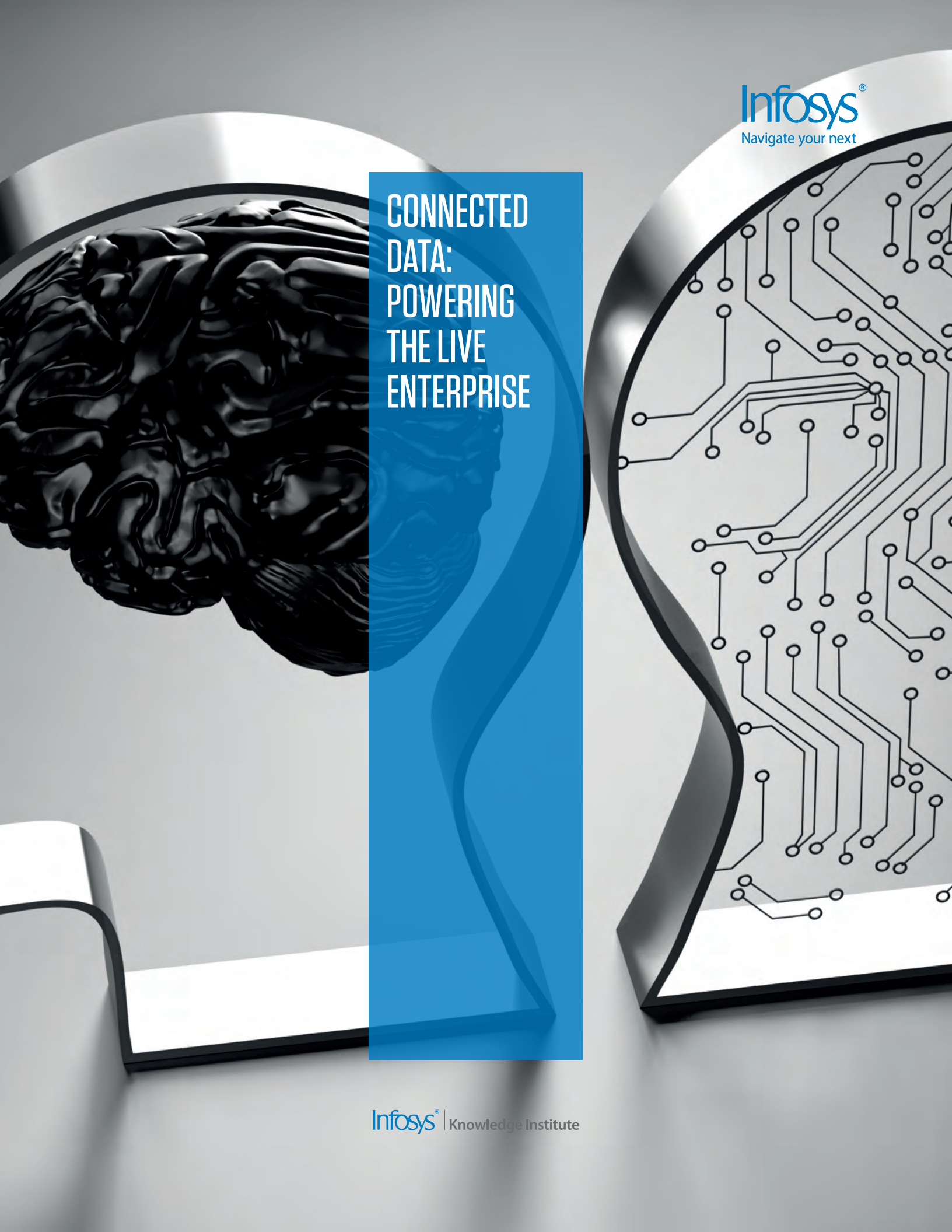


Infosys®
Navigate your next

CONNECTED DATA: POWERING THE LIVE ENTERPRISE

Infosys® | Knowledge Institute

Contents

Organizations have been forced into unfamiliar territory by the COVID-19 pandemic. The disruptive effects of this global event have highlighted the importance of digital transformation, which is happening across three horizons: past, present and future. As new technologies like machine learning (ML), artificial intelligence (AI) and automation become more prominent, organizations will need to adopt the key trends across six data subdomains that can help them transform from a process-based ecosystem to an intelligence-driven ecosystem and remain relevant in this new world.

Across various industries, enterprises are realizing they must become digital natives to survive and thrive in the data economy. AI-powered data is driving new possibilities for the digitization of businesses, new types of experiences (collapsing digital or physical boundaries) and new products or services. Data and AI are defining the characteristics of the future-ready enterprise: hyperpersonalization, real-time context, event-driven and intelligence at the edge.

The COVID-19 pandemic is forcing millions of companies across industries into unfamiliar, treacherous territory. As conferences turn virtual, travel comes to a halt, work routines change and we adopt physical distancing, the paradigm has shifted. Enterprises need to rapidly evolve their workplaces to support remote collaboration at scale. This means enabling employees to stay meaningfully connected, build new skills for new ways of working and embrace a digital culture. These changes have led to increased use of data to make informed and critical business decisions. With data moving from independent data centers to a centralized cloud, AI algorithms will be enabled to optimally plan operations and infrastructure.

Enterprises will need to be prepared to transform their process-based ecosystem into an intelligence-driven ecosystem. This shift will be orchestrated through algorithms with data at the center. As this shift happens, experience will be delivered through the context captured across digital touchpoints. This will have enormous implications for how data platforms (databases and data architecture) evolve in the future.

The digital transformation enables organizations to create competitive advantages and develop brand-new products, services and business models. This is extremely important in today's age, when firms are forced to innovate quickly to stay alive. Working from home, shocks to supply chains, transition to e-commerce sales, and the rise of environmental, social and governance (ESG) issues in consumers' minds have made this sort of transformation the need of the hour. As firms undergo this transformation, more and more data is being produced, forcing companies to collect, process, analyze and govern the data they generate. Further, the speed at which the data moves and proliferates between organizations is also increasing. Today, managing data has become harder for organizations.

The enterprise of the future will be hyperconnected, fueled by a digital brain driven by AI. The ability of data to work across a polycloud architecture will be crucial. Cloud costs will need to be optimized by revising current operating model capabilities and by using opex-based financial management, bringing together technology, finance, and business departments under one umbrella. Once companies get this right, they can build an enterprise to sense market conditions at a micro level and respond to client pain points with the right features, functions and commercial packages in the product portfolio. By connecting business operations, applications, infrastructure services and cybersecurity and by embedding AI in the enterprise core, they also will ensure the workforce can get more done wherever they work, 24/7/365.

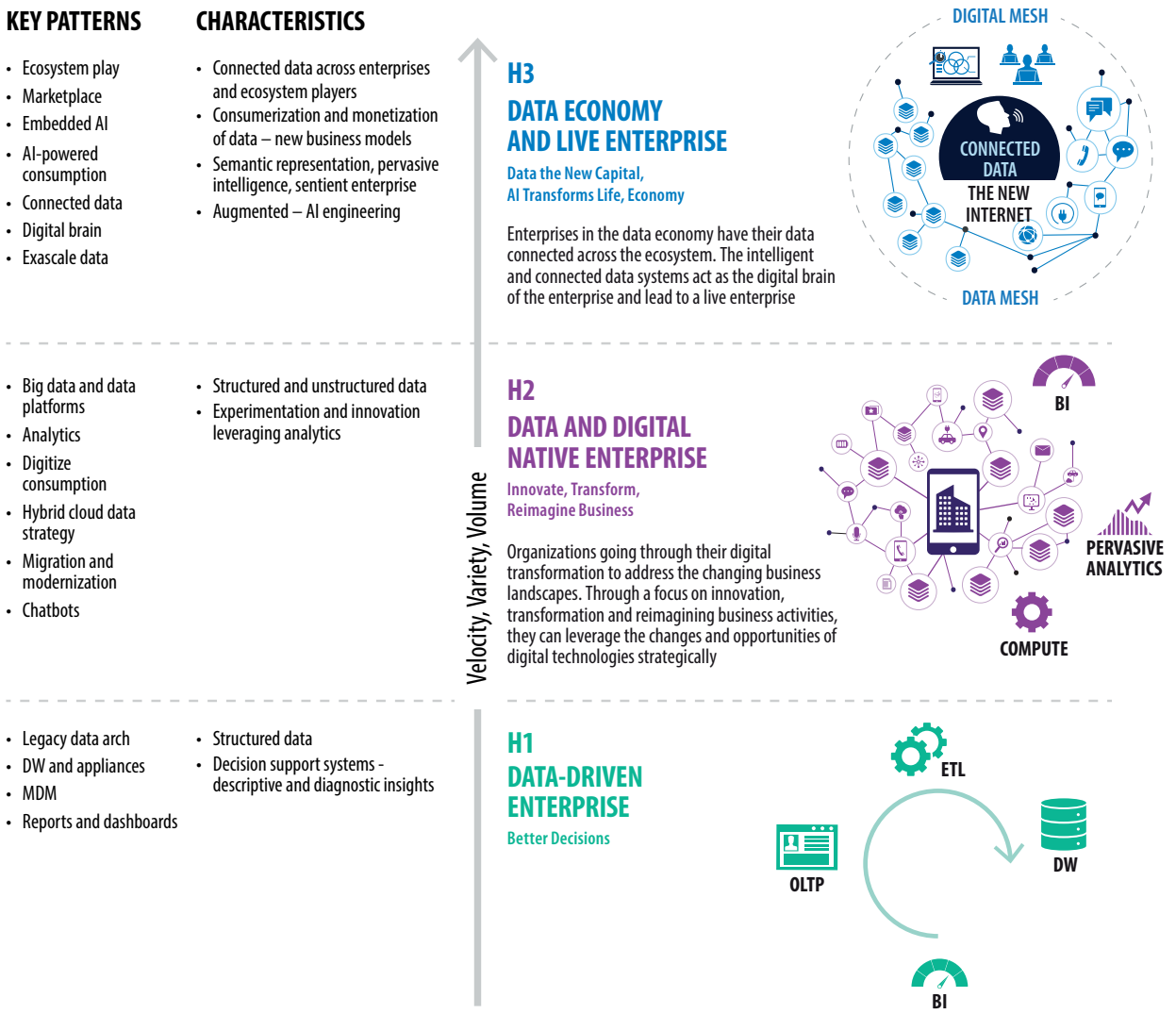
Enterprises are evolving toward a connected data ecosystem

Through extensive client work and research, Infosys has seen that most organizations have multiple

methods of managing their business: a customer relationship management system, an enterprise resource planning system (such as SAP), a records management program and others. Each system offers data, but that data is not connected across the entire enterprise. Infosys data experts have found that while it has become commonplace for these separate systems to be connected, the future is about connected data, powered by tools like ML and AI, to drive hyper personalization. Instead of buckets of customer segments, intelligence will be available to inform unique customer interactions.

As enterprises undergo this data transformation, they are migrating across three horizons: from disparate, legacy systems that are losing adoption (horizon1, H1) to boundaryless systems that have become mainstream (H2) and finally to live enterprises or connected data systems that are in a pilot stage or starting to gain relevance (H3).

Figure 1. Adapting to market dynamics: the three horizons



Source: Infosys

H3 has several characteristics that will distinguish it from the previous two horizons, the first being **connected data across enterprise and ecosystem players.** Data must be brought together physically (in data lakes) or virtually, curated, cleansed, and connected in an automated manner. The connected data across the enterprise and beyond helps derive insights across these connections. These insights then become the business drivers to provide ever-expanding services to the customers, positively impacting the company's bottom line.

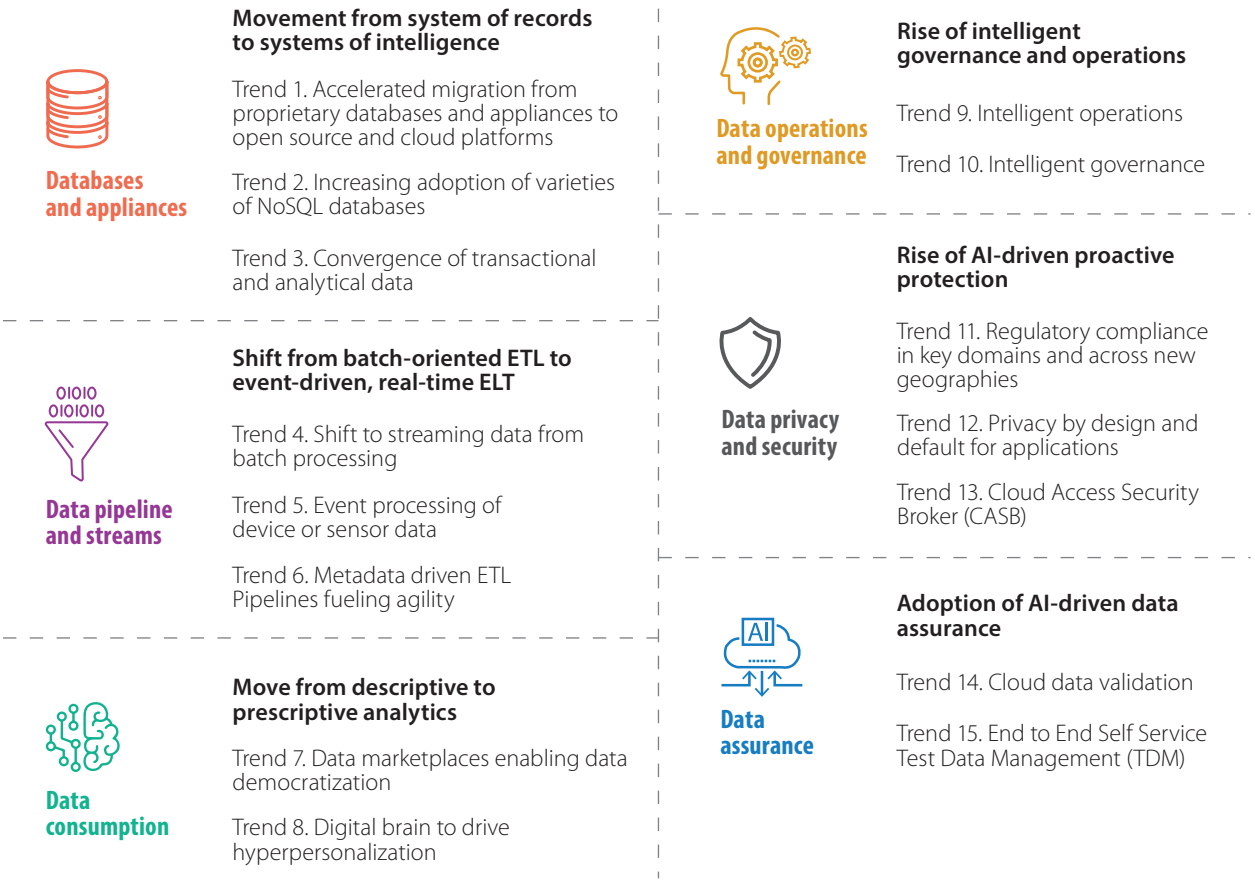
The **connected data system can understand changing patterns** and act where the rules are clearly understood, while deferring to its human partners when things are ambiguous. In many senses, this **connected data becomes the digital brain of the enterprise**, helping increase the velocity of business by expediting the decision-making process while at the same time recognizing new patterns that lead to innovation and evolution of the business.

Migrating to H3 will take enterprises on a transformation journey across all data subdomains:

1. **Databases and appliances**
2. **Data pipeline and streams**
3. **Data consumption**
4. **Data operations and governance**
5. **Data privacy and security**
6. **Data assurance**

In this technology domain, we explore key trends under each of the subdomains that can help transform enterprises from a process-based ecosystem to an intelligence-driven ecosystem.

Figure 2. Key trends across data subdomains



Source: Infosys

DATABASES AND APPLIANCES

Movement from systems of records to systems of intelligence

Databases have evolved in recent decades, from being restricted to just a system of holding records like legacy relational database management systems (RDBMS) (such as Informix), and moving to a system of engagement like open-source relational databases (such as PostgreSQL). The future of databases involves transformation to a system of intelligence where edge database solutions like Couchbase and Realm and distributed databases like CockroachDB are adopted by enterprises.

Trend 1. Accelerated migration from proprietary databases and appliances to open-source and cloud platforms

With digital transformation of businesses comes huge capital and time investment in new, innovative technologies. Cloud computing is a major trend in digital transformation, as it makes business applications and infrastructure easily accessible. According to Gartner, 75% of databases will be deployed or migrated to a cloud platform by 2022.[1] This is driven largely by the use of databases for analytics and the software-as-a-service model.

In the journey toward cloud migration, businesses are looking to reduce costs. It's one of the primary reasons businesses want to move from proprietary to open-source databases. According to EnterpriseDB, with a shift to PostgreSQL, up to 65% of costs can be saved.[2]

As cloud computing gains adoption, DBaaS (database as a service) has also risen. With DBaaS, enterprises don't have to deal with complex infrastructure, and databases are managed and supported by their respective vendors. MySQL and PostgreSQL are provided by major cloud vendors.[2] With infrastructure being managed by cloud vendors and open-source databases being easily available, more organizations are shifting toward DBaaS.

Infosys collaborated with one of the largest multinational investment banks to help migrate from appliances like Teradata to Hadoop data platform.

Infosys partnered with a large financial service company, to create an experience layer based on AeroSpike to decouple customer facing systems from mainframe DB2 SOR, for their trading platform.

Trend 2. Increasing adoption of varieties of NoSQL databases

NoSQL, or nonrelational database, adoption is rising as enterprises develop a need to access and analyze large amounts of unstructured data or the data stored in multiple virtual servers in the cloud. RDBMS encountered few limitations while handling unstructured data, which led to the pioneering of NoSQL databases by top internet companies including Amazon, Google, LinkedIn and Facebook.[3]

These include varieties of NoSQL databases such as key value store (Redis, Riak and Couchbase), columnar (Apache's Cassandra and HBase), document (MongoDB and Couchbase), and graph databases (Neo4j and JanusGraph).

Trend 3. Convergence of transactional and analytical data

Enterprises generally have transactional, analytical and operational workloads across separate data warehouses, data lakes and databases. This leads to data silos, making it difficult to provide real-time analytics and insights without movement of data across these systems.

This process of moving data is slow and cumbersome, and it reduces competitiveness of enterprises in today's digital world. Businesses find challenges in giving price quotes to their sales team in real time, monitoring assets or making product recommendations. Likewise, supply chain partners may not have updated inventory or shipping details.

This leads to the emergence of architecture where online analytical processing and online transactional processing are merged into a single platform. It helps in performing advanced analytics and providing insights and recommendations in real time, while also conveniently displaying live transactional data on one platform.

These databases drive real-time apps, like for fraud detection, patient health monitoring, counterterrorism, stock trading and earthquake monitoring. They also have applications in asset monitoring and provide connected data apps, giving a view of critical business data.[4]

Infosys partnered with one of the largest sportswear manufacturers to build a near real-time event streaming-based solution to ingest and analyze a huge number of events generated through a mobile app, internet for user activity analysis

Infosys collaborated with one of the largest multinational chains of coffeehouses for accelerated onboarding of new data products through a Multi-point Metadata driven Ingestion Framework. Auto Generation of Data Flow pipelines was done with Extreme Automation

Infosys partnered with a government agency to build end-to-end tax collection and tax accounting systems on an open-source platform using an agile development process to meet the unique characteristics of the system.

Infosys partnered with one of the largest oil and gas corporations to create an Integrated Data Marketplace to provide users with a platform to find data, tools and practices to conduct research, develop web and mobile applications, design data visualizations. Also, provide platform/tools for self-service analytics.

Infosys collaborated with one of the largest telecom companies for enhanced user experience through Flexible Dashboards, Analytics Reporting by integrating Insight360 with Data Café's features like Report mashup, KPI mashup, storyboard, additional administrative functionalities, coupled with Robust Security and Data Governance.

Infosys partnered with one of the largest pharmaceutics companies to create an end-to-end analytics platform on cloud that provides a template-driven approach for data onboarding, device-independent architecture to scale for future and advanced AI/ML support to enable analytics at scale.

DATA PIPELINE AND STREAMS

Shift from batch-oriented ETL to event-driven, real-time ELT

Enterprise technology is entering a watershed moment when information has become dynamic and no longer is accessed just once a week or even once a day. In fact, business success is based on how we use continuously changing data. There has been a shift from batch-oriented extracting, transforming and loading (ETL) and point-to-point integration (ETL scripting: PL/SQL) to metadata-driven, real-time ETL (real-time ETL: Kafka). AI-assisted, event-driven processing (attribute mapping: ML-based automapping) will become mainstream in the future. The streaming data pipelines enable organizations to transform and become data-driven, leveraging the latest in AI, ML and real-time prescriptive data analytics.

> AI-assisted, event-driven processing will become the norm in future

Trend 4. Shift to streaming data from batch processing

In today's ever-connected society, enterprises are being bombarded with huge amounts of data from sensors, machines, tracking devices, banking and trading sources, smartphones, social media content, and other "internet of things" devices. The need of the hour for businesses is to have the engine to decipher strategic value from this data in motion with minimal latency to deliver real-time insights, train algorithms or update the event-driven logic of mission-critical applications. This is different from traditional analytic tools operating on data at rest. Not all collected data can be accumulated for future use, as it may lose relevance and not reflect the business realities. This need for real-time analytics has seen enterprises shift from batch processing to real-time data streaming.

Kafka, Flume, Storm and Flink are a few popular real-time, data-streaming ETL tools.

Infosys partnered with a global footwear and apparel giant to build a near-real-time event stream-based solution to ingest and analyze a huge number of events generated through mobile apps and the internet for user activity analysis.

Infosys collaborated with a global financial services client to enable near-real-time movement of data from their core banking systems to the Google Cloud platform, which enabled accelerated onboarding of new clients in the small and medium enterprises (SME) banking segment.

Trend 5. Event processing of device or sensor data

Streaming data provides opportunities for interesting future use cases with AI and event-driven applications, most notably giving rise to various tools and frameworks for building and running scalable event stream processing.

The rise of event stream processing is a result of the growing volume of real-time data. Events are created throughout the enterprise. The rise of the internet of things has fueled the demand for event processing. At the edges, the events are detected by sensors or devices. When processes for a business either start, finish or fail, an event is created within the network. Based on the outcome of these events, the activity of an enterprise can be altered. It includes the capture, emission, subsequent routing and any further processing of emitted events and their consumption.

Infosys partnered with a Belgian courier company to exemplify this trend by implementing bar code scanners to track parcels in real time and to take corrective actions for parcel routing.

Another example includes Infosys collaborating with a Japanese multinational car manufacturer to use real-time processing of telemetry data received from connected cars to generate vehicle history reports instantly.

Trend 6. Metadata-driven ETL pipelines fueling agility

Enterprises have countless data sources and need scalable and robust pipelines to maintain data integrity. The ETL development tools generally require expertise with the tool set and can be time consuming and error prone.

A metadata-driven ETL pipeline provides an easy and flexible abstraction layer and simplifies the implementation process. It provides the required speed and agility and includes generating templates for exception handling, rules management and data migration controls. Data schemas, physical data source locations, job control parameters and error-handling logic can be stored within configuration files. The framework can effortlessly process and maintain these files to generate ETL jobs that are executable.[5] Loading data into a traditional enterprise data warehouse becomes a more streamlined process, which makes data more readily available for reporting, to be used by other applications and analytics. This framework produces code that is simple to maintain and review because it is standardized.

Infosys assisted a German pharma company achieve a 35%-40% reduction in the effort needed to onboard and process new or existing datasets for oncology and women's health.

Infosys partnered with a global coffeehouse giant to accelerate onboarding of new data products through a multipoint, metadata-driven ingestion framework, with extreme automation-enabled auto generation of data flow pipelines.

DATA CONSUMPTION

Move from descriptive to prescriptive analytics

With the rise of AI and systems becoming more intelligence driven, the consumption of data is expected to become more prescriptive (cognitive intelligence: Rasa), evolving from the conventional descriptive (dashboard: Tableau) and predictive (RStudio) insights.

Trend 7. Data marketplaces enabling data democratization

In the information age, data experts mainly have been responsible for unleashing the power of data within organizations, as others lacked training to handle the humongous amount of data effectively.

The rise of emerging technologies, however, has given more power to non-data analysts to utilize and interpret data. Making data accessible to nonspecialists is the future of data and is called data democratization.

Data marketplaces play a huge role in enabling data democratization. Users are enabled to make important data decisions, like which data is important and why is it important, without reliance on IT experts. The marketplace is dynamic. Users decide what has the most value. Companies can decide on their data investments based on the popularity of data by usage. After purchasing data from the marketplace, users can combine it with other available data to launch powerful data-driven projects.

Infosys partnered with a Dutch bank to integrate a data marketplace solution with the company's enterprise systems to provide a single data asset repository for organizationwide users, using Solr.

Infosys partnered with a multinational oil and gas company to develop an integrated data marketplace solution that provides users with a platform to find data, tools and practices to conduct research, develop web and mobile applications, and design data visualizations.

A top airplane manufacturer used an application programming interface marketplace for an aircraft event history service, an event classification service, aircraft disruption event prediction tools, etc.

Trend 8. Digital brain to drive hyperpersonalization

According to the Customer Experience Impact survey, 86% of customers are willing to pay more for a better customer experience.[6] This provides organizations an opportunity to stand out from their competitors by delivering hyperpersonalization. Today, customers use multiple devices that provide businesses with a lot of information regarding their lifestyle and behavior. Enterprises are going through a digital transformation and connecting enterprisewide data. The connected data of an enterprise forms the digital brain and enables continuous, automated learning from data across all business units, departments, product lines and services, giving the organization higher cognition. The digital brain harnesses data and drives personalized experiences for the customer across the buyer journey in real time and is pivotal for achieving hyperpersonalization.

A food processing company offers a great example. Infosys partnered with the company create an up-to-date mind map, which was realized through a connected taste graph that captured affinities across consumers, recipes and products. This allowed it to intelligently perceive relevant signals from consumer clicks and push contextualized exclusive proposals to consumers across touchpoints.

DATA OPERATIONS AND GOVERNANCE

Rise of intelligent operations and governance

Enterprises have moved from a siloed (governance: IBM InfoSphere; operations: AutoSys) to a unified governance and operations model (containerization: Kubernetes; unified operations: Splunk). With AI in the picture, data governance will be driven by intelligence (explainable AI: LIME; intelligent operations: Hitachi Vantara) in the future.

Trend 9. Intelligent operations

Digital disruption, customer experience and data explosion are the key drivers forcing businesses to reimagine their business processes and adopt intelligent operations.

With adoption of intelligent operations at the core, a company becomes more agile, flexible and responsive; generates value faster; and achieves sustainable competitive advantage. The four vital ingredients of intelligent operations include utilizing cloud, applied intelligence, innovative talent and smart partnership ecosystems for long-term business process transformation. Intelligent operations provide the flexibility, responsiveness and agility that businesses need to swiftly change and to navigate a new course confidently.

For an operations example, Infosys partnered with a top financial services company, to implement a big data cluster monitoring using Splunk and improved operational efficiency by 30%. The company used predictive analytics to detect anomalies and optimize its capacity planning, and it set up real-time alerts that would trigger self-healing of the servers when an alarm was raised.

Trend 10. Intelligent governance

To become data-driven, enterprises need to apply automation, intelligence and self-service across the entire organization to accelerate business processes and empower all business units.

Intelligent governance is an important trend, as it is required both for conforming to industry regulations and for best practices in security. In meeting demands of AI or ML initiatives, according to ESG research, data security or compliance and governance have frequently been reported as the weakest link in technology stacks.[7]

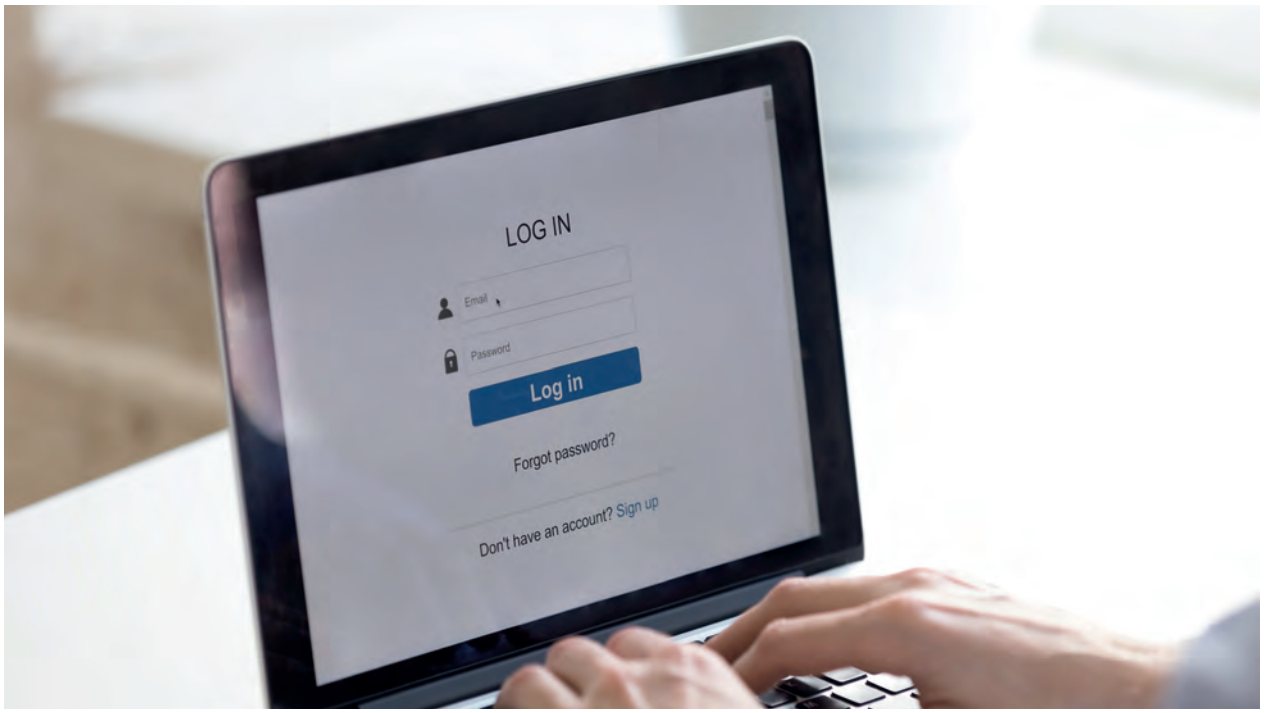
Conformance is the most important requirement at the organizational level. Improper governance leads to improper management and protection of growing data volumes. When it comes to being audit-ready and compliant, this harms the organization's ability in both regards. By ensuring proper access control, businesses can potentially generate faster, more valuable insights — shortening time to value and accelerating innovation.

Without holistic data governance, data becomes chaotic. Enterprises expend great energy struggling to document and implement data governance. This requires taking data governance to the next level. Data across the enterprise needs to be easy to access, understand and use. Intelligent data governance fuels this process and accelerates data-driven digital transformation. An ML-driven engine drives automated quality and security tools to collaborate with business in IT, making information accessible to everyone.

Enterprises should enable end-to-end process and governance framework for creating, controlling, enhancing, attributing, defining and managing a metadata schema, model to cover, data flow from source to target, data flow dependencies, operational metadata (load execution, run stat, end to end monitoring of data pipelines, etc). Enterprises should establish a metadata repository to provide a clear and consistent definition of the data across the enterprise and importing the business and technical metadata for creating the lineage and business glossary. Collate the information specific to the business, technical, and operation metadata for the identified business elements and identify the metadata store for centralized management and astute governance including a single version of the truth.

> Turning to intelligent governance, Infosys partnered with a prominent fast-moving consumer goods company. When it receives incomplete sales data from its point-of-sale systems, it now leverages an ML-based data-cleansing solution to fill in those missing values.

DATA PRIVACY AND SECURITY



Rise of AI-driven proactive protection

The increased vulnerability of businesses to cyberthreats makes data protection increasingly critical, which has led to enterprises moving from adopting basic security (past: IBM Guardium; present: Forcepoint; future: TLS/SSL encryption) to holistic security (past: Elastica CASB; present: Microsoft O365 DLP; future: Zscaler). The majority of enterprises eventually will move toward AI-driven proactive security (present: quantum key distribution, future: internet of things device and communication protection) in the coming years.

Trend 11. Regulatory compliance in key domains and across new geographies

Security compliance has become a hot topic following the rise of various regulations including the European Union (EU) General Data Protection Regulation (GDPR), Basel Committee on Banking Supervision's standard (BCBS) 239 and the California Consumer Privacy Act (CCPA). As shared in a Capgemini report from 2019, the percentage of organizations that are fully GDPR-compliant stands at less than 66%.[8]

Where does the broader issue behind compliance stem from? The relationship between organizations and the people they market to is evolving. From data privacy regulations such as GDPR and CCPA to existing marketing legislation like the Telephone Consumer Protection Act (TCPA) and the CAN-SPAM act for email, consumers are increasingly demanding control over the level of contact they receive as part of a business relationship. This makes data quality more important, as accurate data is critical to prevent any violations and to avoid penalties.

Companies are adopting GDPR readiness assessments to identify current privacy gaps with respect to the GDPR and to develop the strategy road map, including data anonymization, data retention, data minimization, etc.

Enterprises also have created frameworks for securely storing and applying customer-managed security keys to access data and services in a multicloud environment.

Trend 12. Privacy by design and default for applications

Privacy by design includes privacy at the inception stage of new devices, networked infrastructure, IT systems and even corporate policies. Developing and integrating privacy solutions in the initial project phases proactively identifies problems and helps prevent them in the long run.

Privacy solutions in the past often have been installed as a reactive measure after the occurrence of a breach. Privacy by design aims to make data privacy a more proactive and prioritized feature for developers and business administrators.

Privacy by design also can be implemented taking on the challenge of complying with data protection standards. For example, the GDPR mandates robust security for personal data. Recommended privacy protection practices include data minimization and pseudonymization, which are in harmony with privacy by design.

> Infosys partnered with a top American bank to integrate data privacy and security implementation that encompassed various technology streams such as the internet of things, big data, analytics, mobile platforms, social media marketing, cloud, etc.
>
> An American agricultural equipment manufacturer used privacy engineering, assurance and advisory services for the design of an application.
>
> A Belgian courier company was provided recommendations by Infosys to design, develop, and implement a portal compliant with EU data privacy regulations on various platforms.

Trend 13. Cloud access security brokers

Enterprises now can focus on core capabilities because data storage concerns have been eased by cloud adoption. Behind the increased need for cloud security solutions are major concerns about privacy and security breaches. This means that within the cloud security domain, cloud access security brokers (CASBs) are rising to new levels of prominence. Between 2019 and 2025, it's predicted that the worldwide CASB market will expand at a compound annual growth rate of 16.9%. The reason for this growth is widespread deployment by a multitude of business, both small and medium size.[9] Given how flexible the CASB solutions are, it is no surprise that the adoption rate has been as high as it is for SMEs.

CASB helps in shadow IT audits, scanning and protecting data on cloud storage and preventing data leaks on software-as-a-service applications. It enables evaluation of compliance and security requirements. CASB encrypts and tokenizes data while also stopping the upload of sensitive material. Based on location, operating system and device, different levels of cloud service functionality and data access are granted to each user. Gartner reveals that the percentage of enterprises securing their cloud applications with a CASB will be 60% by the year 2022.[10]

Infosys has invested in a modern security stack (multifactor authentication, conditional access, virtual private network, terminal access, endpoint protection platform, endpoint detection and response, data leakage prevention, patching, hardened build, etc.) for endpoints, which gives us ongoing assurance of security of these devices and relevant insights as well. Our remote monitoring and management solution stack provides unified control and visibility into our entire IT infrastructure, so servers, networks and endpoints can be actively and remotely managed. We are rapidly upgrading this infrastructure to support the exponential need for remote access.

DATA ASSURANCE

Adoption of AI-driven data assurance

Data assurance has transformed from being manually driven (offline test data management) to automated (big data validation) and will be AI-driven in the future (AI-powered data validation).

Trend 14. Cloud data validation

As data moves in or out of the cloud (or data lakes), data errors and inconsistencies accumulate. This causes less than 40% of data clouds (and lakes) to be reliable and usable.[11] Lack of cloud data validation is an existential threat to data-sensitive organizations.

Uniquely different data validation rules within each data repository make it difficult to identify rules even for medium-size repositories. Majority data-quality checks are dynamic, hard to code and need to be updated constantly. Understanding data access controls is crucial. Even if data is held by an external service provider, customers themselves are responsible for the security and integrity of owned data. Data in the cloud typically resides in a shared environment with data from other customers. Hence, to have data integrity, it is critical to encrypt and segregate each customer's data from others' data. Data recovery is important to ensure data integrity. At the same time, a data retention strategy (warm, cold, hot, etc.) is required. All these factors have led to the rise in the importance of validating cloud data.

Companies have implemented innovative solutions using custom utilities and Infosys Data Testing Workbench (IDTW) to have a single automation platform for end-to-end data validation, all the way from on-premises legacy systems to various AWS cloud data sources, to validate huge amounts of data. Enterprises have established direct connectivity for automated data validation in legacy databases, AWS Redshift and Amazon S3 using IDTW for end-to-end automation validation.

Trend 15. End-to-end self-service test data management

Major financial losses caused by production defects have led to a rapid rise of interest in test data management (TDM) in the testing industry. This is because the losses could have been prevented by detection via testing with proper test data. Test data has evolved from a few sample files to powerful test data sets with high coverage.

Also, with the growth of Agile and DevOps, quality assurance has become more integral to the sprint cycle. Accommodating tight delivery schedules requires frequent tests with self-service, on-demand test data. To be successful, the DevOps framework should have end-to-end, self-service TDM embedded in it. This will give the right teams accurate test data in a fast, efficient manner, making it possible to drive high-quality, continuous and on-time software delivery. The core of TDM is to address test regulatory compliance, data privacy, test coverage and on-demand data availability.[12]

The trend of end-to-end self-service TDM covers synthetic data generation and data subletting for multiple formats, gold copy creation and data provisioning, and self-service data requests.

References

Trend 1. Accelerated migration to open source and cloud platforms

1 https://www.enterprisedb.com/blog/gartners-state-open-source-dbms-market-2019

2 https://dzone.com/articles/the-rise-of-open-source-databases

Trend 2. Increasing adoption of varieties of NoSQL databases

3 https://arxiv.org/ftp/arxiv/papers/1307/1307.0191.pdf

Trend 3. Convergence of transactional and analytical data

4 http://www.dbta.com/BigDataQuarterly/Articles/The-Convergence-of-Transactions-and-Analytics-125009.aspx

Trend 6. Metadata-driven ETL pipelines driving agility

5 https://rcgglobalservices.com/in/the-value-of-flexible-etl-frameworks-and-soa-services/

Trend 8. Digital brain to drive hyperpersonalization

6 https://www.hgsdigital.com/blogs/what-is-hyper-personalization

Trend 10. Intelligent governance

7 https://www.ibm.com/downloads/cas/QL2MLXOV

Trend 11. Regulatory compliance in key domains and across new geographies

8 https://www.capgemini.com/championing-data-protection-and-privacy/

Trend 13. Cloud access security brokers

9 https://medium.com/@rahul89maske/global-cloud-access-security-broker-casb-software-market-trends-and-growing-demands-2019-key-a784871cafbe

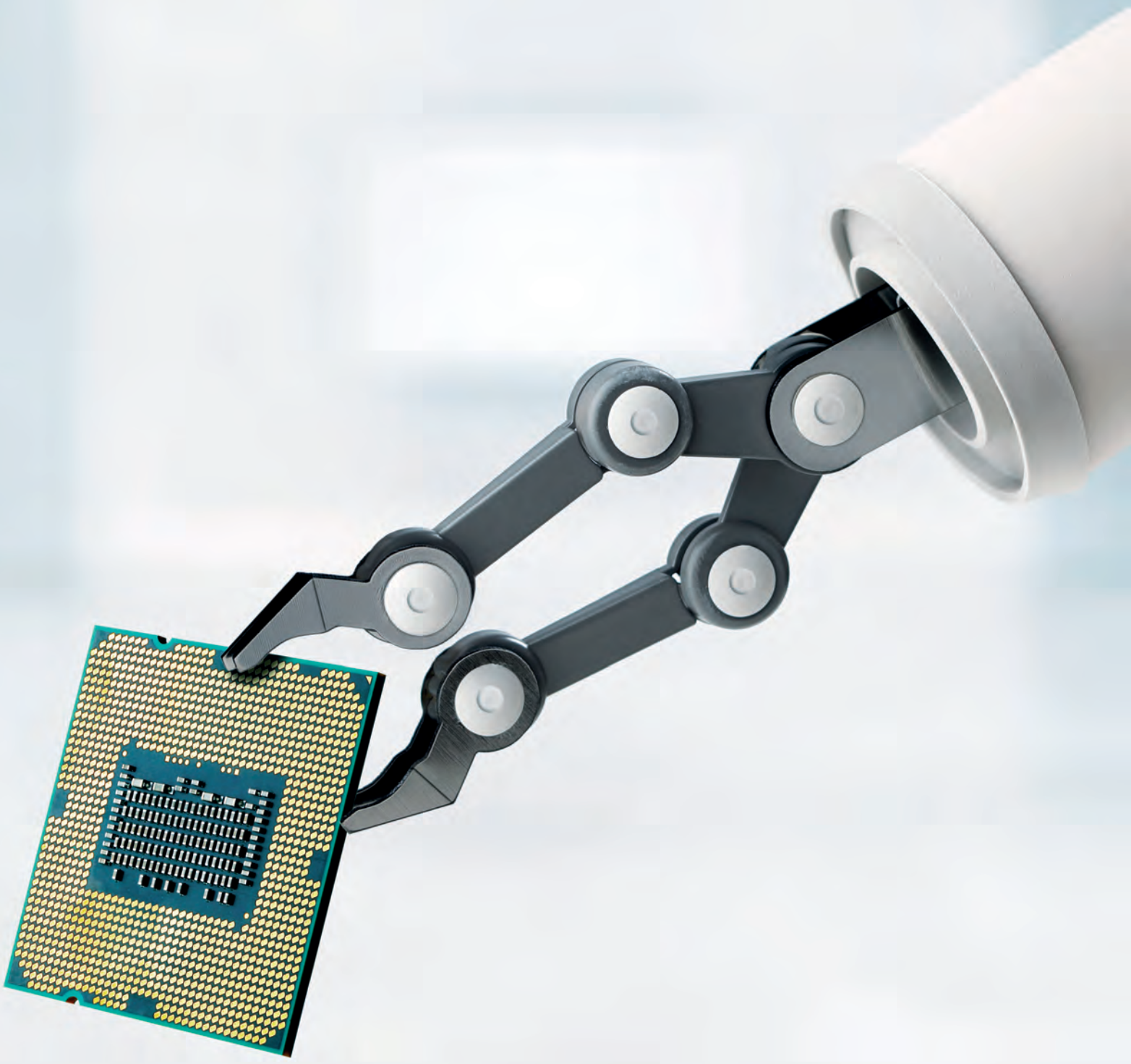
10 https://www.skyhighnetworks.com/cloud-security-university/what-is-cloud-access-security-broker/

Trend 14. Cloud data validation

11 http://firsteigen.com/cloud-data-validation/

Trend 15. End-to-end self-service test data management

12 https://www.infosys.com/services/it-services/white-papers/documents/test-data-management-software.pdf



Advisory Council

Mohammed Rafee Tarafdar
SVP and Unit Technology Officer

Prasad Joshi
SVP, Emerging Technology Solutions

Balakrishna DR
SVP, Service Offering Head –
Energy, Utilities, Communications & Services

Satish HC
EVP, Head Global Services – Data and Analytics

Rajeev Nayar
VP – Unit Technology Officer - Data and Analytics

Srinivas P
Chief Privacy Officer

Gautam Khanna
VP – IP Deployment and Commercialization

Thirumala A
VP – Education, Training and Assessment

Dinesh HR
EVP, Head Global Services –
Enterprise Package Application Services

Jasdeep Kaler
AVP, Global Product Head – NIA

Contributors

Chandra SY

Charudatta Joshi

Deepak PN

Eggonu Vengal Reddy

Jagadamba Krovvidi

Jyotirmay Ray

Karthik Andhiyur Nagarajan

M Sujatha

Manjunatha Gurulingaiah Kukkuru

Mohammed Rafee Tarafdar

Naresh Duddu

Prakash Karimaraka

Rajeev Nayar

Rajib Deb

Ramakant Mohapatra

Sanjay Agara

Sanjay Mohan

Shashidhar Bommavara Ramakrishnaiah

Shreyash Subhash Mantri

Swaminathan Natarajan

Vageesh Patwardhan

Venkat GNP

Vijayaraghavan Varadharajan

Vinieth Kochugovindan Kuruppath

Vivek Nagpal

Producer

Ramesh N
Infosys Knowledge Institute
ramesh_n03@infosys.com

About Infosys Knowledge Institute

The Infosys Knowledge Institute helps industry leaders develop a deeper understanding of business and technology trends through compelling thought leadership. Our researchers and subject matter experts provide a fact base that aids decision-making on critical business and technology issues.

To view our research, visit Infosys Knowledge Institute at infosys.com/IKI.

For more information, contact askus@infosys.com