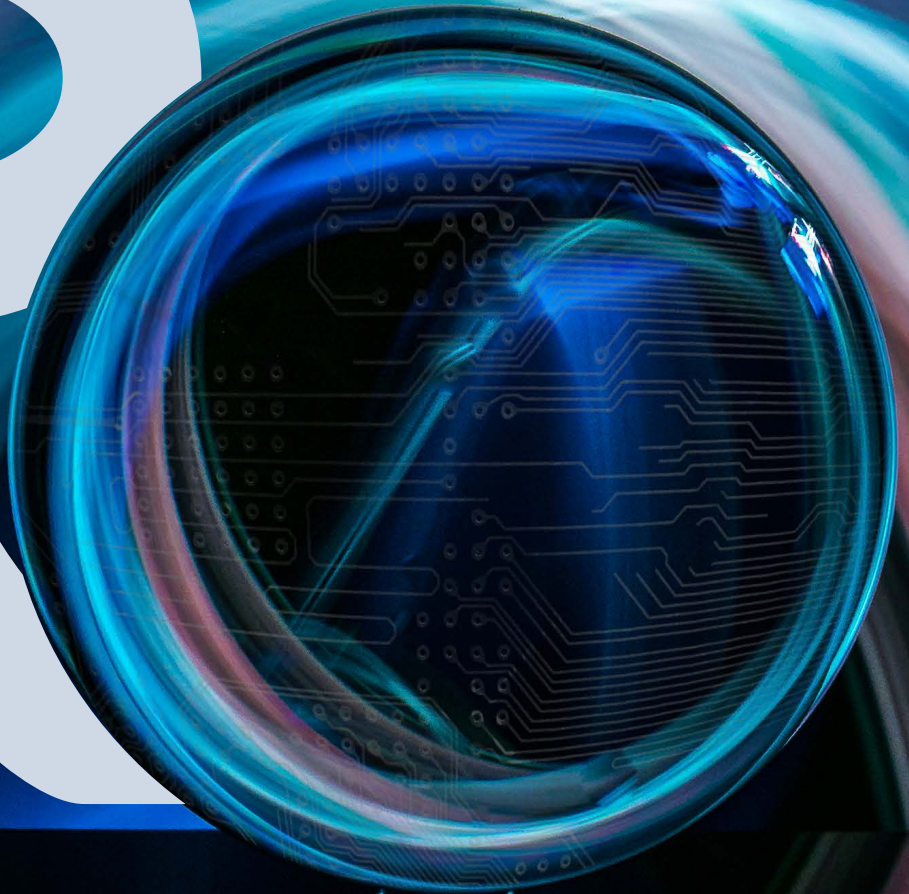


# LSI 2025



Data,  
Analytics  
& AI Trends



# Overview of Trends



As technology accelerates at an unprecedented pace, understanding and anticipating trends is crucial for staying competitive. To do so, businesses need the right tools to support them in reading an increasingly complex reality.

The new edition of the traditional SDG report "Data, Analytics & AI Trends" is born with this precise purpose as its foundation, and it is built upon our proprietary Innovation Radar, a dynamic tool designed to monitor and analyze emerging technological developments.

The 12 trends in the domains of AI, Data Technologies, Data & AI Architecture, and Business are the result of a comprehensive exploration of emerging tools, technologies, and methodologies in the domain of data and analytics. It represents a collaborative effort, informed by discussions among in-house experts, renowned technologists, academic institutions, and leading vendors. This interdisciplinary approach ensures the radar offers a holistic perspective on the trends shaping the future of data-driven innovation.

Beyond identifying key trends, this year's report delves deeper into their implications, enriched with actionable frameworks, design patterns, and tools. Join us in exploring how these innovations will redefine the technological landscape of 2025 and transform data architectures.

# Artificial Intelligence

ARTIFICIAL INTELLIGENCE

StAI Safe: AI Governance

Causal Inference

xLMs:  
What's Next?

# 1 xLMs, What's Next?

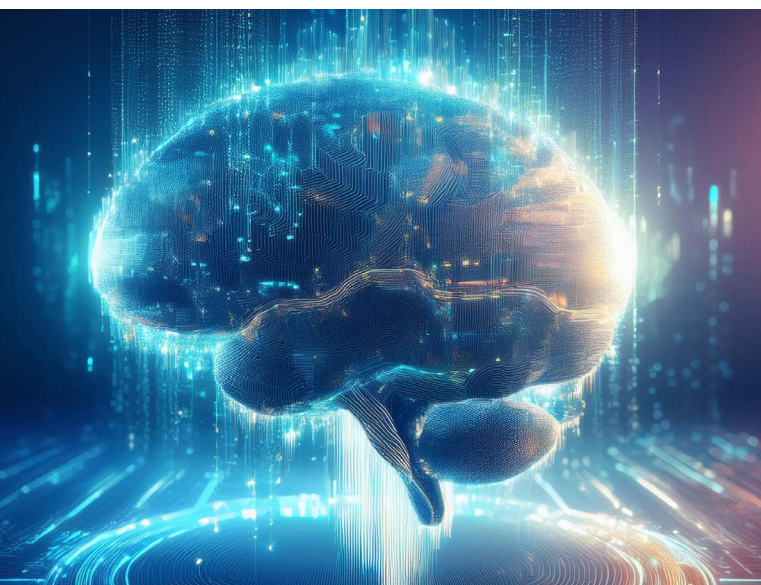
## The Ongoing Evolution of Large Language Models

Large Language Models (LLMs) have undergone a remarkable transformation, shifting from text-centric tools to versatile systems capable of revolutionizing entire industries. This evolution is driven by groundbreaking innovations that integrate diverse modalities—such as text, images, and audio—enabling richer and more dynamic real-time interactions. Multimodal generation in real-time allows LLMs to seamlessly process and combine multiple data sources, creating holistic solutions that go beyond understanding language to contextualizing visual and auditory inputs.

One of the most significant advancements is the emergence of Specialized Language Models (SLMs), which tailor LLM capabilities to specific domains with unmatched precision and relevance. In fields such as healthcare, SLMs can analyze clinical data and provide actionable insights, while in finance, they optimize strategic decisions by integrating complex economic datasets. These specialized models set a new standard of customization and accuracy, addressing targeted challenges with domain-specific expertise.

In parallel, Large Vision Models (LVMs) extend LLM capabilities even further by combining visual understanding with natural language processing. This fusion unlocks transformative applications in content creation, design, and real-time decision-making, where visual interpretation is as critical as textual analysis. For instance, LVMs can analyze images in real time to generate accurate descriptions or suggest design recommendations based on visual patterns.

These advancements position xLMs as indispensable tools for driving creativity and productivity in a fast-paced digital world. By bridging modalities and domains, LLMs not only enhance existing processes but also open new frontiers for innovation. The shift toward multimodal and specialized models marks a pivotal milestone in technological evolution, highlighting their potential to transform industries and redefine how we engage with artificial intelligence.





# 2 Causal Inference

## Causal Inference: The "If" That Makes a Difference

Machine learning (ML) has mainly been applied in building predictive models and algorithms to apply such models. ML models inherently rely on statistical and data-driven mechanisms which, in the case of real-world data, are unable to assess causal effects and exhibit sensitivity to covariate shift. Although good predictions are important for operational purposes, they do not support well-founded decision making and consequent actions.

What is required is to use causal analysis methods and tools. Specifically, the task of causal inference involves estimation of the causal effect of a particular action (such as taking a drug or launching a marketing campaign) in the absence of experimental data. This task is inherently challenging because causal effects are often confounded by other influences. The ability to establish a causal effect enables one to undertake actions that have measurable outcomes and much research have been devoted to develop methods to remove the influence of variables that are considered confounders of the problem.

The other side of the coin is causal discovery which applies when there is little prior knowledge

and specific methods are used to generate causal hypotheses to be presented to domain experts to be validated and then become the subject of causal inference. The last part of the story is to embed causal inference in production processes, somewhat like MLOps but with specificity in terms of process and people involved in a framework that has been presented under the name CausalOps. To summarize, predictive models answer "What will happen?", causal inference answers "What if?" and "Why?"

**Predictive Models:** Answer "What will happen?" questions. For example they produce forecasting based on historical patterns but are limited ability to inform interventions.

**Causal Inference:** Answers "What if?" and "Why?" questions, enables understanding of intervention effects and supports strategic decision-making about actions. Some use cases are: marketing campaign effectiveness, product pricing optimization, policy impact assessment, customer acquisition strategy and feature prioritization in product development.

# 3 StAI/ Safe

## Safe AI, Smart AI: Building Trust Through Robust Governance

As generative AI becomes increasingly integrated into industries and everyday life, the demand for robust security and governance frameworks has never been more critical. The potential of generative AI to revolutionize fields such as content creation, healthcare, and business operations brings significant risks, including data misuse, misinformation, and ethical dilemmas. Addressing these challenges requires a proactive approach to AI governance and security, ensuring that innovation is not only rapid but also responsible.

The evolving landscape of AI regulation, highlighted by frameworks such as the European Union's AI Act, underlines the necessity of ethical and transparent AI use. These regulations focus on risk-based categorization of AI systems and the establishment of specific requirements to ensure fairness, safety, and accountability. In response, companies are adopting a "compliance by design" approach, integrating ethical standards and data protection measures right from the inception of AI development processes.

Key trends in AI governance include the development of frameworks to regulate AI outputs, the implementation of robust data protection measures, and the promotion of transparency in AI model decision-making. For generative AI, challenges like fairness and bias

are especially pronounced. Given the use of foundational models trained on vast datasets, mitigating biases embedded in these models is complex. Techniques such as embedding-based evaluations and classifier-based detection are being utilized to measure and reduce bias, ensuring that AI systems operate equitably across different demographic groups.

Moreover, the concept of responsible AI is being operationalized through strategies like establishing audit trails for generative processes, deploying AI-specific security protocols, and continuous monitoring to identify and correct biases. These measures aim to safeguard both users and organizations, maintaining trust in AI technologies. Implementing a structured framework for AI ethics helps not only in complying with emerging regulatory demands but also in preventing the propagation of harmful content and ensuring fairness.

The future of AI hinges on the collaboration between regulators, businesses, and technologists to establish ethical standards and mitigate risks. Generative AI, while offering immense potential, requires thoughtful governance to align with societal values and global security needs. The focus must be on fostering transparency, responsibility, and equity to build a future where AI-driven innovation contributes positively to society.

# Data Technologies

DATA TECHNOLOGIES

Insights  
Engineering



Autonomous  
Data Constructs



Bring Your  
Own Cloud





# 4 Insights Engineering

## Transforming Business Intelligence With Gen AI

Insights Engineering represents a significant leap beyond traditional Business Intelligence (BI), blending advanced analytics with cognitive capabilities driven by generative AI. This emerging trend is fundamentally transforming how organizations derive and utilize insights, evolving from static reporting and manual data exploration to a more dynamic, interactive approach. Insights Engineering allows for autonomous analysis of dashboards and direct interrogation of data, offering a new era of seamless, efficient insights discovery.

Generative AI plays a crucial role in enabling Insights Engineering teams to interpret complex datasets, identify patterns, and provide actionable recommendations in real time. Imagine decision-makers being able to ask questions in plain, conversational language and receive intelligent, context-aware responses directly from their data. This evolution eliminates the need for deep technical skills or laborious manual exploration, making data insights accessible to a broader range of stakeholders throughout the organization. Such capabilities allow business users to engage directly with their data, obtaining the answers they need without intermediaries or the delay of traditional analysis processes.

What sets Insights Engineering apart from traditional BI is its dynamic nature. Instead of relying on static, pre-built dashboards, generative AI acts as a cognitive engine, constantly uncovering hidden opportunities and bringing proactive insights to the forefront. This approach enhances not only the accessibility of data but also its utility, ensuring that decision-makers can respond swiftly to changing market conditions, customer behaviors, or operational challenges. The insights become more actionable, tailored, and relevant, driving smarter and faster decisions that lead to a tangible impact on business performance.

Embracing Insights Engineering means adopting a culture of data-driven decision-making powered by AI—a move that empowers organizations to harness the full potential of their data. As businesses strive to stay competitive in an increasingly data-driven world, Insights Engineering provides the tools to make decisions that are not just informed but truly intelligent. By integrating these generative AI-driven capabilities, companies can streamline decision-making processes, unlock hidden opportunities, and gain a substantial competitive edge.



# 5 Autonomous Data Constructs

## Ai-Driven Data Systems: Building Foundations & Constructs

Interactive AI-driven data systems are revolutionizing how organizations build and manage their data ecosystems, focusing on the construction of data lakes, data warehouses, and even data lakehouses. These advanced systems enable users to ask questions in natural language, gain real-time insights, and automate the creation of data transformation pipelines. By harnessing AI's capacity to intuitively understand user intent, they allow for the design of end-to-end workflows that automate data ingestion, transformation, and integration—all without the need for extensive manual configuration.

These autonomous systems leverage generative AI to construct entire data ecosystems. By analyzing both input and output data, they have the capability to generate all the necessary processes to build the final layers of data consumption. This includes automating the creation of data transformation pipelines, optimizing workflows, and ensuring that all data processes are seamlessly integrated to meet the desired outcomes.

This shift significantly lowers the technical barriers for data engineering, making sophisticated data processes accessible to a broader audience, including non-technical users. The power of AI-driven automation allows organizations to rapidly adapt to changing business requirements, enhancing both scalability and efficiency. With features like adaptive visualizations, contextual recommendations, and predictive modeling, these systems ensure that data aligns closely with organizational goals, maximizing its utility and impact.

AI-driven data systems also facilitate automated pipeline generation and real-time analytics, transforming raw data into actionable insights with unprecedented speed. This capability is particularly



valuable in scenarios where agility and data accuracy are critical, such as real-time decision-making or predictive maintenance. By automatically optimizing data pipelines, these systems create foundational layers for analytics and machine learning, ultimately fostering a more integrated and intelligent approach to business intelligence.

Real-world applications of these systems span various industries, from finance to healthcare. In finance, interactive AI systems can streamline compliance processes by automatically ingesting and analyzing regulatory data. In healthcare, they enable professionals to explore patient data dynamically, derive insights from medical records, and automate workflows that improve patient outcomes. Across sectors, these systems are paving the way for a new era of business intelligence—one that is not only efficient and scalable, but also deeply integrated into the strategic fabric of the organization.



# 6 Bring Your Own Cloud

## Zero Disk: Be the Owner of Your Metadata

Bring Your Own Cloud (BYOC) is becoming an increasingly popular model, allowing companies to deploy a vendor's software directly in their own cloud environment, usually within their Virtual Private Cloud (VPC). This setup means that all data resides in the customer's cloud environment, giving them full control over their infrastructure. BYOC offers significant benefits, including enhanced flexibility, improved control, and the ability to meet stringent data sovereignty requirements, as all data is retained within the customer's cloud accounts and jurisdictions.

The primary advantage of BYOC is the level of control it offers. Businesses can use the vendor's software while keeping their data within their own cloud environment, which is crucial for complying with local regulations on data privacy and sovereignty. This control allows companies to tailor their cloud settings to meet their security and compliance needs, providing a level of assurance that is often difficult to achieve with traditional Software-as-a-Service (SaaS) models, where data is hosted in the vendor's infrastructure.

However, BYOC also brings certain challenges, especially concerning the division of operational and security responsibilities. In a BYOC model, the

vendor manages the application-level tasks, such as updates, patches, and support. Meanwhile, the customer must manage the cloud environment itself, including network security, access control, and integrating services. This division of responsibilities can create ambiguities and complexities, particularly during troubleshooting, as both the customer and the vendor need to collaborate closely to maintain the overall system's security and functionality.

Another common drawback in many BYOC solutions is that they often require the vendor to have permissions within the customer's VPC for monitoring and troubleshooting. This undermines one of the key promises of BYOC: data sovereignty. Confluent WarpStream's Zero-Access BYOC addresses this issue by separating data from metadata, effectively reducing the security and operational ambiguities. This separation allows customers to retain a cloud-native experience while maintaining strict boundaries for data control, ensuring that vendors do not have direct access to the customer's data. This innovative approach helps maintain a strong security posture and better clarity in responsibilities, mitigating some of the main risks associated with traditional BYOC setups.



Cohort of AIs:  
Agent Collaboration

AI & Data  
Stack Sentinel

Enterprise  
Cognitive OS

DATA & AI ARCHITECTURE

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# Data & AI Architecture

# AI & Data Stack Sentinel

## Continuous Trend Monitoring, Continuous Growth

The AI & Data Stack Observatory addresses the critical need for organizations to establish robust monitoring frameworks in the current technological context, marked by numerous advancements, particularly in generative AI amidst the rapid evolution of data processing and generative AI technologies. As breakthroughs in AI capabilities and data architectures continue to reshape the technological landscape, the observatory serves as a proactive tool for identifying, evaluating, and adopting emerging solutions.

In today's era of accelerated digital transformation, businesses face the challenge of keeping up with an overwhelming pace of innovation. The observatory provides organizations with a structured approach to systematically track these developments, offering early insights into new technologies that could significantly impact their strategies and operations. The output of this observatory can ultimately serve as a continuously updated radar, providing a dynamic overview of emerging trends and innovations.

By establishing a permanent monitoring framework, companies can effectively navigate the ever-changing AI landscape. The observatory's purpose is to help organizations assess the relevance and potential impact of

cutting-edge technologies in real time, allowing them to determine which innovations are worth exploring further. This not only ensures that businesses remain adaptable but also positions them to capitalize on opportunities that can drive growth and build competitive advantages.

The observatory's focus extends across generative AI, emerging data architectures, and related technologies, ensuring that companies have a comprehensive view of the evolving ecosystem. With this continuous monitoring, organizations are better equipped to adapt their operations and processes to the changing technological environment. Instead of reacting to trends after they have already reshaped the market, businesses using the observatory can anticipate changes and take proactive steps to lead the charge.

Ultimately, the AI & Data Stack Observatory is more than just a monitoring tool; it is a strategic asset. It empowers organizations to navigate complexity, seize emerging opportunities, and foster a culture of innovation. In an era where technological leadership is often the key to market leadership, the observatory becomes an essential part of a company's strategy to not only keep pace with, but actively shape, the future of data and AI.

# 8 Enterprise Cognitive OS

## Cognitive Platform: New Data & AI Platform

The Cognitive Platform marks a revolutionary shift in how organizations integrate, process, and analyze data by combining traditional architectures with advanced capabilities tailored to handle emerging data formats like audio, video, and unstructured content. This evolution is powered by generative AI, which extends the possibilities of conventional data processing, enabling businesses to derive value from previously untapped data sources.

Unlike traditional systems, which often struggle with the complexities of multimodal data, The Cognitive Platform seamlessly integrates structured, semi-structured, and unstructured datasets. Its ability to process diverse data types in a unified framework empowers organizations to achieve a more comprehensive understanding of their operations, customers, and markets. By incorporating machine learning models, natural language processing (NLP), and generative AI techniques, this platform turns raw data into actionable insights with unprecedented accuracy and speed.

This innovation reflects a broader trend in data engineering and analytics: the move toward systems that prioritize scalability, versatility, and advanced AI integration. Traditional data pipelines were not designed to handle the sheer variety and volume of today's data streams. The Cognitive Platform, however, bridges this gap by enabling businesses to adopt robust, scalable strategies that extract insights from previously siloed or inaccessible data sources.

One of the most transformative aspects of this platform is its ability to handle multimodal data — integrating and analyzing audio recordings, video footage, and textual content alongside transactional and structured datasets. For example, companies can now derive sentiment analysis from customer service calls, uncover patterns in video surveillance footage, or generate summaries from dense legal documents, all within a single system.

By unlocking the potential of these diverse data formats, organizations can achieve superior decision-making, accelerate innovation, and enhance operational efficiency. This trend not only underscores the growing importance of AI-driven platforms in modern data ecosystems but also sets the stage for a new era of data-driven value creation.

The Cognitive Platform isn't just an evolution in data management; it's a fundamental reimagining of how businesses harness information. With its ability to unify and analyze diverse data streams, it represents the future of data innovation — a future where insights are limitless and decision-making is redefined.



# 9 Cohort of AIs

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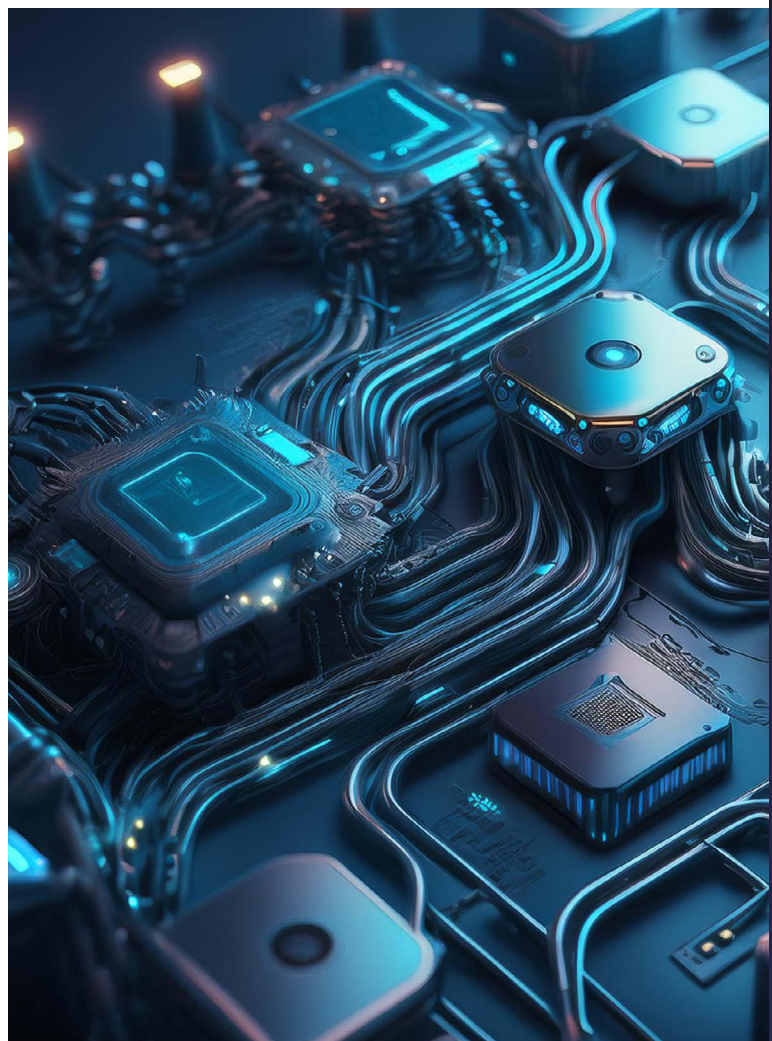
## The New Era of Agents Collaboration: Multi-Agent Systems

Multi-Agent Systems (MAS) are emerging as a game-changing innovation in the AI landscape, revolutionizing how complex problems are approached and solved. These systems involve multiple autonomous agents—either similar in nature or highly diverse—working collaboratively or competitively to achieve shared or individual objectives. Leveraging the principles of distributed intelligence, MAS excel in dynamic environments, offering unparalleled scalability, flexibility, and resilience, even amid uncertainty and rapid change.

The decentralized nature of MAS enables agents to communicate in real time, adapt to evolving conditions, and make independent decisions while contributing to a larger system's goals. This distributed approach contrasts sharply with centralized AI models, allowing MAS to handle problems that exceed the capacity of singular or tightly controlled systems. Recent advancements in agent communication protocols, reinforcement learning techniques, and game theory have significantly enhanced the capabilities and effectiveness of these systems, bringing them to the forefront of AI research and application.

The potential use cases for MAS are vast and diverse. In autonomous transportation, MAS power fleets of self-driving vehicles that coordinate to optimize traffic flow and safety. In energy, MAS improve smart grids, balancing supply and demand in real time. Robotic swarms, inspired by natural phenomena like ant colonies, are transforming sectors such as search-and-rescue operations and industrial automation. Decentralized finance also stands to benefit from MAS, as intelligent agents enable secure and adaptive financial transactions in blockchain networks.

MAS are not just advancing technology—they are reshaping how organizations approach collaboration, efficiency, and innovation in increasingly complex ecosystems. By fostering real-time interaction and adaptive problem-solving, MAS offer a blueprint for tackling challenges that demand agility, robustness, and creativity. As research and development in this field continue to accelerate, MAS are poised to redefine the possibilities of artificial intelligence, opening new frontiers in how machines and systems work together to drive progress.



IBP Reloaded



From Hype  
to RoAI



Business Agents  
& Hypercustomization



BUSINESS/OTHER TRENDS

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# Business/ Other Trends

# 10 Business AI Agents

## Your Business, Your AI Agent: Hypercustomization of AI Agents

The advent of hypercustomized AI agents is revolutionizing the way businesses build and manage their technology ecosystems, focusing on the creation of tailored solutions that align precisely with organizational needs, industry specifics, and customer expectations. Unlike generic AI systems, hypercustomized agents are designed to reflect a business's unique workflows, brand identity, and strategic goals. By leveraging domain-specific data, advanced fine-tuning techniques, and modular architectures, these agents deliver unparalleled precision, adaptability, and personalization.

In addition to enhancing customer engagement through personalized experiences, hypercustomized AI agents significantly improve operational efficiency. They streamline workflows, reduce manual effort, and optimize resource utilization across critical business functions. From automating repetitive tasks to providing predictive insights, these agents enable organizations to achieve greater productivity and agility in a competitive landscape.

These autonomous systems leverage fine-tuning LLMs, embedding domain expertise, and integrating multimodal capabilities to construct entirely customized AI ecosystems.

By analyzing specific business requirements, they have the capability to generate all the necessary processes to build effective and aligned AI-driven solutions, ensuring that all processes are seamlessly integrated to meet the desired outcomes. With hypercustomization, these models are designed to generate content and insights using the specific terminology of each corporation and have the capacity to understand company-specific concepts, making them highly relevant and effective within their unique business context.

This trend explores the key technologies and methodologies driving the hypercustomization of AI agents, highlighting the transformative potential of these agents in unlocking business innovation. Real-world applications span various industries, where hypercustomized AI agents have been deployed to automate customer service, enhance personalization in marketing, and streamline complex operational processes. These agents are not just tools—they are strategic enablers, empowering businesses to operate smarter, faster, and more efficiently, deeply integrating into the strategic fabric of the organization.



## 11

# From Hype to RoAI

## ROI Metrics for Generative AI

Generative AI is reshaping industries by streamlining processes, enhancing creativity, and unlocking entirely new revenue streams. Its transformative potential spans areas like personalized content creation, predictive analytics, and automated decision-making, making it a cornerstone of innovation strategies across sectors. However, as organizations allocate substantial resources to develop and deploy generative AI technologies, the challenge of accurately measuring their return on investment (ROI) comes to the forefront.

Traditional ROI metrics, rooted in direct cost savings or revenue generation, often fall short of capturing the nuanced value generative AI delivers. These systems frequently produce intangible benefits, such as accelerating time-to-market, enhancing customer experiences, or fostering a culture of innovation. Furthermore, their impact often extends across multiple business units, complicating attribution and evaluation.

To address this, organizations are exploring new approaches to measuring the impact of generative AI. These include metrics that quantify innovation enablement, such as the speed and quality of new product development, or measures that assess customer engagement, like retention rates driven by hyper-personalized experiences. Additionally, evaluating AI's role in risk mitigation and operational resilience—such as identifying supply chain disruptions before they occur—provides a more holistic view of its value.

Moreover, the concept of "AI ROI maturity models" is gaining traction. These models provide a framework to assess the long-term strategic benefits of generative AI, accounting for both tangible and

intangible outcomes over time. By incorporating metrics like organizational learning, scalability, and ecosystem integration, these models enable businesses to better understand and articulate the broader impact of their AI investments.

As generative AI continues to evolve, so too must the metrics used to evaluate its business potential. Organizations that embrace innovative approaches to ROI measurement will be better positioned to demonstrate the value of their AI initiatives, drive stakeholder confidence, and maximize the transformative potential of this groundbreaking technology.



# 12 IBP Reloaded

## Automating Tasks & Generating Insights

As businesses strive for accuracy, efficiency, and agility in today's competitive landscape, Advanced Analytics and AI are foundational to modern Integrated Business Planning (IBP). These techniques transform how organizations predict, plan, and execute strategies, enabling data-driven insights and optimized decision-making.

Advanced Analytics includes techniques like data management, predictive/prescriptive analytics, and scenario modeling. Within IBP, these tools empower organizations to make proactive, data-driven decisions. Predictive analytics helps anticipate shifts in demand, supply chain risks, or pricing trends, enabling preemptive action. Prescriptive analytics recommends optimal stock levels, sourcing strategies, or production schedules. Scenario modeling tests "what-if" scenarios, refining strategies for resilience. Over time, these techniques have been integrated into complex planning frameworks with varying success, and the trend remains to optimize and rationalize them. This enhances precision, efficiency, and eliminates manual tasks, freeing planners to focus on decision-making.

A next step for IBP is adopting AI with machine learning algorithms and intelligent systems that learn from diverse sources and continuously improve forecasts. These sources range from internal data (e.g., store traffic, customer interactions) to external data (e.g., tourism trends, pricing dynamics, weather conditions). They are now enriched by image recognition and text analysis of product master data or life cycle management repositories.

By leveraging these data and algorithms, companies can handle complex planning tasks in supply chain optimization (inventory management, distribution) and strategic processes like collection planning or smart assortment. AI-powered models identify



subtle patterns, enhancing predictions for new products and anticipating demand trends. This human-centered AI bridges human expertise and AI-driven insights.

Together, AI and Advanced Analytics enable unprecedented insights and real-time decision-making. They provide actionable data across functions—sales, marketing, finance, and operations—facilitating collaboration, quicker decisions, accountability, and measurable impacts.

Incorporating AI and Advanced Analytics into IBP optimizes resource use and supports an agile, resilient business model. By learning and adapting, these technologies help businesses stay competitive, responsive, and positioned for growth in a dynamic, data-driven world.

# Discover Our Innovation Radar

At SDG Group, innovation is the fuel that drives our value propositions in the field of Data, Analytics, and Artificial Intelligence.

[EXPLORE THE RADAR](#)

## WHO ARE WE?

We are a consulting firm specialized in **AI, Data, and Analytics**.

Business agility is the ability of an organization to adapt quickly to market changes, both internally and externally. This cannot exist without becoming a truly data-driven company. SDG Group achieves this by co-creating optimal solutions with its customers, leveraging Data & Analytics services through a unique combination of business domain expertise and state-of-the-art technologies delivered by industry-leading talent.

We are pioneers in AI, Data & Analytics consulting and we are committed to unlocking organizations' hidden potential by offering in-depth analytics expertise.

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