pressures from High Operating Costs

Operating a physical bookstore involves significant expenses, including rent, utilities, and inventory costs, which can strain finances in a low-margin industry. In a rural setting, where sales volumes are lower, these costs can quickly erode profitability, especially with competition from discounted online retailers.

Solution: To mitigate financial pressures, the owner can diversify revenue streams. Hosting paid events, such as writing workshops, literary readings, or children's story hours, can generate additional income while fostering community engagement. Partnering with local businesses, like cafes or schools, for cross-promotional events can reduce costs and increase visibility.

Additionally, applying for grants or crowdfunding campaigns aimed at supporting small businesses or cultural initiatives can provide financial relief, allowing the store to invest in inventory or marketing without overextending its budget. ✿

## **Application Case #6: Compared two annual documents for the profound differences.**

**CAL Introduction:** *Strategists* commonly need to know what changed year-on-year related to some phenomenon of interest. This application case shows how Gen AI can be used to identify “profound year-on-year differences” in a reputable annual AI document. The accuracy of the response cannot be known without verification and so the content must be used with caution.

**CAL Prompt:** Can you identify the top three profound differences between the AI Index Report 2024 and the AI Index Report 2025 published by Stanford?

**Response: ChatGPT – April 22, 2025**

⌘ The Stanford Institute for Human-Centered Artificial Intelligence (HAI) released the AI Index Report 2025 on April 8, 2025, building upon the 2024 edition. While both reports offer comprehensive insights into the state of artificial intelligence, several key differences highlight the evolving landscape of AI development, deployment, and governance.

### 1. Geopolitical Shifts and Global Competition

- 2024 Report: The United States led in producing notable AI models, with 61 models originating from U.S.-based institutions, compared to China's 15 and the European Union's 21.
- 2025 Report: China has significantly narrowed the gap, producing models that rival top U.S. models despite facing export restrictions. China now leads in AI publications and patent filings, indicating a shift towards a more competitive global AI race.

### 2. Advancements in AI Performance and Benchmarking

- 2024 Report: AI surpassed human performance in specific tasks like image classification and English understanding but lagged in areas such as competition-level mathematics and visual commonsense reasoning.
- 2025 Report: AI systems have made significant strides, with performance improvements of 18.8, 48.9, and 67.3 percentage points on new benchmarks like MMMU, GPQA, and SWE-bench. Additionally, language model agents have outperformed humans in programming tasks under time constraints.

### 3. Evolution of Responsible AI Practices

- 2024 Report: Highlighted the lack of standardized methods to measure responsible AI, hindering businesses and users in choosing suitable AI providers.
- 2025 Report: Introduced new benchmarks like HELM Safety, AIR-Bench, and FACTS to assess AI safety and factuality. While companies have recognized responsible AI risks, there remains a gap in implementing meaningful actions. Governments, however, have shown increased urgency, with global cooperation on AI governance intensifying.

These differences underscore the rapid advancements and shifting dynamics in the AI field, highlighting the need for continuous monitoring and adaptation to emerging trends and challenges. ⌘

### **Application Case #7: Compared AI courses taught at leading U.S. and Chinese universities.**

**CAL Introduction:** *Strategists* find it useful to compare different countries, industries, businesses, etc. This application case shows how Gen AI can be used to compare the AI courses taught at leading U.S. and Chinese universities. The accuracy of the response cannot be known without verification and so the content must be used with caution.

**CAL Prompt:** Can you tell me in a half page the differences in the AI courses taught at leading U.S. and Chinese AI universities?

**Response: Grok 3 – April 21, 2025**

⌘ Leading U.S. and Chinese universities offer robust AI curricula but differ in structure, focus, and delivery. U.S. institutions like Stanford, MIT, and Carnegie Mellon emphasize a broad, research-driven approach, integrating AI with computer science, ethics, and interdisciplinary applications. Courses often cover machine learning, natural language processing, and AI safety, with flexible electives and hands-on projects. For example, Harvard's CS50 AI course is beginner-friendly and globally accessible. U.S. programs prioritize innovation, critical thinking, and attracting international talent, supported by strong industry ties and diverse funding.

In contrast, Chinese universities such as Tsinghua, Peking, and Zhejiang University align AI education with national strategic goals, emphasizing rapid talent development and industry integration. Since 2018, China has approved AI majors at over 345 universities, often incorporating mandatory AI education in high schools. Courses focus on practical applications like robotics, computer vision, and big data, with less emphasis on ethics. Centralized oversight ensures uniformity, but curricula may lag in cutting-edge theory due to a research-heavy faculty focus. Industry partnerships with firms like Alibaba and DeepSeek enhance practical training, though teaching quality can vary, especially in under-resourced regions. ⌘

### **Application Case #8: Conducted a “Theory of the Business” Analysis for an AI company.**

**CAL Introduction:** Peter Drucker's (1994) paper on “The Theory of the Business” is a classic and provides a framework for thinking about how to position an organization in its environment from a strategic perspective. This is sometimes the task of the *Strategists* during a Strategic Improvement Cycle. This application case shows how Gen AI can be used to conduct a “Theory of the Business” Analysis. The accuracy of the response cannot be known without verification and so the content must be used with caution.

**CAL Prompt:** Can you create a half page theory of the business analysis by Peter Drucker for the company xAI?

**Response: ChatGPT – April 21, 2025**

⌘ Sure! Here's a half-page "Theory of the Business" analysis based on Peter Drucker's framework, tailored for xAI, the AI company founded by Elon Musk:

#### **Theory of the Business Analysis for xAI (based on Peter Drucker's Framework)**

xAI's theory of the business rests on three foundational assumptions: the **environment**, the **mission**, and the **core competencies**.

**Environmentally**, xAI operates under the belief that society will increasingly demand transparent, controllable AI systems aligned with human values. It assumes the public and regulatory sentiment will continue to shift toward greater scrutiny of "black box" models and centralized AI control, giving rise to opportunities for open-source and explainable alternatives.

**The mission** of xAI is to develop artificial intelligence that is maximally curious, truth-seeking, and beneficial to humanity, while also serving as a counterbalance to perceived monopolistic control by other tech giants. This purpose informs everything from its focus on open-source development to its integration with platforms like X (formerly Twitter), creating direct channels for AI-human interaction.

**Core competencies** include access to immense real-time data from X, deep integration with Tesla's and SpaceX's AI capabilities, and the leadership of Elon Musk, whose vision attracts top talent and investment. These assets enable rapid iteration, model training at scale, and a unique cultural edge in the competitive AI landscape.

For xAI to succeed long-term, its assumptions must remain valid. Any major shifts—such as regulatory crackdowns, failures in public trust, or misalignments between mission and execution—could challenge its foundational theory and demand a strategic reassessment. ⌘

### **Application #9: Conducted a Stakeholder Analysis for an AI startup company.**

**CAL Introduction:** Strategists often need to understand an issue, opportunity, or strategic decision from the viewpoint of multiple stakeholders. This application case shows how Gen AI can be used to conduct a Stakeholder Analysis for an AI startup company in Safe Superintelligence. The accuracy of the response cannot be known without verification and so the content must be used with caution.

**CAL Prompt:** Please conduct a half-page Stakeholder Analysis for the Safe Superintelligence company.

**Response: Meta AI – April 17, 2025**

⌘ Here's a concise Stakeholder Analysis for Safe Superintelligence company:

#### **Stakeholders:**

1. **Founders/Developers:** High interest and influence. They drive the company's mission to develop safe superintelligence.
2. **Investors:** High influence, moderate interest. They provide funding, expecting returns and impact.
3. **Users/Beneficiaries:** Moderate interest, low influence. They'll utilize superintelligence for various applications.
4. **Regulators/Governments:** High influence, moderate interest. They'll shape policies and regulations around AI development.
5. **AI Ethics Community:** Moderate influence, high interest. They'll scrutinize the company's methods and impact.
6. **General Public:** Low influence, high interest. They're concerned about AI's societal implications.

#### **Key Concerns:**

- Balancing safety and capability
- Transparency and accountability
- Regulatory compliance
- Public trust and acceptance

This analysis highlights key stakeholders and their interests, influencing the company's strategy and decision-making. ⌘

## **Application Case #10: Conducted a “Five Forces Model” Analysis for an AI company.**

**CAL Introduction:** Michael Porter’s (1980) “Five Forces Model” provides a framework for analyzing an industry. *Strategists* still use this model today. This application case shows how Gen AI can be used to conduct a “Five Forces Model” Analysis for an AI organization in OpenAI. The accuracy of the response cannot be known without verification and so the content must be used with caution.

**CAL Prompt:** Please conduct a "Michael Porter Five Forces Model Analysis" for OpenAI and report the results in one page.

**Response: Copilot – April 3, 2025**

⌘ Certainly! Here's a **Michael Porter Five Forces Model Analysis** for OpenAI:

Porter's Five Forces Analysis of OpenAI

OpenAI operates in the rapidly evolving artificial intelligence (AI) industry, facing intense competition and unique market dynamics. Below is an analysis of OpenAI using Michael Porter's Five Forces Model:

### **1. Industry Rivalry (High)**

The AI industry is highly competitive, with major players such as Google (DeepMind), Meta, Microsoft, and Amazon investing heavily in AI research and development. OpenAI competes for talent, computational resources, and market share, making rivalry a strong force.

### **2. Threat of New Entrants (Moderate)**

While AI development requires significant capital investment, expertise, and infrastructure, new entrants—especially startups—continue to emerge. OpenAI's brand recognition and partnerships (e.g., with Microsoft) provide a competitive edge, but the industry remains open to innovation.

### **3. Bargaining Power of Suppliers (High)**

OpenAI relies on high-performance computing resources, primarily provided by \*\*NVIDIA (GPUs) and cloud services like Microsoft Azure. The limited number of suppliers for AI hardware and cloud computing increases their bargaining power.

### **4. Bargaining Power of Buyers (Moderate)**

Businesses and consumers increasingly adopt AI-powered solutions, but OpenAI faces competition from alternative AI models and services. While OpenAI's products (e.g., ChatGPT, DALL·E) are widely used, customers can switch to competitors, giving them moderate bargaining power.

### **5. Threat of Substitutes (Low to Moderate)**

AI models like Google Bard, Anthropic's Claude, and Meta's AI tools\*\* serve as substitutes. However, OpenAI's unique offerings and continuous innovation help mitigate this threat.

## **Conclusion**

OpenAI operates in a highly competitive industry with strong rivalry and supplier power. While barriers to entry exist, new players continue to emerge. OpenAI's strategic partnerships, technological advancements, and brand strength help it maintain a leading position in AI. ⌘

## **Application Case #11: Conducted a “Survival Likelihood” Analysis for an AI startup.**

**CAL Introduction:** *Strategists* sometimes want to know the viability of an organization. This application case shows how Gen AI can be used to conduct a “Survival Likelihood” Analysis for an AI startup. The accuracy of the response cannot be known without verification and so the content must be used with caution.

**CAL Prompt:** Describe the survival likelihood for the **AI Startup Company X** (disguised).

**Response: Llama 4 (Meta AI) – April 5, 2025**

### **⌘ Assessing the Likelihood of AI Startup Company X’s Survival**

**AI Startup Company X**, a pioneering organization in the field of artificial intelligence, faces an uncertain future. To evaluate its likelihood of survival, let's consider several key factors:

#### **Strengths:**

- **Innovative Research:** **AI Startup Company X** has a strong track record of producing cutting-edge research in AI, with a focus on developing novel algorithms and applications.
- **Talented Team:** The organization boasts a team of skilled researchers and engineers, many of whom are leaders in their field.
- **Collaborations:** **AI Startup Company X** has established partnerships with prominent institutions and industry players, providing access to resources and expertise.

#### **Weaknesses:**

- **Funding:** As a research-focused organization, **AI Startup Company X** relies heavily on grants, donations, and partnerships to sustain its operations. Securing consistent funding can be challenging.
- **Competition:** The AI research landscape is increasingly crowded, with many organizations and institutions vying for talent, resources, and attention.
- **Sustainability:** **AI Startup Company X**’s business model, which is largely based on research grants and partnerships, may not be sustainable in the long term.

#### **Opportunities:**

- **Growing Demand for AI:** The demand for AI research and development is on the rise, driven by industries such as healthcare, finance, and transportation.
- **Diversification:** **AI Startup Company X** could explore new areas of research, such as applications of AI in social good or environmental sustainability.
- **Strategic Partnerships:** Forming alliances with industry leaders or other research organizations could provide access to new resources and opportunities.

#### **Threats:**

- **Funding Cuts:** A decline in funding or a shift in government priorities could significantly impact **AI Startup Company X**’s operations.
- **Brain Drain:** The organization's researchers and engineers may be poached by better-funded institutions or companies.
- **Reputation:** Any perceived failures or controversies could damage **AI Startup Company X**’s reputation and impact its ability to attract funding and talent.

#### **Likelihood of Survival: 60%**

Given these factors, **AI Startup Company X**’s likelihood of survival is moderate. While the organization has a strong foundation in innovative research and talented personnel, its reliance on funding and partnerships creates uncertainty. To increase its chances of survival, **AI Startup Company X** should focus on diversifying its revenue streams, exploring new research areas, and cultivating strategic partnerships. By adapting to the changing AI landscape and addressing its weaknesses, **AI Startup Company X** can improve its prospects for long-term sustainability. ⚡

## **Application Case #12: Conducted a “Survival Likelihood” Analysis for a new flower shop.**

**CAL Introduction:** Another “Survival Likelihood” Analysis. The result is not surprising and the straightforward “brutally honest” response is interesting and refreshing! The accuracy of the response cannot be known without verification and so the content must be used with caution.

**CAL Prompt:** What would be the survival likelihood of a new small flower shop in Minnetrista, Minnesota that only sold the trillium flower?

**Response: Gemini – April 22, 2025**

⌘ The survival likelihood of a new small flower shop in Minnetrista, Minnesota that *only* sold the trillium flower would be extremely low, bordering on unsustainable. Here's a breakdown of the critical factors:

Severe Limitations and Challenges:

- Extreme Seasonality: Trilliums are ephemeral spring wildflowers. In Minnesota, they typically bloom for a relatively short period, from early April to mid-May. This means the shop would only have its primary (and only) product available for a few weeks out of the entire year. A business cannot survive on a few weeks of sales annually.
- Limited Appeal and Usage: While trilliums are beautiful native wildflowers, they aren't a typical choice for most common floral needs. They aren't traditionally used in bouquets for birthdays, anniversaries, weddings, or sympathy arrangements in the same way as roses, lilies, or carnations. Their delicate nature and woodland aesthetic limit their market.
- Ethical and Legal Concerns: Many trillium species are considered rare, threatened, or of special concern in various regions, including Minnesota. Harvesting them from the wild is often illegal and unethical due to their slow growth and sensitivity to disturbance. Sourcing them sustainably through cultivation would be very challenging and likely expensive, further limiting profitability.
- Lack of Variety: A flower shop thrives on offering variety to meet diverse customer needs and preferences. Selling only one type of flower, regardless of its beauty, would severely restrict its customer base and ability to cater to different occasions.
- Competition from Existing Shops: Even during the short blooming season, the shop would still compete with established florists in Mound and nearby areas who offer a wide array of flowers, including seasonal options like trilliums as part of a broader selection. Customers needing other types of flowers would naturally go to these established shops.
- Storage and Handling: Trilliums are delicate and have a limited vase life compared to commercially grown flowers. Managing their freshness and minimizing waste during their short season would be challenging.
- Profitability: Given the limited availability, specialized appeal, and potential sourcing difficulties, it would be incredibly difficult to generate enough revenue in a few weeks to cover operating costs (rent, utilities, etc.) for the entire year and provide a sustainable income for the owner.

Potential Minor Niches (Highly Unlikely to Sustain a Business Alone):

- Native Plant Enthusiasts: There might be a small niche market for individuals specifically seeking native Minnesota wildflowers. However, this market is likely too small to support a dedicated brick-and-mortar shop focusing solely on one species with a limited bloom time.
- Educational or Conservation Focus: The shop *might* have a slightly better chance if it positioned itself as an educational resource about native plants and sustainable harvesting (if possible) or partnered with conservation efforts. However, sales of trilliums alone would still be insufficient.

In conclusion, a flower shop in Minnetrista, Minnesota, exclusively selling trillium flowers, has an exceptionally low likelihood of survival due to extreme seasonality, limited market appeal, ethical/legal considerations, lack of variety, competition, and profitability challenges. It would be a highly unsustainable business model.

A successful flower shop needs to offer a diverse range of flowers and services to cater to year-round demand and various occasions. While incorporating native and unique blooms can be a positive aspect of a broader offering, relying solely on a single, highly seasonal, and potentially restricted flower like the trillium is not a viable business strategy. ⚡

### **Application Case #13: Conducted a SWOT Analysis for a technology company.**

**CAL Introduction:** Strategists often want to analyze the Strengths, Weaknesses, Opportunities, and Threats (SWOT) associated with their organization during the Strategic Improvement Cycle. This application case shows how Gen AI can be used for a SWOT Analysis. The accuracy of the response cannot be known without verification and so the content must be used with caution.

**CAL Prompt:** Please conduct a half-page SWOT analysis for Nvidia.

**Response: Llama 4 (Meta AI) – April 13, 2025**

⌘ Here's a half-page SWOT analysis for Nvidia:

#### **Strengths:**

1. **Market Leader in GPUs:** Nvidia is the dominant player in the graphics processing unit (GPU) market, with a strong brand and high market share.
2. **Diversified Product Portfolio:** Nvidia's products span gaming, professional visualization, datacenter, and automotive markets, reducing dependence on a single segment.
3. **Strong Research and Development:** Nvidia invests heavily in R&D, enabling innovation and staying ahead of competitors.

#### **Weaknesses:**

1. **Dependence on Third-Party Manufacturers:** Nvidia relies on partners like TSMC for chip manufacturing, which can lead to supply chain vulnerabilities.
2. **High R&D Costs:** Nvidia's significant R&D investments can strain profitability if not balanced with revenue growth.

#### **Opportunities:**

1. **Growing Demand for AI and Machine Learning:** Nvidia's GPUs are well-suited for AI workloads, positioning the company for growth in this expanding market.
2. **Expanding Datacenter Business:** Nvidia's datacenter segment is growing rapidly, driven by increasing demand for cloud computing and AI infrastructure.

#### **Threats:**

1. **Intense Competition:** Nvidia faces competition from AMD and Intel in the GPU market, as well as emerging threats from custom chip designs.
2. **Supply Chain Disruptions:** Global supply chain issues can impact Nvidia's ability to meet demand and maintain profitability. ⌘

## **Application Case #14: Conducted a Competitive Analysis for two AI companies.**

**CAL Introduction:** This application case shows how Gen AI can be used to conduct a Competitive Analysis—comparing one AI company with another.

**CAL Prompt:** Can you conduct a half page competitive analysis that summarizes the competitive differences between the company Anthropic and the company xAI?

**Response: Gemini – April 22, 2025**

⌘ Anthropic and xAI are two prominent players in the rapidly evolving field of artificial intelligence, both striving to create advanced AI models, but with distinct approaches and philosophies. Here's a competitive analysis highlighting their key differences:

Anthropic:

- Focus on Safety and Ethics: Anthropic, founded by former OpenAI researchers, places a strong emphasis on AI safety and ethical considerations. Their core principle revolves around developing "Constitutional AI," where AI systems are guided by a set of ethical principles during training to ensure safer and more beneficial outcomes.
- Responsible Scaling: Anthropic adopts a more cautious and measured approach to scaling their AI models, prioritizing safety mechanisms and rigorous testing at each stage of development. They have a "Responsible Scaling Policy" that adapts as their models' capabilities increase.
- Product Focus: Their primary product is the Claude family of AI models, known for strong conversational abilities, ethical interactions, and a focus on safety. Anthropic also offers safety toolkits and consulting services to help other organizations integrate AI responsibly.
- Target Audience: Anthropic often targets industries with high safety and ethical requirements, offering customized AI solutions tailored to their specific needs.
- Governance Structure: Anthropic operates as a public-benefit corporation, supported by a Long-Term Benefit Trust (LTBT). This structure is designed to prioritize societal benefits over purely financial motives in their decision-making.

xAI:

- Focus on "Understanding the Universe": Founded by Elon Musk, xAI's stated mission is to "understand the true nature of the universe." This ambitious goal suggests a focus on fundamental AI research and pushing the boundaries of what AI can achieve in terms of knowledge and reasoning.
- Rapid Development and Integration: xAI appears to be pursuing a more rapid development cycle, leveraging its close integration with other Musk-owned entities like X (formerly Twitter) and potentially Tesla for data and applications.
- Product Focus: Their initial prominent product is Grok, an AI chatbot integrated with the X platform. Grok has been positioned as a more unfiltered AI, with access to real-time information from X and a more "edgy" persona compared to other mainstream chatbots.
- Target Audience: Initially focused on X Premium subscribers, xAI's Grok aims to be a widely accessible AI companion. The company also targets applications within the broader Musk ecosystem.
- Governance Structure: As a privately held company under Elon Musk's leadership, xAI's governance is more centralized compared to Anthropic's public-benefit structure.

Key Competitive Differences Summarized:

Feature	Anthropic	xAI
Core Philosophy	AI Safety and Ethics, Constitutional AI	Understanding the Universe, Knowledge Discovery
Development Pace	More cautious, emphasis on safety testing	More rapid, leveraging existing platforms
Primary Product	Claude family of AI models	Grok chatbot
Target Market	Safety-conscious industries	Broad consumer base, Musk ecosystem
Governance	Public-benefit corporation	Privately held, centralized leadership
Data Sources	Carefully curated, potentially proprietary	Real-time X data, potential Tesla data

In essence, Anthropic is positioning itself as a leader in safe and ethical AI development, catering to use cases where reliability and adherence to principles are paramount. xAI, on the other hand, is taking a more audacious approach, aiming for fundamental breakthroughs and leveraging its integration with social media and other technologies for rapid deployment and a distinct AI persona. Both companies are significant players shaping the future of AI, but their differing priorities and strategies will likely lead them down unique paths. ⌘

### **Application #15: Conducted a “Playing to Win” Analysis for a vehicle manufacturer.**

**CAL Introduction:** The “Playing to Win” Framework from Lafley and Martin (2013) can help *Strategists* think through how they want to position their organization in its environment. This application case shows how Gen AI can be used for a “Playing to Win” Analysis. The accuracy of the response cannot be known without verification and so the content must be used with caution.

**CAL Prompt:** Please write a half-page report that answers the Five Questions in the book "Playing to Win" by Lafley and Martin for the company Toyota.

**Response: Grok – April 17, 2025**

#### **✿ Toyota Motor Corporation: Applying the "Playing to Win" Framework**

Toyota Motor Corporation, a global leader in the automotive industry, can be analyzed through the lens of A.G. Lafley and Roger Martin’s "Playing to Win" strategy framework, which revolves around five critical questions to craft a winning strategy.

**1. What is your winning aspiration?** Toyota’s winning aspiration is to lead the global mobility industry by delivering sustainable, innovative, and high-quality vehicles that enhance customer lives and contribute to a carbon-neutral future. This is evident in its vision of "Mobility for All" and its commitment to electrification and hydrogen fuel cell technology.

**2. Where will you play?** Toyota competes in the global automotive market, focusing on key segments such as hybrid, electric, and hydrogen-powered vehicles, as well as mass-market and luxury brands (e.g., Lexus). It prioritizes markets with high demand for sustainable mobility, including North America, Europe, and Asia, while also investing in emerging markets for affordable, reliable vehicles.

**3. How will you win?** Toyota differentiates itself through its renowned Toyota Production System (TPS), which emphasizes lean manufacturing, quality, and efficiency, ensuring cost leadership and reliability. Additionally, its early investment in hybrid technology (e.g., Prius) and advancements in electric and hydrogen vehicles positions it as a leader in sustainable mobility, appealing to environmentally conscious consumers.

**4. What capabilities must be in place?** Toyota’s core capabilities include its expertise in lean manufacturing (TPS), advanced R&D in electrification and hydrogen technology, and a strong global supply chain. Its deep understanding of customer needs, robust brand reputation, and ability to innovate incrementally while maintaining quality are critical to its success.

**5. What management systems are required?** Toyota employs rigorous management systems like the "Toyota Way," which fosters continuous improvement (kaizen) and respect for people. Its global quality control systems, data-driven decision-making, and strategic planning ensure alignment with its sustainability and innovation goals, while performance metrics track progress toward carbon neutrality and market leadership.

By aligning its strategy with these five questions, Toyota continues to solidify its position as a global automotive leader, navigating competitive pressures and evolving consumer demands effectively. ✿

## **Application Case #16: Conducted a Scenario Analysis for an AI organization.**

**CAL Introduction:** *Strategists* often imagine the future using various scenarios. This application case shows how Gen AI can be used to conduct a Scenario Analysis for an AI organization in this case OpenAI. The accuracy of the response cannot be known without verification and so the content must be used with caution.

**CAL Prompt:** Please create two scenarios in one page for OpenAI staying not-for-profit and OpenAI becoming a public company.

**Response: Meta AI – April 5, 2025**

### **⌘ Scenario 1: OpenAI Stays Not-For-Profit**

OpenAI remains committed to its original mission of developing artificial general intelligence (AGI) that benefits humanity as a whole. By staying not-for-profit, OpenAI continues to prioritize research and development over financial gain. The organization focuses on creating open-source AI solutions that can be used by anyone, anywhere, without restrictive licensing or proprietary constraints.

#### **Key Outcomes:**

- **Increased Accessibility:** OpenAI's AI technologies are widely adopted by researchers, developers, and organizations worldwide, accelerating innovation and progress in the field.
- **Greater Transparency:** As a not-for-profit, OpenAI maintains its commitment to transparency, publishing research papers, and sharing findings with the broader scientific community.
- **Philanthropic Funding:** OpenAI continues to rely on donations and grants from individuals and organizations who share its vision for a more equitable and AI-driven future.
- **Potential Limitations:** Without the influx of capital that comes with going public, OpenAI might face constraints in scaling its operations and investing in large-scale infrastructure.

### **Scenario 2: OpenAI Becomes a Public Company**

OpenAI decides to go public, listing its shares on a major stock exchange and becoming a publicly traded company. This move brings in significant capital, allowing OpenAI to accelerate its research and development efforts, expand its team, and invest in new infrastructure.

#### **Key Outcomes:**

- **Increased Resources:** As a public company, OpenAI has access to substantial funding, enabling it to pursue ambitious projects and hire top talent from around the world.
- **Commercialization:** OpenAI begins to develop and market proprietary AI solutions, generating revenue through licensing agreements and enterprise sales.
- **Partnerships and Collaborations:** The company forms strategic partnerships with other industry leaders, driving innovation and growth in the AI sector.
- **Potential Risks:** As a public company, OpenAI faces pressure to meet quarterly earnings expectations, which might lead to a shift in focus from long-term research to short-term profits. Additionally, the company's values and mission might be influenced by shareholder interests.

In both scenarios, OpenAI's core mission remains intact, but the path forward differs significantly. The not-for-profit model prioritizes accessibility and transparency, while the public company model brings in resources and commercial opportunities. The choice between these paths will ultimately depend on OpenAI's priorities and the values it aims to uphold. ⌘

## **Application Case #17: Created a Balanced Scorecard Framework for an AI organization.**

**CAL Introduction:** *Strategists* can use the Balanced Scorecard to develop a performance measurement system. This application case shows how Gen AI can be used to create a Balanced Scorecard Framework for an AI organization in this case OpenAI. The accuracy of the response cannot be known without verification and so the content must be used with caution.

**CAL Prompt:** Please suggest three performance metrics in each of the four Balanced Scorecard Categories by Kaplan and Norton for OpenAI.

### **Response: Grok – April 17, 2025**

⌘ The Balanced Scorecard by Kaplan and Norton evaluates organizational performance across four perspectives: Financial, Customer, Internal Business Processes, and Learning and Growth. Below are three suggested performance metrics for each category tailored to OpenAI, a research organization focused on advancing AI technologies.

#### **1. Financial Perspective**

This perspective focuses on financial performance and resource allocation to ensure sustainability and growth.

- **Revenue Growth from API and Partnerships:** Measure the annual percentage increase in revenue from OpenAI's API services (e.g., ChatGPT API) and strategic partnerships with enterprises or cloud providers like Microsoft.
- **R&D Investment Efficiency:** Track the ratio of research and development (R&D) expenditure to successful model deployments (e.g., new GPT iterations or specialized AI models) to ensure cost-effective innovation.
- **Profit Margin on Commercial Products:** Monitor the profit margin on commercial offerings like ChatGPT Plus subscriptions or enterprise solutions to assess financial health.

#### **2. Customer Perspective**

This perspective evaluates how well OpenAI meets the needs of its customers, including developers, enterprises, and end-users.

- **Customer Satisfaction Score (CSAT):** Collect feedback via surveys from API users, enterprise clients, and ChatGPT users to measure satisfaction with usability, performance, and support.
- **Net Promoter Score (NPS):** Gauge the likelihood of customers (e.g., developers or businesses) recommending OpenAI's tools or services to others, indicating brand loyalty.
- **Market Penetration Rate:** Track the percentage of target market segments (e.g., startups, large enterprises, or academic institutions) actively using OpenAI's products or services.

#### **3. Internal Business Processes Perspective**

This perspective focuses on the efficiency and effectiveness of internal processes critical to delivering value.

- **Model Development Cycle Time:** Measure the average time from ideation to deployment of new AI models or updates (e.g., GPT iterations) to assess research agility.
- **API Uptime and Reliability:** Monitor the percentage of time the API is operational and meets performance benchmarks, ensuring dependable service for developers.
- **Ethical AI Deployment Rate:** Evaluate the percentage of models passing ethical and safety reviews before deployment, aligning with OpenAI's mission to ensure responsible AI.

#### **4. Learning and Growth Perspective**

This perspective emphasizes employee development, innovation, and organizational adaptability to sustain long-term success.

- **Employee Retention Rate in Research Teams:** Track the retention rate of AI researchers and engineers to ensure continuity of expertise and innovation.
- **Innovation Pipeline Strength:** Measure the number of new AI research projects or prototypes in development annually to gauge future growth potential.
- **Training Program Participation:** Monitor the percentage of employees completing advanced AI, ethics, or safety training programs to foster a skilled and mission-aligned workforce.

These metrics align with OpenAI's mission to advance AI research while balancing commercial objectives, customer needs, operational efficiency, and long-term innovation. If you'd like, I can refine these metrics further or provide guidance on implementation. ⌘

### **Application Case #18: Created actions to address the most important Critical Success Factor.**

**CAL Introduction:** *Strategists* often want to know the major Critical Success Factors. This application case shows how Gen AI can be used to identify the most important Critical Success Factor and then develop and implement actions to address it. The accuracy of the response cannot be known without verification and so the content must be used with caution.

**CAL Prompt:** What is the one most important thing a business owner of a new small flower shop must do for success?

**Response: Gemini – April 22, 2025**

⌘ The single most important thing a business owner of a new small flower shop must do for success is to cultivate and nurture strong relationships with their local customer base.

Here's why this is paramount:

- Repeat Business is Key: Unlike one-time purchases, flowers are often bought for recurring events (birthdays, anniversaries, holidays, sympathy) or even as regular treats. Loyal customers provide a predictable revenue stream, crucial for a new business's survival and growth.
- Word-of-Mouth Marketing: Satisfied local customers are your best advocates. They will recommend your shop to friends, family, and colleagues, generating organic and trusted referrals, which are invaluable for a small business with a limited marketing budget.
- Community Connection: A flower shop thrives on being part of the local community. Building relationships fosters a sense of belonging and makes your shop the go-to place for floral needs in Mound and the surrounding areas. This connection can lead to partnerships with local event organizers, businesses, and community groups.
- Understanding Customer Preferences: By getting to know your customers, you can learn their preferences, anticipate their needs for upcoming occasions, and offer personalized recommendations. This creates a more tailored and appreciated experience, fostering loyalty.
- Building a Reputation: Positive customer interactions and a reputation for quality and service will set your flower shop apart from competitors, especially larger online retailers. In a smaller community like Mound, positive word travels fast.

While other factors like sourcing quality flowers, having an appealing shop design, and managing finances are undoubtedly important, the ability to connect with and retain local customers forms the bedrock of sustainable success for a new small flower shop. These relationships drive repeat business, generate positive word-of-mouth, and embed the shop within the fabric of the community. ⌘

### **Application Case #19: Created a Marketing Plan for a new small flower shop.**

**CAL Introduction:** *Strategists* often want to create items like a Marketing Plan. This application case shows how Gen AI can be used to create a Marketing Plan for a small business. The accuracy of the response cannot be known without verification and so the content must be used with caution.

**CAL Prompt:** Can you create a half page marketing plan for a new small flower shop in St. Bonifacius, Minnesota?

**Response: ChatGPT – April 22, 2025**

⌘ Absolutely! Here's a half-page marketing plan tailored for a small flower shop in St. Bonifacius, Minnesota — a smaller, tight-knit community with lots of local charm.

Half-Page Marketing Plan: Wild Petal Co. – St. Bonifacius, MN

Business Overview:

Wild Petal Co. is a cozy, locally owned flower shop offering handcrafted arrangements, everyday florals, and special event services. Rooted in the heart of St. Bonifacius, we focus on bringing natural beauty and neighborly warmth to every bouquet.

Target Market:

- Local families and gift buyers
- Residents planning weddings or events in nearby towns
- Nearby businesses and churches
- Surrounding rural community (delivery available)

Marketing Strategies:

1. Local Connection & Word of Mouth

- Soft Launch Event: Invite locals for cider, cookies, and \$5 mini bouquets.
- Community Boards: Place flyers at the post office, cafes, and church bulletin boards.

2. Hyper-Local Digital Presence

- Facebook Page: Share seasonal blooms, customer shoutouts, and small-town stories. Facebook is king in smaller towns.
- Google Business Profile: Keep hours, photos, and location updated to pop up in “florist near me” searches.

3. Grassroots Partnerships

- Collaborate with local farmers for unique floral stock and promote “locally grown” messaging.
- Offer wedding/event discounts through local venues or caterers.

4. Customer Loyalty & Personal Touch

- Create a "Petal Club" email list with birthday discounts and seasonal tips.
- Handwritten thank-you notes in delivery orders to build long-term loyalty.

Let me know if you'd like to turn this into a flyer, social media plan, or seasonal campaign! ⌘

## **Application Case #20: Created a Business Plan for a specialty dental practice.**

**CAL Introduction:** *Strategists* often want to create a Business Plan. This application shows how Gen AI can be used to create a Business Plan for a business. The accuracy of the response cannot be known without verification and so the content must be used with caution.

**CAL Prompt:** Please create a one-page business plan for a dental practice in Golden Valley, Minnesota that plans to focus only on wisdom teeth removal.

**Response: Copilot – February 27, 2025**

### **❖ Business Plan for Wisdom Teeth Removal Dental Practice**

**Executive Summary:** Our practice will be a specialized dental clinic in Golden Valley, Minnesota, focusing exclusively on wisdom teeth removal. By honing in on this niche, we aim to provide superior, patient-focused care, fast recovery times, and exceptional customer service.

**Mission Statement:** To provide top-tier wisdom teeth removal services with utmost patient comfort and care, ensuring a swift and safe recovery.

**Market Analysis:** Golden Valley and surrounding areas present a significant demand for specialized oral surgery services. With an increasing population and growing awareness of oral health, our niche clinic can capitalize on the specific need for wisdom teeth removal.

#### **Target Audience:**

- Teenagers and young adults (ages 16-25)
- Referrals from general dentists
- Patients experiencing pain from impacted wisdom teeth

#### **Services Offered:**

- Comprehensive consultations
- Safe and efficient wisdom teeth removal surgery
- Pre-surgery and post-surgery care

#### **Marketing Strategy:**

- Partner with local general dentists for referrals
- Develop an informative and user-friendly website
- Utilize social media platforms to reach our target demographic
- Offer initial consultations at a competitive price

#### **Operational Plan:**

- Location: Golden Valley, Minnesota
- Hours of Operation: Monday to Friday, 9 AM - 5 PM
- Staff: Experienced oral surgeons, anesthetists, and support staff
- Equipment: State-of-the-art surgical tools and patient monitoring systems

#### **Financial Plan:**

- Initial Setup Costs: Rent, equipment, staff hiring, marketing
- Revenue Streams: Fees for consultations, surgeries, and follow-ups
- Financial Projections: Break-even within the first year, with a steady increase in revenue as the practice gains reputation

#### **Growth Plan:**

- Expand services to include other types of oral surgeries
- Build a network with other dental practitioners
- Increase the number of surgery rooms and staff as demand grows

With a focused approach, our dental practice aims to become the go-to clinic for wisdom teeth removal in Golden Valley, Minnesota. By prioritizing patient care and leveraging specialized expertise, we are confident in our ability to achieve success and long-term growth. ❖

The twenty application cases involved the use of five Gen AI Strategy Assistants (like ChatGPT and Grok) completing a variety of tasks related to researching, comparing, analyzing, and creating. The following is a summary of the findings. {**Note:** The word “*Strategist*” refers to a human.}

### **Observations**

- All tasks were completed by the Gen AI Strategy Assistants in ten seconds or less.
- The tasks and topics were extremely diverse.
- The Gen AI Strategy Assistants completed all requested tasks – no requests were refused.
- The Gen AI Strategy Assistants conducted several forms of analysis and created new original content.
- The outputs from the Gen AI Strategy Assistants were realistic, impressive, and useful.
- The Gen AI Strategy Assistants are more capable than traditional search engines.
- The accuracy of the outputs was never immediately known or easy to evaluate.

### **Potential Benefits – Emphasis on the Word “Potential”**

- The Gen AI Strategy Assistants can increase the pace, scale, and scope of learning.
- The Gen AI Strategy Assistants can increase the productivity of the *Strategists*.
- The Gen AI Strategy Assistants can conduct various forms of analysis and create “new to the world” content.
- The Gen AI Strategy Assistants can accelerate the pace of ideation and give *Strategists* “starting points.”
- The use of multiple Gen AI Strategy Assistants allows for comparisons which can create new insights.
- The use of multiple *Strategists* and multiple Gen AI Strategy Assistants allows for even more comparisons.

### **Potential Risks – Emphasis on the Word “Potential”**

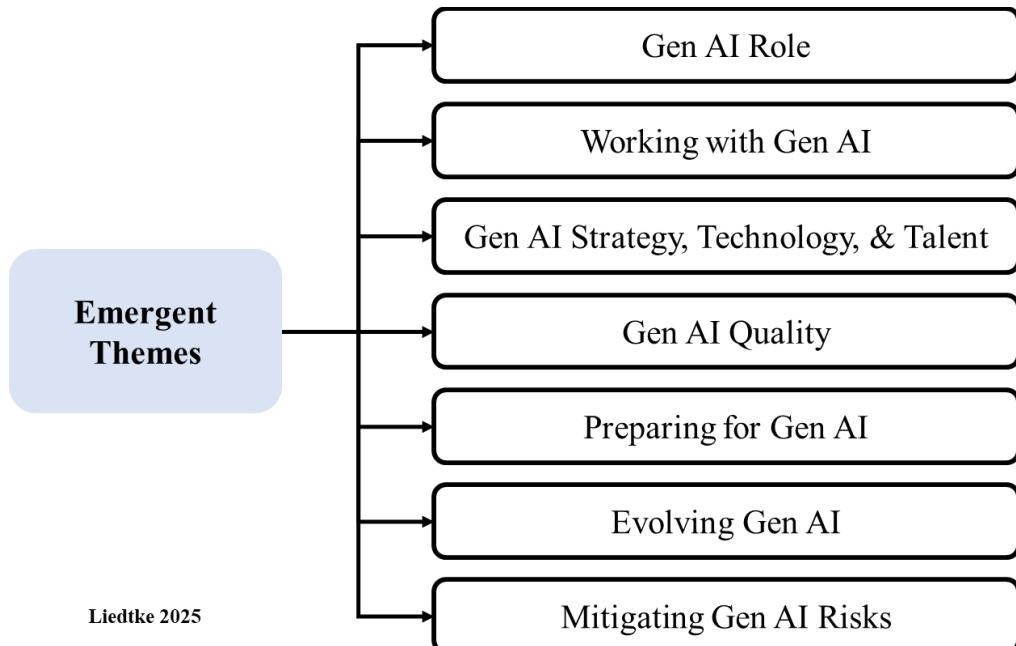
- The *Strategists* could abandon critical thinking.
- The *Strategists* could become “lazy”—that is, not grow and develop.
- The *Strategists* could become disengaged from learning, analyzing, synthesizing, and creating activities.
- The accuracy of the outputs might not be checked leading to poor decisions and/or actions.
- The outputs could be inaccurate and/or misinterpreted.
- The *Strategists* could (in theory) have created better content (e.g., SWOT Analysis or Business Plan).
- The *Strategists* might not understand how outputs were created or why.
- The *Strategists* might not learn about underlying causal mechanisms (“Black Boxes”).
- The Gen AI Strategy Assistants might not create “out of the box” content.
- There might be role confusion if there are multiple Strategists and multiple Gen AI Strategy Assistants.
- Gen AI Strategy Assistants could become obsolete or inferior.
- Gen AI Strategy Assistants might not produce consistent results over time (LLMs tend to be dynamic).
- The outputs could be created so fast that *Strategists* make rushed decisions leading to poor actions.

### **General Recommendations**

- *Strategists* should consider using multiple Gen AI Strategy Assistants for the time being.
- *Strategists* should critically evaluate the outputs (trust in the outputs must be earned over time).
- *Strategists* should identify the tasks that are most suitable for Gen AI Strategy Assistants.
- Take care in writing the prompts: be concise, ask for specific desired outputs, and provide context.
- Be specific in the text prompts – “Dental practice in Minnetrista, MN” instead of “Dental practice.”
- Bound the output – “one page” or “one paragraph.”
- Request the “why” behind the outputs.
  - “Please tell me the ‘Top 5’ best car companies in the world and explain why they are the best.”
- Results tend to be better for well-known topics rather than obscure topics.

### 3. Emergent Gen AI Themes

Numerous themes emerged during the research – far too many to introduce and discuss. What follows are seven emergent themes which are depicted in Figure 41.



**Figure 41. Emergent Themes.**

#### Emergent Theme #1: Gen AI Role

Gen AI can potentially be used throughout the entire Strategic Improvement Cycle. The Gen AI role could be *very limited* all the way to *very extensive*. What role will Gen AI play during our Strategic Improvement Cycle? The *Strategists* should think deeply about the role Gen AI will play and then develop a plan accordingly. The following are some Gen AI role questions:

#### **Questions: Gen AI Role (Partial List)**

- What is our vision for the role that Gen AI will play during our Strategic Improvement Cycle?
- Will we use Gen AI in all phases of our Strategic Improvement Cycle?
- What are the specific tasks that Gen AI will perform during our Strategic Improvement Cycle?
- Do we envision the role of Gen AI changing over time?
- Will we make it known that we are using Gen AI during our Strategic Improvement Cycle?
- Will we use more than one Gen AI Strategy Assistant?
- What criteria will we use in selecting a Gen AI Strategy Assistant?
- Do we eventually plan to evolve to a more active Agentic AI approach?

## **Emergent Theme #2: Working with Gen AI**

The most feasible situation for many organizations in the next year or two is for one or more *Human Strategists* to use at least one Gen AI Strategy Assistant (like Copilot and ChatGPT) during Strategic Improvement Cycles. The twenty application cases which were previously described represented a “*passive*” use of Gen AI (“Question > Answer”) as opposed to more active, real-time, back-and-forth conversations between *Human Strategists* and Gen AI Strategy Assistants (Agentic AI). How should *Human Strategists* work with the Gen AI Strategy Assistants?

### **Questions: Working with Gen AI (Partial List)**

#### **Employment Status, Supervision, & Autonomy**

- Will the Gen AI Strategy Assistants (“*machines*”) be viewed as employees since they perform tasks?
- Will the Gen AI Strategy Assistants have an official employment status in the organization?
- Will we make clear the roles, responsibilities, and decision rights for humans and machines?
- Will there be any legal or regulatory implications for the role we create for Gen AI Strategy Assistants?
- Who will oversee and supervise the Gen AI Strategy Assistants?
- Who will determine the Gen AI tasks and then communicate them to the Gen AI Strategy Assistants?
- Who will be accountable for the decisions and actions of the Gen AI Strategy Assistants?
- Will the Gen AI Strategy Assistants have any autonomy?
- Will the Gen AI Strategy Assistants be allowed to make unilateral decisions or take unilateral actions?

#### **Performance**

- What are the performance expectations for the Gen AI Strategy Assistants?
- Who will be responsible for evaluating the performance of the Gen AI Strategy Assistants?
- Who will review the outputs (work products) of the Gen AI Strategy Assistants for accuracy?
- Will there be periodic formal performance reviews for the Gen AI Strategy Assistants?
- Will the Gen AI Strategy Assistant performance reviews be the same as human employee reviews?
- What is the process to be followed if a Gen AI Strategy Assistant is performing poorly?

#### **Relationships**

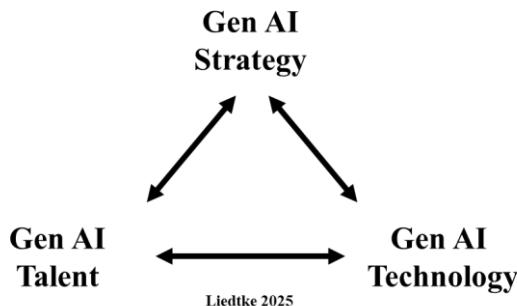
- How will people perceive the outputs of the Gen AI Strategy Assistants?
- How will our *Strategists* feel about working with Gen AI Strategy Assistants?
- Will our *Strategists* feel comfortable working with a Gen AI Strategy Assistant or a future humanoid?
- Will we give formal credit (recognition) to the Gen AI Strategy Assistants for their work outputs?
- Will anyone who uses an output created by a Gen AI Strategy Assistant be required to make it known?
- How will we assure that the *Strategists* think critically?
- How will we assure that the *Strategists* grow and develop?

#### **Legal & Security**

- What are the legal and regulatory implications associated with using Gen AI Strategy Assistants?
- Do we need special business insurance coverage for using Gen AI Strategy Assistants to perform work?
- Are there any intellectual property rights to consider?
- What proprietary information or trade secrets will we share with Gen AI Strategy Assistants?
- What security clearances and access rights will be granted to the Gen AI Strategy Assistants?
- Will we need any firewalls or controls to contain the Gen AI Strategy Assistants as with humans?

### **Emergent Theme #3: Gen AI Strategy, Technology, & Talent**

There appears to be at least three components that are necessary for the successful use of Gen AI Strategy Assistants which are depicted in Figure 42. Anecdotal evidence suggests that you need all three components—having only two components will decrease the likelihood of success.



**Figure 42. Gen AI Strategy, Technology, & Talent.**

We can imagine various scenarios related to the three components – here are four:

**Scenario A:** No Gen AI Strategy, No Gen AI Technology, & No Gen AI Talent.

**Implication:** The likelihood of success with Gen AI is obviously very low.

**Scenario B:** “We have Gen AI Technology and Gen AI Talent, but no Gen AI Strategy.”

**Implication:** Possible wasted time and energy since we don’t have a clear direction.

**Scenario C:** “We have a Gen AI Strategy and Gen AI Technology, but no Gen AI Talent.”

**Implication:** Very little will be accomplished without people with Gen AI skills.

**Scenario D:** “We have a Gen AI Strategy and Gen AI Talent, but no Gen AI Technology.”

**Implication:** Our Gen AI capabilities will be limited without Gen AI technology.

### **Questions: Gen AI Strategy, Technology, and Talent (Partial List)**

#### **Gen AI Strategy**

- What is our Gen AI strategy?
- Do we have a Gen AI vision, roadmap, deployment plan, and/or objectives?

#### **Gen AI Technology**

- What technology do we need to be successful in using Gen AI Strategy Assistants?
- Do we need to create a Gen AI technology roadmap?

#### **Gen AI Talent**

- Who will be working with the Gen AI Strategy Assistants?
- What knowledge, skills, and abilities will they need?
- Who will train them and what are the specific topics they need to learn?

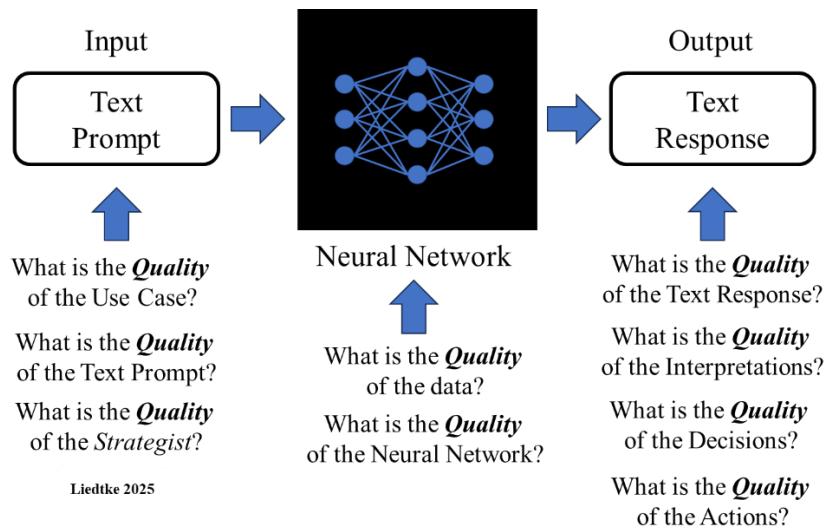
## **Emergent Theme #4: Gen AI Quality**

The performance of Gen AI Strategy Assistants has already been mentioned. What about quality? The quality of the work of the Gen AI Strategy Assistants can be evaluated as well as the quality of the components of a larger model. What follows are questions and a Quality Model.

### **Questions: Gen AI Quality (Partial List)**

- Who will be accountable for Gen AI quality?
- How will we evaluate the quality of the work that the Gen AI Strategy Assistants perform?
- What are the components of our Gen AI Quality Model?
- Who will evaluate the Gen AI Quality Model components?
- What will be our Gen AI Quality Metrics (KPIs)?

We can add the quality perspective to the simplistic representation of Gen AI resulting in a basic Gen AI Quality Model which is depicted in Figure 43.



**Figure 43. Basic Gen AI Quality Model.**

#### **Left-Side Quality**

- How will we evaluate the quality of the use cases, text prompts, and *Strategists*?
- How will we know if the *Strategists* are using Gen AI effectively and efficiently?
- How will we find out how satisfied the *Strategists* were with their Gen AI experiences?
- How will we identify what went well in using Gen AI and what can be improved?
- How will we find out our stakeholders' perceptions of Gen AI quality?

#### **Center Quality**

- How will we evaluate the quality of the data and neural networks (LLMs)?

#### **Right-Side Quality**

- How will we evaluate the quality of the text responses (outputs)?
- How will we evaluate the quality of the interpretations, decisions, and actions?
- Most LLMs have a "Thumbs Up | Thumbs Down" option. Should we keep track of our selections?

## **Emergent Theme #5: Preparing for Gen AI**

Some organizations are “not ready” for the widespread application of Gen AI. One deployment strategy is *uncontrolled haphazard experimentation*. This approach is not recommended except for a short period of time. How can an organization prepare for the introduction of Gen AI into its Strategic Improvement Cycle? What follows are some questions.

### **Questions: Preparing for Gen AI (Partial List)**

- Are we committed to Gen AI (“All In”)?
- Have we set clear expectations for how we will use Gen AI and the predicted benefits?
- Have we clarified the roles and responsibilities for Gen AI and how our employees will use it?
- Will we operate in *stealth mode* at the start or will we announce our plans to the world?
- Do we have a Gen AI Deployment Plan?
- Do we have a Governance System for Gen AI?
- Do we have a Risk Management System for Gen AI?
- Are our employees optimistic and excited about Gen AI or pessimistic and fearful?
- Are our *Strategists* and other employees receptive to using Gen AI?
- How will we measure employee satisfaction related to work with Gen AI Strategy Assistants?
- What do our other stakeholders think about Gen AI?
- Do our *Strategists* appreciate data, analytics, and the scientific method?
- What has been our organization’s experience with the introduction of other technologies?
- What other organizations can we benchmark on Gen AI and how will we do it?
- What known pitfalls should we avoid?
- Are we clear on the Strategy, Technology, and Talent components (from earlier)?
- Who needs to be trained on Gen AI?
- What are the necessary training topics?
- How will we assure that our employees evaluate outputs?
- How will we assure that our employees think critically?
- How will we assure that our employees don’t get lazy?
- How will we assure that our employees grow and develop?
- Will we have a sandbox for safe experimentation?
- How will we measure the Return on Investment (ROI) related to Gen AI?
- How can we proceed quickly with caution?

## **Emergent Theme #6: Evolving Gen AI**

We can be certain that Gen AI will continue to rapidly advance in the foreseeable future. New versions of existing LLMs are routinely released and entirely new LLMs are often launched. Meta recently released Llama 4 and Amazon announced the upcoming release of Alexa+. Some future releases and launches will no doubt be significant “moments”—like the “ChatGPT Moment” and the “DeepSeek Moment”—which will change the existing Gen AI paradigm. What follows are some questions to help *evolve* Gen AI over time.

### **Questions: Evolving Gen AI (Partial List)**

- How will we keep our mission, philosophy, values, and vision in mind when evolving Gen AI?
- Should we go “All In” on one Gen AI Strategy Assistant or use multiple assistants?
- Who will be responsible for scanning the environment for Gen AI advances?
- Who will formally scan for news and announcements and evaluate any new claims?
- How will we know if new performance claims are false and/or exaggerated?
- How can we separate the signals (important things) from the noise (trivial things)?
- Who will search for best Gen AI practices?
- Who will be responsible for monitoring how competitors are using Gen AI?
- If we have a competitive advantage on Gen AI, then how will we keep it?
- Who will monitor our Gen AI Strategy Assistants for version changes?
- What is our process for switching from one Gen AI Strategy Assistant to another if necessary?
- Are we prepared to “pivot quickly” if necessary?
- What capabilities do we need to develop to be able to adapt and be flexible?
- Who is responsible for identifying and capturing new Gen AI applications (use cases)?
- How will we identify, evaluate, and develop actions for a new Gen AI technology?
- How will we identify and safely test new Gen AI technologies (sandbox)?
- How will we keep in mind that all states are tentative?
- How will be mindful of “no going back” decisions?
- What is our plan for continuous learning?
- What is our process if there is a Black Swan event?
- What are our contingency plans if something goes awry?
- Do we have a Task Force formed and ready to go just in case?

## **Emergent Theme #7: Mitigating Gen AI Risks**

There are numerous potential risks associated with using Gen AI during Strategic Improvement Cycles. Someone in the organization could be assigned the responsibilities for identifying, analyzing, prioritizing, and mitigating the Gen AI risks. Below are items related to managing risks.

### **Questions: Mitigating Gen AI Risks (Partial List)**

- Who will develop a Gen AI Risk Management System?
- Who will be responsible for identifying and analyzing the Gen AI risks?
- Who will be responsible for mitigating Gen AI risks?
- What risk concepts, methods, tools, and techniques will we use?

### **Potential Gen AI Risks (Partial List)**

- *Strategists* develop an over-reliance on the Gen AI Strategy Assistants.
- *Strategists* use an inferior and/or obsolete Gen AI Strategy Assistant.
- *Strategists* fail to continue to develop their knowledge, skills, and abilities.
- *Strategists* become disengaged from learning, analyzing, synthesizing, and creating activities.
- *Strategists* fail to acquire tacit knowledge.
- *Strategists* fail to think critically and/or creatively.
- *Strategists* have poor-quality use cases or poor-quality text prompts.
- *Strategists* fail to understand underlying causal mechanisms.
- *Strategists* fail to understand how the Gen AI Strategy Assistants created the outputs or why.
- *Strategists* fail to evaluate the accuracy of the outputs created by the Gen AI Strategy Assistants.
- *Strategists* misinterpret the outputs created by the Gen AI Strategy Assistants.
- *Strategists* make poor decisions based on the outputs created by the Gen AI Strategy Assistants.
- *Strategists* take ineffective actions based on the decisions.
- *Strategists* make numerous bad decisions quickly.
- The Gen AI Strategy Assistants could be biased, hallucinate, and/or commit errors.
- One or more competitors could become much better than us at using Gen AI.
- Confidential and proprietary secrets could be inadvertently shared with Gen AI Strategy Assistants.
- We could incur unexpected legal costs and discover intellectual property rights issues.

### **Mitigating the Risks (Partial List)**

- Involve multiple *Strategists* with different perspectives.
- The *Strategists* can use multiple Gen AI Strategy Assistants.
- Assure that Legal and Regulatory staff are involved.
- Develop and implement a Gen AI Governance System, Risk Management System, and Quality Model.
- Continually scan the environment for advances in technology.
- Be aware of misinformation and exaggerated claims.
- Compare the outputs of the different models.
- Periodically evaluate the performance of the Gen AI Strategy Assistants.
- Review the text prompts and questions that are inputted into the models.
- Develop a sandbox to safely test new Gen AI-related items.
- Assure there are safeguards, guardrails, and fail-safes.
- Assume a “Gen AI Black Swan” event will occur and prepare the organization.
- Have a contingency plan and/or business continuity plan.

## VI. Conclusions

The Executive Team members of an organization—the *Strategists*—are accountable for improving organizational performance. They conduct knowledge work with existential implications and only certain tasks should be delegated to machines. One important desired outcome of their work is for targeted organizational performance metrics to be *noticeably improved*. AI has emerged as an important new formal strategic improvement approach with unique characteristics, benefits, and risks. Its future is unpredictable and the scenarios range from “solving all of humanity’s problems” to “the extinction of humans.” Gen AI—especially since the introduction of ChatGPT in 2022—is being used by *Strategists* to improve organizational performance. One approach for using Gen AI is *uncontrolled haphazard experimentation* which is not sustainable. A carefully developed deployment plan based on a clear vision for how Gen AI will be used is recommended.

This research report has shown how Gen AI Strategy Assistants (like ChatGPT) can be used during the first two phases of a Strategic Improvement Cycle. Three emergent models, twenty emergent application cases, and seven emergent themes were discussed. Gen AI Strategy Assistants are accessible, easy to use, relatively inexpensive, fast, and the outputs are realistic, impressive, and useful. The accuracy of the outputs is not easy to quickly determine. The Gen AI models are dynamic and so organizations must be flexible and adaptable with their use.

Gen AI Strategy Assistants can potentially help *Strategists* by increasing the pace, scale, and scope of learning; increasing productivity; enhancing creativity; and improving decision making. Some potential risks include *Strategists* failing to think critically; becoming disengaged from learning, analyzing, synthesizing, and creating; failing to grow and develop; failing to discover causal mechanisms; failing to evaluate outputs; machine hallucinations; and decision errors.

Some *Strategists* will be uncomfortable working with machines. It will help if roles, responsibilities, and decision rights are clear and the Gen AI work is planned. *Strategists* can provide oversight, contribute tacit (*first hand*) knowledge, generate creative ideas, and assure the scientific method is used. The *Strategists* should continue to grow and develop.

Future research is needed to understand how Gen AI can be used in Phases C, D, & E of the Strategic Improvement Cycle; whether an organization should develop its own proprietary Small Language Model (SLM); and when and how an organization should advance to a more active real-time conversational approach in Agentic AI.

Many have identified concerns about the future of AI including Nobel Prize winner Geoffrey Hinton (see also Bolstrom, 2014; Kissinger *et al.*, 2024; Narayanan & Kapoor, 2024). Some of us will remember the gloom of “*Frankenstein*” by Shelley and “*2001: A Space Odyssey*” by Clarke!

Humans are on an unknown path with AI and we don’t know where the path will take us. We can influence the path by thinking deeply, developing a clear vision and plan, making the necessary investments, and enjoying the benefits while carefully managing the risks. An Executive Team can prepare its organization for an ever-increasing role of AI while always grounding AI decisions and actions in the mission, philosophy, values, and vision of the organization. *Strategists* must always assure that stakeholders and society are kept safe. AI . . . welcome to the Team!

## Acknowledgement

I will be forever grateful to Dr. Felix H. Hsia (1919-2006) for introducing me to the field of *Statistics* and for inspiring me to pursue a career that allowed me to apply what he so ably taught.

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