Hype Cycle for Communications Service Provider Operations, 2023

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Initiatives: CSP Digital Transformation and Innovation

Critical changes in CSP operations such as the operating model, technologies, business processes and data centricity require consistent and coherent planning and investments. This Hype Cycle captures the top operational capabilities for CSP CIOs to plan, invest and enable broader transformation.

More on This Topic

This is part of an in-depth collection of research. See the collection:

- 2023 Hype Cycles: Deglobalization, AI at the Cusp and Operational Sustainability

Analysis

What You Need to Know

Communications service provider (CSP) operations need to provide cost efficiencies, agility and innovation at multiple levels that closely align with changes to strategic priorities, business models, products and network capabilities and architectures. As operations evolve, they must holistically address transformation by covering the operating model, business processes, technology, organization structure, skills and talent. CIOs must collaborate with business and network leaders to execute change in operations.

This Hype Cycle addresses key facets of operational change requirements, focusing on the most important innovations that can enable desired outcomes. CSP operations and its transformation encompass numerous evolving technologies and processes that call for continued investments in capabilities essential for success. Disruptive changes are providing both opportunities and challenges to operations in areas such as cloud-native technology utilization, increasing use cases for AI/ML, and demands for improved customer and partner experience and service composability.

The Hype Cycle

CSPs and their traditional ecosystems are disrupted by new types of CSPs, IT and systems integrator companies, as well as players from other industries and changing customer demands. Additionally, some CSPs have restructured into multiple units, such as netco and servco, or have techco ambitions. Incumbent CSPs need a well-planned approach to modernizing their operations, including accelerating digital transformation, automation and operating model change.

To better compete and differentiate value creation, evaluate where change is needed across commercial, service and infrastructure operations, and implement swiftly. Newer CSPs with fewer legacy systems and processes should also embrace and implement modernized and leading approaches for their operations to manage costs and compete more effectively.

Notably, the innovations on the Hype Cycle are a mix of technology, process and organizational capabilities, as all are critical in CSP operations evolution and execution. CSPs need innovation at multiple levels — in their products, service delivery and the way they operate and manage resources — which all must be reflected in and supported by operational changes, skill set development and an agile mindset.

CSP CIOs should use this Hype Cycle to:

- Identify the required capabilities to enable their vision and business strategy.
- Validate various capabilities' maturity levels with business leaders and execution teams, and solicit support for the evolution.
- Analyze key technologies on which to focus investments under innovation and transformation initiatives.
- Identify the necessary technology- and process-related capabilities and related skill sets across teams.

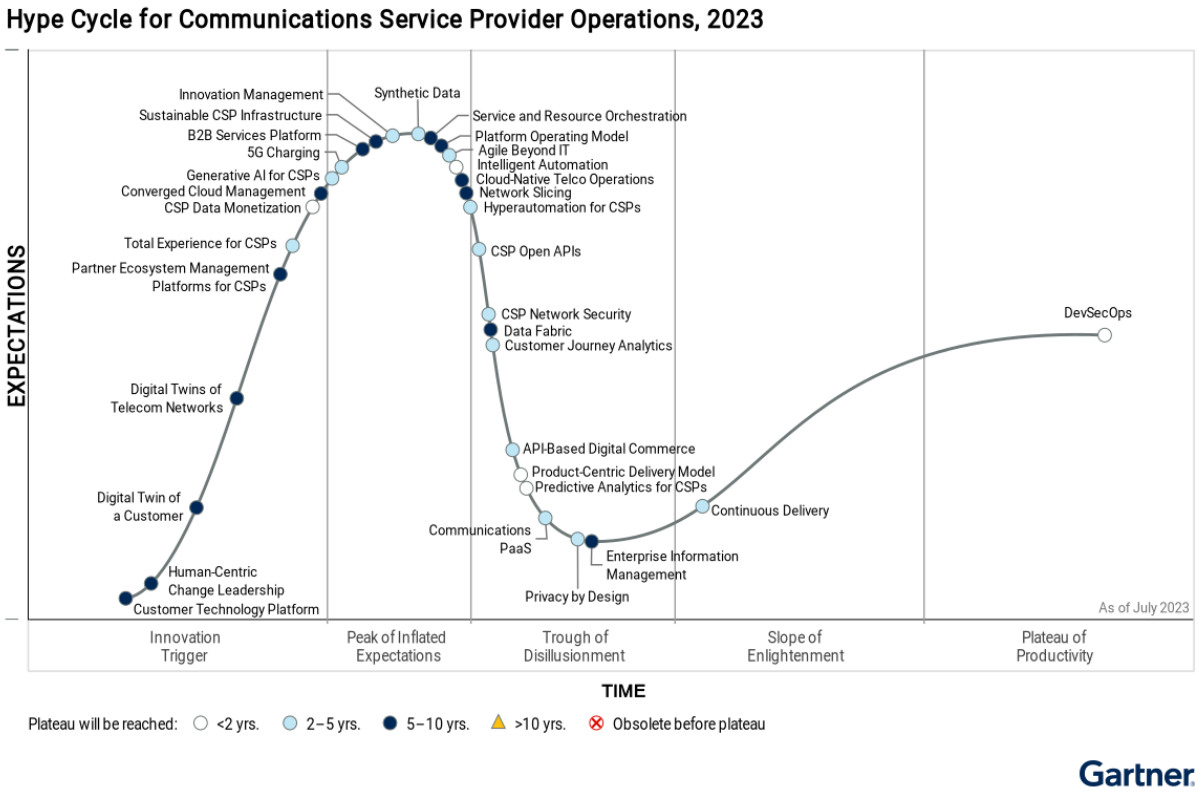
Several recent innovations that support requirements of broader organizational capabilities have been added to this Hype Cycle, focused on three key priorities that are continuing to gain traction among CSPs:

- Improving customer experience — and total experience — with new digital tools
    - Customer journey analytics

- Enabling service portfolio expansion and evolution
  - Communications PaaS
- Evolving AI capabilities for multiple use cases
  - Generative AI for CSPs

CSPs looking for guidance about infrastructure capabilities should consult Hype Cycle for the Future of CSP Networks Infrastructure, 2023.

Figure 1: Hype Cycle for Communications Service Provider Operations, 2023



The Priority Matrix

The Priority Matrix indicates the need for strategic, long-term, coordinated and sustained investments to improve capabilities. We have focused on a set of capabilities that are critically important and need continuous improvement. Most capabilities will take more than two years before they are expected to reach mainstream adoption, except DevSecOps, intelligent automation, predictive analytics, product-centric delivery model and CSP data monetization. CSPs should prioritize these capabilities to make their operations efficient, support revenue growth and improve the customer experience. Start with early use cases, and continue to add use cases and functionality over a longer period.

For many of the capabilities, CSPs require an active strategic orientation toward culture, mindset and structural changes, rather than a sole focus on technology and processes. For example, total experience, agile beyond IT and APIs will have significant impact in the next two to five years, as they affect multiple dimensions of the organization.

Many of the transformational and high-priority capabilities will take five to 10 years to reach mainstream, as they entail significant shifts in underlying infrastructure and implementation of platforms that take longer to develop. Even as or before they begin developing these platforms, CSPs will adopt capabilities that are faster to implement, enabling them to be more agile in the short term so they can differentiate immediately. Most of these capabilities will benefit from the transformational platforms as they are deployed, and lead CSPs will begin developing the platforms before they hit mainstream to benefit sooner.

Executive sponsorship is needed for transformational capabilities such as hyperautomation, cloud-native telco operations, platform operating model and sustainable CSP infrastructure. Deploying or evolving these capabilities may require sourcing specific skills from outside the organization (e.g., buying talent as a service from a services firm), or even a different organizational structure or cross-business unit collaboration through a dedicated team. Similarly, prioritizing investment in capabilities such as data fabric and human-centric change leadership is required to support various transformation projects for efficiency and growth.

Table 1: Priority Matrix for Communications Service Provider Operations, 2023

(Enlarged table in Appendix)

Benefit	Years to Mainstream Adoption			
↓	Less Than 2 Years ↓	2 - 5 Years ↓	5 - 10 Years ↓	More Than 10 Years ↓
Transformational	DevSecOps	Agile Beyond IT API-Based Digital Commerce CSP Network Security CSP Open APIs Innovation Management Total Experience for CSPs	Cloud-Native Telco Operations Converged Cloud Management Customer Technology Platform Data Fabric Digital Twin of a Customer Human-Centric Change Leadership Network Slicing Platform Operating Model Service and Resource Orchestration	
High	Intelligent Automation Predictive Analytics for CSPs Product-Centric Delivery Model	5G Charging Communications PaaS Continuous Delivery Customer Journey Analytics Hyperautomation for CSPs Synthetic Data	B2B Services Platform Enterprise Information Management Partner Ecosystem Management Platforms for CSPs Sustainable CSP Infrastructure	
Moderate	CSP Data Monetization	Generative AI for CSPs Privacy by Design	Digital Twins of Telecom Networks	
Low				

Source: Gartner (July 2023)

Off the Hype Cycle

- Business ecosystems has been removed, as a general profile; ecosystem-related capabilities are addressed in B2B services platforms and partner ecosystem management platforms for CSPs.
- CSP AI has evolved; rather than including this general profile, we address operations AI in intelligent automation (and network AI and automation on the Hype Cycle for the Future of CSP Networks Infrastructure, 2023).
- Data lakes has been removed and replaced with data fabric, as we have noted its increasing importance among CSP CIOs.
- Data literacy has been removed; while it remains important, it has become more widespread and in part will be supported by low-code platforms (e.g., those that use generative AI).
- Design thinking has been removed, as it has been more widely understood.
- Digital business technology platforms are now evolving into more specific platforms, such as B2B service platforms and partner ecosystem management platforms for CSPs.
- Intercarrier service automation has been removed due to its maturity.
- Hyperautomation has been changed to a more specific CSP contextualization.
- Metaverse-ready networks has been removed as a separate profile and will be addressed in 5GA/6G/optical technologies on the Hype Cycle for the Future of CSP Networks Infrastructure, 2023.
- Open-source solutions for CSPs has been removed to cover specific technologies where open source is used, rather than a broad category, due to its maturity and broader adoption.
- Remanufactured IT equipment has not been included in this Hype Cycle this year; this is an important topic but not included as a main focus within operations.

On the Rise

Customer Technology Platform

Analysis By: Gene Alvarez, Andrew Gianni, Saul Brand, Mike Lowndes

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Embryonic

Definition:

The customer technology platform (CTP) is the integration of all customer-facing technology and applications into a platform. This platform aligns the customer's "outside in" view of the organization's customer experience with the "inside out" delivery of the organization's CX vision, strategy and technology. This platform enables an organization to support a holistic and complete view of the customer experience that benefits both the customer and the organization.

Why This Is Important

The customer technology platform is created by using business capabilities and technology reference models. These models will enable organizations to:

- Build a bridge from their CX CORE objectives to the delivery of their CRM strategy.
- Determine which systems need to work with each other to support the delivery of the organization's CX and CRM strategy in order to create positive customer sentiment.
- Determine how to make improvements to their CRM systems in order to move the organization toward a CTP platform.

Business Impact

Digitalization of the customer experience has exposed process gaps and disconnected customer-facing processes to customers. This is due to CRM applications that were implemented solely to automate individual processes. Application leaders need to address these gaps by viewing CRM applications in the context of CX-centric application strategy that goes beyond CRM. Using a CTP approach to CRM applications can resolve these customer-facing gaps and lead to improved customer experiences.

Drivers

- Delivery of positive customer experience as a part of digital transformation is a key differentiator for any organization.
- Digital transformation of customer-facing processes has exposed disconnected CRM applications, leaving the customer to be the coordinator of their experience across an organization's points of interaction (POIs). Examples of POIs are call centers, chatbots, websites, mobile applications, stores and branches.
- Organizations seeking to scale their customer experience capabilities are using more customer-facing technologies and applications. These organizations want to provide a relevant and integrated customer experience that is intelligently coordinated across all POIs.
- Organizations seeking to provide integrated experiences such as "campaign to contract" know they need to integrate applications (such as campaign management, lead management, salesforce automation and configure, price and quote) to enable intelligent coordinated experiences across all POIs.

Obstacles

- Major investments in CRM applications that are already live and operational in organizations are making it hard to integrate CRM applications into great customer experiences.
- It can be difficult to determine how to integrate CRM applications with the organization's entire IT portfolio.
- Investment in strategic vendor relationships has made the integration of many CRM applications a requirement that vendors must support. However, organizations may not be able to wait until then, due to a need to improve their customer experiences today.
- Customer dissatisfaction or frustration can come from organizational inertia. Customers are exposed to new ways of doing things from competitors or organizations in other industries, and they view the organization as behind in helping customers with their "job to be done." This organizational inertia can come from a variety of sources, such as a mindset that change is a risk rather than a tool that can be used to improve the customer's experience.

User Recommendations

- Use Gartner's CX CORE approach to first build the organization's business capability model. This model will determine what business capabilities are needed to support the integration of an organization's business model and its operating model.
- Avoid misalignment of CRM applications and technology and the organization's business model (for example, using self-check-out in a luxury store environment). This approach will ensure that the organization's CRM applications and technology are properly aligned with its CX objectives.
- Use an architecture that includes business capability and technical reference models to identify which key CRM applications and other technology needs to be intelligently coordinated within the CTP to deliver the right customer experience.
- Use an architecture that includes business capability and technical reference models to determine what needs to be changed when the organization faces a customer experience disruption in its market from competitors.
- Use a CX-CORE-driven approach to design customer experiences. Couple this with using a CTP architectural approach to ensure that all CRM applications and technology are aligned to the organization's CX objectives.

Gartner Recommended Reading

Enable Great Customer Experiences Using Gartner's Customer Experience CORE Model

Drive Your Customer Experience With a CTP Reference Architecture Model

Improve CX With a Customer Technology Platform Reference Architecture Model

Video: How to Build Your Customer Technology Model

Quick Answer: How to Get Started With the CTP Reference Architecture Model for CX CORE

Human-Centric Change Leadership

Analysis By: Cynthia Phillips, Casey Buckley

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

Definition:

Human-centric change leadership is a variant of organizational change management that ensures adequate resourcing, provides needed support and permits the stabilization periods necessary for sustainable change.

Why This Is Important

Organizations must change to thrive. Organizational change is predicated on individual change, yet Gartner's research shows that employees' willingness to change has plummeted. Human-centric change leadership will reduce the risk of transformation failure by planning for change at the individual level.

Business Impact

Human-centric change leadership improves an organization's transformation capabilities by ensuring its people have the support and psychological safety required to explore and adopt sustainable change. Implementing human-centric leadership requires fact-based, empathetic interventions that account for the pace and impact of change and the recovery periods that ensure change success. This approach protects organizations' investments as they strive to remain relevant and become increasingly competitive.

Drivers

- Continual organizational change is required for business viability. As organizational change success depends on individual change, a human-centric approach to change must be taken.
- Technologies such as strategic portfolio management tools now provide visibility across assignments and functions, permit resource capacity modeling, improve resource forecasting, and identify overburdened resources in order to prompt workload balancing.
- Organizations must deploy human capital to achieve their goals optimally. But deploying human capital without regard to the effects of fatigue, such as decreased motivation and performance, leads to failure to execute strategy.

Obstacles

- Siloed resource management tools cannot view or model resource demand across an enterprise or account for how allocations affect that demand.
- Strategic portfolio management solutions are costly at a time when organizations may be reluctant to invest. Difficulty obtaining the funding may be an obstacle to procuring necessary systems.
- Leaders may think that a human-centric approach is unnecessary as they can easily replace staff in the current employment market.
- Leaders may use past successes with a command-and-control approach to change to justify a continuing focus on short-term organizational outcomes, rather than empathetic, inclusive and sustainable change.
- Organizational ownership of human-centered change leadership may remain unclear. This can lead to a lack of ownership when collective ownership is needed.

User Recommendations

- Create an organizational change management practice focused on human-centric organizational change management processes to instill sustainable changeability.
- Implement resource management technology to detect workplace experience, employee satisfaction, operational performance and well-being.
- Educate leaders about the need for human-centered change leadership, including the need to manage transformation timing.
- Train direct managers to detect and respond to employees' needs relating to the pace of change and recovery periods.
- Promote experimentation, psychological safety and fact-based change interventions.

Gartner Recommended Reading

Enterprise Transformation Enablement Primer for 2023

Future of Work Reinvented: Human-Centric Work Design

A Human-Centric Workplace Framework for the Future of Work

The 12 Principles Every Organizational Change Needs to Succeed

Human-Centric Work Models Proven to Drive Performance the Most

Digital Twin of a Customer

Analysis By: Melissa Hilbert, Michelle DeClue

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Embryonic

Definition:

A digital twin of a customer (DToC) is a dynamic virtual mirror representation of a customer that can be used to simulate and to emulate and anticipate behavior. Customers can be individuals, enterprise customer, personas, groups of people or machines.

Why This Is Important

DToCs help organizations of all sizes better understand their customers and anticipate their behavior. They increase efficiency and provide a personalized, empathetic service to customers, many of whose buying habits have changed during periods of disruption and change.

A DToC can be used to modify and enhance the customer experience (CX) and support new digitalization efforts, products, services and opportunities. It can be an engine of transformation and disruption.

Business Impact

Today, digital twins enable organizations to anticipate how a physical product will perform or need to be maintained in different conditions. Organizations can now use DToCs to simulate how a customer will react, given a specific set of ecosystem parameters, conditions, and control or input signals. DToCs help organizations selling products or services provide customers with better experiences, which results in increased revenue and lasting customer relationships.

Drivers

DToCs will help organizations drive revenue by:

- Gaining critical insights into customers

- Increasing revenue by enabling new ways to serve or capture customers, as well as by facilitating new data-driven business models
- Predicting and simulating behaviors with a view to making products, services, promotions and business campaigns more successful and reducing unnecessary costs of failure
- Improving customer engagement, customer retention, customer lifetime value and company growth
- Reducing churn, product failure and engagement abandonment

DToCs will help customers:

- Reduce friction in interactions with the supplier organization across their journey
- Increase positive outcomes, creating better value
- Engage in curated experiences and concierge-like experiences specifically tailored to drive value for them
- Protect privacy with the ability to change what personal data is collected and how organizations use it

Obstacles

- Privacy and cyber risk concerns may lengthen the time it takes DToCs to mature, and increase legal and regulatory risk.
- Organizations need competency in machine learning algorithms and some staff with data science skills to build or manage DToCs.
- Internal bias and concern exists about a DToC's ability to drive revenue or reduce costs. A strategy based on use cases of how to create value will be needed.
- The technology behind digital twins has focused on organizations and products. A customer focus is emerging, and lack of clear KPIs and other success measures limits the potential use of DToCs.
- Organizations need to establish trust with customers for customers to agree to share information. Customers will need transparency about what data is collected, how it will be used and the privacy and data controls that will be applied. For B2B, they need to know the benefits such as providing a more personalized experience, more relevant products or services, convenience and exclusive offers.

User Recommendations

- Align your activities with customers' privacy and cybersecurity concerns based on the availability of customer assets and establish a trust center to house these documents and expectations.
- Identify use cases for which DToCs could help deliver a better CX and for which suitable data is available by examining customer journeys and failure points.
- Define clearly KPIs and specific objectives that can be measured to validate improved business outcomes such as CX, demand forecastability or agility of responsiveness.
- Run a pilot, whether you build or buy a DToC, and compare results against a persona or C360 over a statistically significant period using significant data. Ensure your business and operating models are ready to support the endeavor.
- Encourage customers to share their data with you. Define benefits they can expect from a DToC, agree to the level of control they will have over their data including canceling the digital twin. Provide clear visibility into how their data will be used.

Sample Vendors

Absolutdata; Arrayworks; Fetch.ai; Infogain; Nstream; Salesforce; Tata Consultancy Services (TCS)

Gartner Recommended Reading

A Digital Twin of a Customer Predicts the Best Customer Experience

Quick Answer: Privacy Basics for a Digital Twin of a Customer

Innovation Insight: Demystifying Digital Twin of a Customer for B2B Sales

Quick Answer: Is a Digital Twin of a Customer the Future of a 360-Degree View of the Customer?

Supply Chain Executive Report: Drive Growth and Elevate Experiences With Digital Twin of the Customer

Digital Twins of Telecom Networks

Analysis By: Pulkit Pandey, Peter Liu

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

Definition:

A digital twin of a telecom network is a virtual representation of the telecom network, which encapsulates logical models with true data structure to emulate real behavior. These real-time representations are used to improve network performance, asset maintenance, planning, base station information modeling and other use cases. A digital twin of a telecom network can be of a physical network component, single base station or the end-to-end network.

Why This Is Important

Digital twins of telecom networks can be leveraged to assess a situation and predict outcome-based scenarios for planning, monitoring and optimizing the network. They can also assess and identify scope of improvement in network operations through simulations. Finally, they can model processes to improve network performance in terms of better customer service/experience or reduced operating costs.

Business Impact

Digital twins of telecom networks:

- Enable CSP CIOs to enrich decisions — for example, to plan network capacity and deployment scenarios in a better way, or to lower maintenance and operational costs while improving network performance as well as customer experience.
- Test the prototypes of network elements to reduce product defects, thus shortening the time to market.
- Optimize processes such as monitoring, managing and maintaining the supply chain.

Drivers

Adopting digital twins of telecom networks can support a broad variety of business outcomes:

- Reduce infrastructure maintenance costs through asset management and real-time remote monitoring.
- Optimize resource allocation and planning through prediction and simulation based on real-time information.
- Optimize equipment and processes by aligning asset digital twins into a range of solutions, such as predictive analytics and field service management.
- Increase and speed up experimentation of new business and operating models for different industry verticals.
- Provide effective data-driven decision making and testing of various scenarios in a virtual environment with less risk and cost.

Obstacles

- There are underlying challenges with understanding business objectives and applicability for how digital twins can really enhance overall network performance and improve the bottom line.
- Few vendors have a viable go-to-market strategy to build a digital twin business, creating market confusion and excess hype.
- While consortium and standards bodies are emerging, they are all generally immature, with many vendors pushing proprietary formats. There is a lack of standards for a broad range of digital twin integration, evolution and other technical issues.

User Recommendations

- Strengthen the data collection capabilities of critical processes as a way to set the foundation for the introduction of digital twin models by adopting a data-driven network architecture.
- Engage with business unit peers to ensure the business case has clear metrics that the IT organization can support.
- Identify IT gaps and build a roadmap to drive IT organization learning opportunities, its investment plan for internal skills and partner selection strategy.
- Consider digital twin capabilities when selecting vendors for network rollouts.
- Take a holistic view of digital twin network planning and implementation. Go beyond digital twins for individual physical objects, and loop in processes and process-related personnel.

Sample Vendors

Ericsson; Huawei; Nokia; NTT

Partner Ecosystem Management Platforms for CSPs

Analysis By: Susan Welsh de Grimaldo

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Partner ecosystem management platforms support an open network of partners, peers and manufacturers to drive revenue by offering richer, better-integrated solutions. These virtual platforms integrate existing partner relationship management (PRM) technologies, supporting distribution and sharing of data and content among partners. They ease multiway communication in co-selling, co-marketing and reselling for vendors and partners in multiple sales channels.

Why This Is Important

Partner ecosystem management platforms enable communications service providers (CSPs) to collaborate with partners for product and service innovation, co-development, marketing and sales, expanding the value provided to customers and partners. They enable stakeholders to open up data sources for collaboration and exchange within the ecosystem with the necessary security applied. Demand for these platforms is increasing, as they are an alternative to PRM and are not just limited to improving collaboration with resellers.

Business Impact

Partner ecosystem management platforms allow CSPs to enable a new level of collaborative decision making, execution efficiency and enriched offerings for customers. These platforms enable working with each party's data in one core application, based on the common platform. They also support indirect selling, co-selling and co-bundled models, alliance management strategies, and co-creation of composable services among partners, and may support digital marketplaces.

Drivers

- The use cases of partner ecosystem management platforms are expanding far beyond traditional value-added services (VAS) and content services to include co-developing, co-selling, co-marketing, co-bundling, referral management and promotions of the community. The use of a platform, to manage and scale the partner ecosystem, can support more efficient operations, including automation of business processes and richer sets of services to be offered to partners. This is helpful for CSPs looking to create capabilities for composable services incorporating partner offerings, for example, for enterprise services to be offered in a digital marketplace.
- New and expanded capabilities being added to the partner ecosystem management platform in the next several years will allow additional business activities to be performed, such as real-time insights and comprehensive business analytics including revenue settlement.
- Some vendors in this space provide additional capabilities, such as business planning support, marketing distribution funds (MDF) management, marketing functionalities and partner-learning features.
- Platform users (whether from the CSP or partners) can interact with any type of content and present it on one application to all stakeholders. Players in the ecosystem can learn and track the pulse of the customer in real time, supporting a faster process of gaining insights and iterating to improve offerings.

Obstacles

- CSP processes and the level of maturity to manage more comprehensive partner ecosystems take time to develop and need to be in place to support the use of platforms to manage the ecosystems. For example, CSPs need to enhance business processes for revenue settlement, launching of new partner products and jointly executing advertising campaigns.
- Partner ecosystem management platforms provide the infrastructure for collaboration, while partner relationship management (PRM) applications are managing tasks mostly operated at a one-on-one level, that is with point-to-point integrations between the CSP and each partner individually. Organizations wanting to collaborate on more reselling and co-creation opportunities with their partners should consider a combination of these two investments.
- Capabilities for performing business activities, like real-time insights and comprehensive business analytics, will be added or enriched in partner ecosystem management platforms during the next three to five years.

User Recommendations

- Assess partner ecosystem management platforms for collaborative sales activities between providers, vendors and sales partners, especially for collaboration on the wealth of unstructured and structured data available, without custom coding and complex data models.
- Work across cross-functional teams, including product, finance and technology, to develop supporting processes and skills needed to fully utilize partner ecosystem management platforms.
- Work with vendors to develop a roadmap of capabilities, focusing on increasing levels of automation, open APIs, and AI/machine learning (ML) for predictive and prescriptive guidance for fine-tuning campaigns, offerings and onboarding partners.
- Develop an approach to connect the platform to front-end solutions, such as digital marketplaces, to help drive digital and composable business capabilities.
- Aim to gather “deal intelligence” to better understand the reason for a particular sale’s success (or lack of it), price sensitivities, and regional nuances.

Sample Vendors

360insights; Amdocs; Beyond Now; ChannelXperts; Comviva; Oracle; Pronto; Subex; Whale Cloud Technology

Gartner Recommended Reading

10 Must-Have Capabilities for CSP Partner Ecosystems for Composable Products

Market Guide for Partner Relationship Management Applications

Quick Answer: How Can XaaS Providers Measure the Performance of Partner Ecosystem Communities?

Providers Should Offer Ecosystem Community Sites to Help Buyers Map Solutions to Targeted Outcomes

Emerging Tech: How to Buy the Right Ecosystem or Marketplace Solution

Total Experience for CSPs

Analysis By: Susan Welsh de Grimaldo, Juha Korhonen

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Total experience (TX) is a strategy that creates superior shared experiences by intertwining customer experience (CX), employee experience (EX), multiexperience (MX) and user experience (UX) disciplines. The goal is to drive greater customer and employee confidence, satisfaction, loyalty and advocacy, using digital and nondigital techniques.

Why This Is Important

A leading differentiator to which communications service providers (CSPs) aspire worldwide is CX. Customers and employees have increased expectations for improvements in their experiences across their customer and employee journeys, and TX is a way to use technology and interactions to enhance, empower and embolden customers and employees. CSPs should evaluate how TX interlinks these experiences, increasing customer and employee confidence, as well as lifetime value, throughout their journeys.

Business Impact

TX helps deliver differentiation in customer service and generate greater customer and employee lifetime value and satisfaction. Making improvements in the employee journey that aid the employee's ability to support customers affects a range of business metrics, including customer churn, cross-sell and upsell, as well as the cost and time to resolve customer issues. A TX approach enhances productivity and reduces employee turnover, thus minimizing the costs to recruit and train new talent.

Drivers

- CSPs differentiate by delivering improved digital experiences to their consumer and enterprise customers, as well as partners in their expanding ecosystems. CSPs consider digital capabilities fundamental to improving engagement and lifetime value, and reducing churn, as well as providing a competitive differentiator. For some CSPs, early digital experiences have not delivered desired results; using a broader TX approach is aimed at solving pain points for customers, partners and employees.
- Technology advancements increase opportunities to connect across multiple channels with multiple ways of engagement (voice, gestures, touchpoints, etc.) for improved MX. Real-time, low-latency, high-impact interactions supported by edge compute, 5G, Internet of Things (IoT), artificial intelligence (AI) and data, will provide improved MX to customers, partners and employees.
- Skills shortages, tight hiring markets, challenges with employee retention and hybrid work are pushing CSPs to find ways to enhance EX to increase employee retention, recruitment and productivity. Process automation needs to be approached in sync with EX to deliver the best TX and not risk losing talent in the automation journey by ensuring employees support customers with digital tools, insights and automation that enhances their work.
- Employees can be more customer-centric through digital solutions. One example is using AI and predictive analytics to suggest the next-best offer that's personalized for a customer — a relevant discount or promo code, unlocking exclusive content or providing additional services.
- Investments in AI/machine learning (ML) enable new capabilities to identify gaps and opportunities that improve TX and drive better business outcomes, spurring a focus on implementing a TX approach.

Obstacles

- **Concept:** CSP projects on CX, AI/ML and automation often miss the total impact of the different components of TX and fail to drive better outcomes.
- **Cultural:** CSPs' focus has been overwhelmingly on CX, neglecting the value of EX. However, TX can improve the EX, which can then yield a better CX — not only digitally, but also in real-world interactions. In addition, the siloed nature of different teams addressing CX and EX can create challenges for developing a TX approach.
- **Inertia:** CSPs may be inclined to stay with the CX they have, versus adopting a TX strategy.
- **Technology:** Even as CSPs transform digitally, they struggle with modernizing for digital experiences, preventing richer MX customer and employee journeys across multiple devices with multiple touchpoints and modalities.
- **Data management:** Required customer data resides in a maze of business and marketing systems, creating persisting data collection and profile unification challenges, resulting in poor UX.

User Recommendations

- Engage with CX, EX, UX and MX leaders across your organization to form a TX "fusion team" that crosses activity silos.
- Gain support by conducting "art of the possible" meetings to show how TX transformation can lead to greater revenue growth and new customer opportunities.
- Engage with business stakeholders by conducting workshops to determine how TX strategy can transform their roles, increase agility and link to key performance indicators (KPIs) to drive desired digital business outcomes.
- Identify gaps in customer and employee interactions; assess business, operating and service model gaps to prioritize initiatives that affect overlapping CX and EX to maximize value.
- Find important business opportunities that have been held back by their CX, EX, UX or MX impediments.
- Invest in technologies that support reimagined customer and employee journeys based on effortless experiences across MX touchpoints.

Sample Vendors

Amdocs; Deloitte; Help Lightning; Qualtrics; Salesforce; ServiceNow; TechSee

Gartner Recommended Reading

Top Technology Trends for CSPs in 2022: Total Experience Drives Growth and Customer Centricity

Converged Cloud Management

Analysis By: Enrique Hernandez-Valencia, Gaspar Valdivia

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Converged cloud management integrates the provisioning, orchestration and management of the telecom cloud infrastructure supporting network functions (NFs) and IT applications. It enables communications service providers (CSPs) to integrate infrastructure management (public and private), optimize resource utilization, and accelerate service delivery. CSPs can gain efficiency and scale running NFs and IT applications over a unified telecom cloud infrastructure with improved observability.

Why This Is Important

CSPs are beginning to converge the management for their disparate private and public cloud platforms, with the goal of unifying the operations of their cloud infrastructure. This will give them operational efficiency, scale of operations, and technical and business agility crucial for competitiveness. Most CSPs currently run their network and IT on separate platforms, adding complexity and cost to their operations and reducing their ability to respond quickly to marketplace demands.

Business Impact

Converged cloud management enables:

- Operational simplicity via a single “pane of glass” for unified resource management.
- Better scale of network and IT operations across a mixed private/public cloud infrastructure.

- Greater agility in delivering current and future services through integrated onboarding of virtual network functions (VNFs) and IT applications over a unified cloud infrastructure.
- Reduced costs through easier deployment of standardized hardware, simplified infrastructure management and better resource sharing.

Drivers

- Converged cloud management is strategic for operational efficiency, service agility and cost containment, and manages the complexity of a mix of private and public (and multicloud) resources.
- Early implementations by major CSPs, including the creation of a chief technology and information officer (CTIO) role to drive the transformation and business agility, are providing guidance for other CSPs on how to develop an approach and a roadmap.
- Hyperscale cloud providers are offering telecom-specific solutions from their wide portfolio of cloud platform services.
- Increasing emphasis by CSPs, and emerging products by vendors and cloud providers, on multivendor and multicloud interoperability will provide an incentive for adoption.

Obstacles

- CSPs still require separate platforms for telecom and IT workloads due to their very different characteristics and requirements.
- Implementing converged cloud management is a big challenge as most CSPs lack sufficient software and integration skills to build such platforms.
- Some CSPs are outsourcing the development of converged cloud to large systems integrators (SIs), which lack experience, besides being costly.
- Some SIs are beginning to build these capabilities, but it will take time before they have acquired sufficient experience.
- Many CSPs are still observing the developments and waiting for an opportune time to proceed, delaying the decision for adoption.
- Although large VNF vendors continue to push full-stack systems, they have begun taking steps to decouple their software from their proprietary hardware.

User Recommendations

- Develop a reference architecture for a unified telecom cloud infrastructure under a converged cloud management model, considering the role of private and public assets, the different requirements for network and IT workloads, and the different maturity levels of network and IT cloud platforms.
- Build a framework to manage decoupled hardware and software to provide the flexibility of running a wide choice of VNFs, (including container-based VNFs) and IT applications on fewer and standardized cloud platforms.
- Support open standards and open-source software, wherever possible, to provide multivendor interoperability, which will stimulate competition from supporting vendors.
- Harmonize and consolidate the separate network and IT cloud platforms progressively for ease of operations, efficiency and scalability.
- Ensure vendors' technology compliance with reference architecture to accelerate future architectural integration and interoperability across legacy, physical and virtual infrastructure.

Sample Vendors

Amazon Web Services (AWS); Ericsson; Google; Huawei; IBM; Microsoft; Nokia; Red Hat; VMware

Gartner Recommended Reading

Predicts 2023: CSP Technology and Operations Strategies

Top Technology Trends for CSPs in 2022: Hyperautomation Drives Business Outcomes

Key Principles for the Design and Implementation of a Cloud-Native Telecom Infrastructure

How CSPs Are Hedging Their Partnership Bets With Hyperscalers

CSP Data Monetization

Analysis By: Kameron Chao, Susan Welsh de Grimaldo

Benefit Rating: Moderate

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

CSP data monetization is the practice of realizing net new measurable and quantifiable economic benefit from data, combined with business models and techniques beyond standard connectivity products. It often involves data, analytics and AI capabilities ranging from identifying appropriate data to developing and marketing solutions of value to customers. Data monetization offers cross-industry collaboration opportunities for CSPs to many industries, such as finance, retail and healthcare.

Why This Is Important

Many CSPs have invested in their data and analytics units during past years and are expanding data monetization portfolios, though most are in a fairly early stage. With continued focus on data management and analytics for productization, data monetization by CSPs will continue to gain momentum in the next two years.

Business Impact

CSPs amass vast amounts of data across their networks and related operational and business support systems. As CSPs address their operational technology issues and adopt a structured approach beyond specific use cases, there lies potential for new business models and revenue generation opportunities with data monetization. CSPs moving toward adjacent markets like banking and insurance and adopting an industry-specific ecosystem approach are better positioned for externalizing data monetization initiatives.

Drivers

- CSPs seeking to generate more value in the face of shrinking revenue in their core voice and data services increasingly see anonymized customer data as an asset to be monetized.
- CSPs are further exploring the economic potential of their data repositories. Managing data as an enterprise asset has become a critical business function and requires trust-based data sharing across internal and external data sources (see Top Trends in Data and Analytics, 2023).
- CSPs' internal digital transformation in customer engagement, by using data, is ahead of other industries and is driving opportunities to sell that experience to their B2B clients.
- Growing location-based services ecosystems, enabled by 5G with data and analytics capabilities, are offering new growth and differentiated opportunities by monetizing movement and traffic patterns.
- Use cases of personalized marketing and product bundling are gaining popularity, such as advertising, credit scoring and helping other industries with specific insights into population, location and consumption patterns. Examples of CSPs providing such use cases include Globe Telecom, Orange, Telefónica and Vodafone.

Obstacles

- As CSPs divest assets that generate significant customer data insights such as streaming, OTT and broadcast, they will need to create net new business models and revenue opportunities for data monetization.
- CSPs often lack alignment inside of the organization to put together people who know the use cases with people who know how to manage the data.
- Global data protection legislation is maturing, and the use and sharing of datasets and protection of data privacy and connected devices have ethical implications that must be addressed to maintain trust with customers and abide by regulations (see Quick Answer: How Executive Leaders Must Prepare for the New EU Data Act).
- Data silos among different CSP organizations plus the lack of institutionalized adaptive governance aligned to data monetization goals are additional obstacles.

User Recommendations

- Map data monetization requirements to overall business strategy, market segments of interest, operational technology evolution and platform capabilities, ecosystem development and security, and privacy and compliance mandates.
- Implement a by-design privacy and ethics capability, rather than a bolt-on approach. Do this by collaborating with the chief data and analytics officer (CDAO), security/privacy office and COO to build a consent management process that ensures consumer privacy requirements are met when monetizing personal or other sensitive data.
- Structure data monetization platform initiatives to include strong analytics and collaboration capabilities by incorporating business support system (BSS) modernization, along with integrated analytics and automation tools.
- Adapt data monetization initiatives for increased success by building required capabilities associated with data handling and management, analytics, product life cycle management, near-real-time support services, automated security and assurance, and execution partnerships with external entities.

Sample Vendors

Amdocs; AWS; Comviva; Google; IBM; Intersec; Netcracker; Oracle; Salesforce; Virtusa

Gartner Recommended Reading

Research Roundup for State of Data and Analytics for CSPs

State of Data Monetization for CSPs: Presentation

Market Trend: Location-Based Service Vendors Driving New Growth for TSPs

7 Best Practices to Monetize Enterprise Information Assets

Toolkit: How to Get Started With Data Monetization

At the Peak

5G Charging

Analysis By: Juha Korhonen, Amresh Nandan

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Adolescent

Definition:

"5G charging" refers to implementation of 3GPP-specified new services-based charging and mediation capabilities. This includes a converged charging system (covering 3G, 4G and 5G) with a new charging and billing architecture. The domain of 5G charging is evolving to support new and varied business model ambitions of CSPs covering on-demand, subscription, consumption and various B2B2X business scenarios.

Why This Is Important

5G charging and related upgrades in CSPs' business support system (BSS) are mandatory for monetizing new 5G network capabilities. It has significant implications in terms of transitioning from the 4G and traditional charging mechanism to the new 5G specification and getting ready for future business models. Many CSPs have been deploying 5G charging capabilities during the past couple of years, and this trend will continue as 5G implementations continue. CSPs with 5G charging will lead the monetization of new use cases like network slicing.

Business Impact

The 5G network brings new capabilities that can be charged, like network slicing, ultra low latency, precise location and modularity, which form the basis for the new product structure that is essential for 5G monetization. Therefore, 5G charging should be viewed as a key capability to enable 5G network differentiation, as CSPs move beyond basic connectivity services.

Drivers

- 5G network deployments and commercialization of 5G-based enhanced service features for mMTC and URLLC require updated charging mechanisms.

- The new 3GPP 5G specifications brought mandatory changes. The charging mechanism can now support new online and offline charging methodologies and nontraditional business models and enable a converged charging solution. There are new integration mechanism interfaces (RESTful APIs), along with support for backward compatibility through Diameter and CAMEL.
- CSPs are investing in network-slicing capabilities and plan to commercialize varied products using network slices and other products.
- There is a need to support low latency and high threshold in processing charging requests in certain use cases, and to support dynamic pricing configuration.
- Support is coming in current releases for precise location and other 3GPP 5G functions.
- There is demand for more flexible, usage-based pricing schemes for 5G private mobile networks (PMNs), including hybrid CSP 5G network working together with a purpose-built PMN.

Obstacles

- There is a lack of clarity for a smooth transition path for a converged charging solution and vendors' still-evolving 5G charging product roadmap for both 5G and legacy products and services.
- There is a lack of business demand when the majority of existing 5G services can be implemented without 5G charging.
- There is not enough understanding of user requirements, various B2B2X scenarios, and their implications on charging and revenue management or related business processes.
- 5G makes up less than 20% of newer PMN deployments, and the majority are still using 4G, limiting business urgency for 5G charging.
- 5G SA, together with Release 16 and Release 17 deployments, are progressing but have not reached maturity, limiting the full technical readiness to monetize new 5G capabilities.

User Recommendations

- Accelerate development of 5G network monetization use cases across the new capabilities to maximize the ROI for the 5G investments. Work with lines of business to trial out and introduce new capabilities with new or emerging business models.
- Deploy 5G charging based on the 5G network functional roadmap. Roadmaps should include logical and technical architecture for the future BSS; new product, ecosystem and partner management capabilities; settlements based on delivered SLAs; and strong data management.
- Identify a 5G charging partner with a roadmap for transitioning from traditional or 4G charging to 5G converged charging. Ensure the partner offers integration with existing BSS components, a mediation approach, solutions for the public 5G network and private enterprise networks, ecosystem support, varied commercial models, and diverse partner settlement approaches.
- Link 5G charging capabilities to network as a service (NaaS) and network as code (NaC) strategies with OpenAPI capabilities to create additional ways to monetize.

Sample Vendors

Amdocs; CSG; Ericsson; Netcracker; Nokia; Oracle

Gartner Recommended Reading

Market Guide for CSP Revenue Management and Monetization Solutions

Market Guide for CSP Customer Management and Experience Solutions

Generative AI for CSPs

Analysis By: Pulkit Pandey, Ajit Patankar, Kameron Chao

Benefit Rating: Moderate

Market Penetration: Less than 1% of target audience

Maturity: Embryonic

Definition:

Generative AI technologies can generate new derived versions of content, strategies, designs and methods by learning from large repositories of original source content. Generative AI has profound business impacts, including on content discovery, creation, authenticity and regulations; automation of human work; and customer and employee experiences.

Why This Is Important

Generative AI (GenAI) exploration is accelerating, thanks to the popularity of text-to-image generators, such as StableDiffusion and Midjourney, OpenAI's ChatGPT and other large language models (LLMs). End-user organizations in most industries aggressively experiment with GenAI. Technology vendors form GenAI groups to prioritize the delivery of GenAI-enabled applications and tools. Numerous startups have emerged in 2023 to innovate with GenAI, and we expect this to grow. Some governments are evaluating the impacts of GenAI and formulating laws.

Business Impact

GenAI will keep expanding throughout various business domains in the telecom industry. This includes the network function, with coverage such as network optimization and automation, to customer-facing functions, with capabilities such as enhancement of customer engagement. CSPs and tech suppliers are starting to explore the possibility of LLMs for specific use cases with telecom businesses.

Drivers

- Enables telecom operators to deliver personalized and engaging experiences to customers, increasing loyalty and reducing churn.
- Allows generation of synthetic data to support analysis and optimization of network performance, identification and resolution of issues in real time, and reduction in downtime.
- Provides instant and personalized customer support through chatbots, and creates personalized responses to customer queries, reducing the workload on customer service representatives and improving customer satisfaction.
- Automates routine tasks such as coding, data entry, and analysis, freeing up employees to focus on higher-value tasks. It can also provide personalized recommendations for skill development and learning, enabling employees to continuously improve their capabilities and stay up-to-date with the latest industry trends.
- It can analyze customer data to generate personalized marketing campaigns that target specific customer segments and improve campaign effectiveness.

Obstacles

- Inability to source the content and the related cost and time commitments required to fulfill these demands and create telecom-specific use cases.
- Downstream propagation of bias and toxicity, deepfakes, copyright issues, unclear legal and regulatory situations.
- GenAI also poses a potential for misuse and the concentration of power in a few large technology companies.
- GenAI may be hindered by regulations as there are threats of losing or exposing data to third parties.
- Regrettably, GenAI can be used for fraud, malware, disinformation and instigation of social unrest. Full and accurate detection of generated content will remain challenging for years and may not be completely possible.
- Fragmented and specialized technology offerings (such as generating only images or only text) currently lead to a combination of tools rather than a single solution.
- Sustainability concerns about high energy consumption for training generative models are on the rise.

User Recommendations

- Investigate how GenAI techniques could benefit your organization. Determine initial use cases and their applicability within the organization or in customer-facing functions.
- Understand the underlying technology and develop your own GenAI roadmap for your organization.
- Collaborate and work closely with security and risk management leaders to safeguard data and limit any risk or regulatory concerns surrounding the GenAI technology.
- Determine how synthetic data could lessen regulatory concerns, mitigate data bias, facilitate data monetization and lower the cost of data acquisition, especially if you lack data for specific events.
- Examine and quantify the advantages and limitations of GenAI. Use it first to improve an existing process.
- Pay close attention to the advances in GenAI techniques, as we expect their rapid adoption.

Sample Vendors

Google; Facebook; OpenAI; Microsoft

Gartner Recommended Reading

Board Briefing: Understanding ChatGPT, Other Large Language Models and Their Risks

Quick Answer: How Can You Manage Trust, Risk and Security for ChatGPT Usage in Your Enterprise?

Gartner Addresses Frequently Asked Questions on ChatGPT

B2B Services Platform

Analysis By: Amresh Nandan, Susan Welsh de Grimaldo

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

B2B services platform refers to a set of integrated systems and capabilities, which are decoupled from the underlying network and products and enable B2B customer journey, service design, service creation, provisioning, activation and assurance. The platform is extensible in both directions — supply (for partners to add to the CSP products) and customers (for empowering them with self-service capabilities).

Why This Is Important

Enterprise (B2B and SMB) digital transformation requirements present several growth opportunities for network-based CSPs. These opportunities, in the form of IT, security, cloud, infrastructure and connectivity, IoT-related services and managed services, are diverse compared to traditional connectivity services. Slow enterprise business growth and even churn in many CSPs further support the need to adopt an enterprise-focused service platform. B2B services platform can also enable the ServCo model as a platform for B2B/SMB segments.

Business Impact

Flexibility in commercial and operational models necessitates a service management platform. A B2B service management platform allows for improved management of service quality, SLAs and service transparency. The platform supports a self-service-driven customer journey across market segments and enables flexibility and automation in customer journey, offering configurations, and service change management. The platform also decouples services from the underlying network and IT, moving toward an OTT-type management.

Drivers

- B2B services platforms can dramatically enhance a CSP's ability in multiple ways — which is important for differentiation among peer companies and competitiveness with cloud-based CSPs. However, a platform approach demands independent service management capabilities with features and functionalities. It is in line with demand for uniformly designed and creative services that are provisioned and activated in an automated manner, and are assured proactively through service impact analysis (by using techniques like advanced analytics. These platforms also enable exposure of APIs for partners to leverage underlying platform capabilities (including network/resource exposure) and add to CSP offerings. They also answer the demand for a well-crafted self-service and management portal for customers, partners and CSPs to manage customer journeys and life cycles.

- Success with platform opportunities is dependent on multiple factors such as infrastructure exposure, ability to link network and applications performance, processes for service fulfillment and assurance, and exposure of platform capabilities. However, the most critical success factors lie in: the ability to decouple service management with underlying infrastructure and products; the flexibility of configuring various business models (through composability); and utilization of partner ecosystems for competitive offerings, such as IoT services.

Obstacles

- A service platform may need to be supplemented with professional services, depending on the products/services being offered. Complexities of existing business support systems (BSS) and operations support systems (OSS), operational practices and data management issues, and the siloed nature of products/services mean enterprise service management is still at an early stage.

- As enterprises demand private mobile networks and network slicing, CSPs' investments have been largely on network and network operations. Unclear understanding of enterprise use cases and a lack of focus on delivering business outcomes for enterprise customers is likely to lead to lack of readiness with services and commercialization capabilities.

- Even though CSPs have been investing in BSS systems, there is a need to go for wide-scale business process reengineering and automation. We see the area still in the adolescence stage, with about 8% to 10% of network-based CSPs using such an approach. Leading CSPs such as Verizon, BT, Telstra and Telefónica are showing greater proactiveness in developing such a platform.

User Recommendations

- Develop capabilities to transition from product-specific systems and processes to a platform which leads to operational efficiency and agility by gradual movement toward end-to-end service orchestration.
- Enhance scalability and efficiency by adopting uniformity (through standardization and use of composability) in product design, service orchestration and assurance.
- Improve monitoring, visibility and observability into your systems and operations along with standardized integration capabilities to enable proactive service optimization and data monetization.
- Strengthen your enterprise portal, configure-price-quote (CPQ), service and resource orchestration extensively by process optimization and automation.
- Involve enterprise customers in the evolution of your service management platform by using agile and DevOps practices.
- Enhance flexibility and efficiency in leveraging partners and their capabilities in augmenting offerings through standardized/open APIs and exposure of key functionalities.

Sample Vendors

Amdocs; Ericsson; Netcracker; Nokia; Oracle; ServiceNow

Gartner Recommended Reading

Predicts 2023: CSP Technology and Operations Strategies

Communications Industry: 2023 Top Tech Trends for CSP CIOs

Digital B-Brands Enable CSPs to Drive SMB Revenue Growth

Objectives and Principles for OSS Architecture Evolution in CSPs

Sustainable CSP Infrastructure

Analysis By: Juha Korhonen, Susan Welsh de Grimaldo, Pulkit Pandey, Peter Kjeldsen

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Sustainable communications service provider (CSP) infrastructure refers to telecommunications industry offerings to innovate, build, maintain and operate communications network infrastructure in a sustainable manner. These are focused on energy consumption, carbon emissions, sustainable materials, reusability and recycling of equipment and materials in line with the push for sustainability targets from greater society, shareholders, customers and regulators.

Why This Is Important

The Paris Agreement, adopted by 196 countries, set a goal to limit global warming below 2 degrees Celsius. Many countries and CSPs have since adopted sustainability goals. In February 2019, the GSMA board set an ambition for the communications industry to reach net-zero carbon emissions by 2050. Last year, the cost of energy became a critical driver for CSPs, especially in Europe. Sustainability focus is changing how network elements are being built, procured, designed and managed.

Business Impact

Environmental sustainability requirements for communication networks are fundamentally changing network elements, maintenance and operations, including procurement and business operations. Many governments, regulators, customers, employees and shareholders are expecting stricter commitments and more progress toward the sustainability targets. Sustainability has already impacted CSP buyer behavior, the procurement process, vendor selection and differentiation among vendors.

Drivers

- CSPs have to establish environmental sustainability strategy and measurements to be compliant with the requirements and regulations where they operate.
- Many investors require appropriate environmental, social and governance (ESG) transparency and performance from CSPs. Transparency requires definition of targets, commitment and KPI reporting of the progress.
- Customers are focused on the material environmental performance of their suppliers (including vendors, products and services), and, in particular, the associated energy and greenhouse gas (GHG) emission performance.
- Energy efficiency for operational savings has been a market driver for years, and now the trend is changing to include the materials used, water used and reusability of physical equipment. Concrete steps taken by leading CSPs include using upgradable antenna elements, artificial intelligence (AI) and machine learning (ML) to optimize energy consumption during low utilization, automatically repositioning antennas, and using 5G beams.
- Leading CSPs have chosen environmental sustainability as one of their core differentiators going forward and are now actively positioning sustainability with their brand. Examples are Elisa, KPN, Telia Company and Telstra with more aggressive carbon neutral and net-zero targets; 13 European operators founding the European Green Deal; and leading operators in the U.S. such as AT&T, T-Mobile and Verizon.
- The communications industry has the capability to impact society by enabling other industries to become more sustainable using IoT or real-time control and automation. For example, AT&T's Connected Climate Initiative aims to eliminate gigatons of global emissions by 2035, working together with Microsoft, universities and other ecosystem partners.

Obstacles

- Lack of transparency for a full-value-chain environmental impact, making it difficult to assess the impact of different communication industry components — for example, supply chain, recycling and reusing network components
- Slow change of mindset across organizations to take sustainability into account while deploying new technologies with a recycling and repurposing approach
- Lack of sufficient and constant renewable energy sources in the countries, requiring long-term planning from CSPs together with energy companies (including long-term commitments and contracts or even building their own energy production)
- Lack of industry standardization, slowing down development of best practices
- Unclear long-term roadmap from countries and regulators, making planning for new infrastructure projects difficult
- Conflict between the need to densify the network for additional capacity, edge computing requirements for compute and distributed equipment, and the need to reach sustainability goals

User Recommendations

- Set up an environmental strategy and goals for your network, and make sure that all the necessary teams are aware of the plan and impact. Assess financial impact.
- Establish KPIs to be used to follow the progress, and report both internally and externally to governments, shareholders, customers and employees (e.g., follow the GSMA Sustainability Assessment Framework).
- Ensure your sustainability requirements (including ecolabels, emissions, reusability and recycling materials, packaging, and shipping) are part of your procurement and vendor selection decision-making criteria and overall sustainability in the RFI/RFP phase.
- Create a roadmap with specific network modernization and optimization targets to incorporate higher energy efficiency while setting up short-, mid- and long-term goals.
- Work with various business unit teams (including corporate strategy, ESG, finance and product managers) to identify and assess your sustainability initiatives and better understand how sustainable CSP infrastructure can most effectively contribute.

Sample Vendors

Cisco; Ericsson; Hewlett Packard Enterprise; Huawei; Intel; Nokia

Gartner Recommended Reading

A Framework for Sustainable Technology

Top Technology Trends for CSPs in 2022: CSP-Driven Sustainability Impacts Society

Leverage Technology Ecosystems to Improve Sustainability Capabilities

Executive Leadership: Sustainability Primer for 2023

Unlock the Business Benefits of Sustainable IT Infrastructure

Innovation Management

Analysis By: David Cearley, Marty Resnick

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Definition:

Innovation management is a business discipline that aims to establish a repeatable and sustainable innovation process and culture within an organization. Innovation is defined here as the processes, tools and technologies for the implementation of new ideas that create value.

Why This Is Important

Enterprise architecture (EA) and technology innovation leaders are increasing their focus on technology-driven innovation. CIOs, CTOs and technology innovation leaders need to understand how to develop innovation as a core competency and establish an innovation function. EA is increasingly becoming an internal management consultancy, enabling continuous innovation throughout the organization by supporting and participating in innovation management and related disciplines, such as trendspotting.

Business Impact

Engaging in innovation in a thoughtful and deliberate way can generate substantive value by the discovery of new business opportunities. A managed innovation approach delivers a more effective and efficient process of generating value. Ideas that will have the most impact on the business are actionable and help achieve business outcomes. Ideas may not always result in a new product or process, but may lead to continuous improvement, intellectual property, trademark and/or new elements.

Drivers

- An innovation management function is needed to avoid mistakes and ensure critical steps are not missed and the enterprise makes informed decisions on innovation ideas.
- Program design varies between organizations based on goals and operational context, driving the need for thoughtful program design and use of a variety of innovation techniques for ideation, evaluation and realization of value from innovation projects.
- Technology innovation leaders need to identify and nurture behavior goals and risk models to support a shared and evolving culture of innovation.
- Technology innovation teams are increasingly tasked with facilitating idea generation and evaluation and shepherding innovation projects to successfully scale and realize business value.

Obstacles

Technology innovation leaders need to be intentional and methodical to maximize impact, but the following challenges need to be managed:

- The lack of clear goals and a link to the business strategy undermines support for innovation and can lead to innovation with minimal business impact.
- Cultural barriers and a lack of executive sponsorship and support with adequate resources for innovation stifle idea generation and limit program success.
- Overlooking the inherent risks in transformative or disruptive innovation and an intolerance for any failure undermine participation and buy-in from both IT and the business.
- The lack of a process that can see ideas through from prototyping through implementation leads to innovations that do not scale and are not adopted.

User Recommendations

- Identify the goals and context of the business innovation program before developing detailed processes, and adapt these processes over time. Reimagine business capabilities and processes by using trendspotting as inspiration to provide insights into optimizing or creating new innovative business models.
- Facilitate the processes and practices of innovation by enabling leaders to guide the focus toward innovation and to quickly trigger and elicit great ideas, expose new insights, identify new opportunities, resolve obstacles, remove barriers or speed up decisions.
- Create fusion teams including members of various groups focused on innovation, IT and the business to jointly develop, evaluate and implement ideas.
- Identify “lessons learned” from failed ideas and present them in a positive light to encourage calculated risk taking. Create a culture of innovation by influencing mindsets and methods, leading to a shift in attitudes which translate into activities, behaviors and outcomes.

Sample Vendors

Brightidea; EY; HYPE Innovation; ITONICS; Planbox; Qmarkets

Gartner Recommended Reading

Market Guide for Innovation Management Tools

Achieve the Desired Maturity Level Using the Innovation Management Maturity Model and Assessment

Hype Cycle for Innovation Management Techniques, 2022

Jump-Start Your Innovation Journey With a Customizable Innovation Framework

Platform Operating Model

Analysis By: Amresh Nandan, Susan Welsh de Grimaldo

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

A platform business is when organizations enable value creation through interactions between people, businesses and things. A platform operating model is a way for communications service providers (CSPs) to deliver value derived, in part, from the ecosystem. It is a practice that delivers value by enabling ecosystem participants, as providers and customers, to enable the creation, exchange and consumption of services.

Why This Is Important

CSPs face intense pressure to create and deliver new and differentiating value. With traditional operating models, the organization delivers most value through its products and services. Platform operating models push CSPs to implement composable infrastructure, leading to agility and flexibility and enabling ecosystem collaboration. As such, CSPs can derive value from the broader ecosystem, and can extend value creation with networking, connectivity, content, collaboration and commerce opportunities.

Business Impact

Platform operating models provide CSPs with major benefits:

- Ability to participate in digital ecosystems as leaders, partners, founders, providers and consumers.
- Prevent networks from becoming a pure connectivity utility.
- Enable CSPs to diversify and create new and distinct value in adjacent markets.
- Accelerate digital business by transforming the information and technology (I&T) operating model.
- Rapidly scale growth utilizing networking effects, agile experimentation with new technologies, and validation of applications, market and industry fit.

Drivers

- The commoditization of CSPs' traditional value streams, such as connectivity, voice and networking, is driving CSPs to consider value creation with content, collaboration and commerce. To do so, they are considering various platform operating models to expand into adjacent markets.
- Digitally enabled powerhouses — such as the digital dragons, Amazon, Apple, Microsoft, Alibaba Group and Google — are already challenging and eroding CSPs' traditional value enablement in infrastructure and connectivity. In response, CSPs are adopting digital platform models and collaborating with digital dragons to find new revenue opportunities for their traditional services, as well as create net new differentiating value.
- CSPs are subject to disintermediation and disaggregation by nontraditional market entrants, including some from adjacent industries. This has resulted in intensified competition, collaboration and "co-opetition," creating the urgent need for a new view of value creation and delivery of new communications services that require ecosystem participation and scale. The ability to create new value beyond convenience and price, by adopting the four types of platform business models (matching, creation, orchestration and collaboration) through B2B2X, requires the implementation of platform operating models.
- If tech leaders do not adopt a platform operating model in the next two to five years, they will be at the risk of being substantially sidelined, and miss out on new and emerging opportunities. Those that do not build such a model will eventually be forced to compete on price and scale, ultimately becoming irrelevant to customers beyond connectivity.
- Adoption of the platform approach to service design and orchestration improves operational efficiencies and moves toward a factory approach (industrialization and repeatability of business solutions and offerings).

Obstacles

- Lack of proactive collaboration between network, IT, business leaders and partners.
- Rigid business and technology operating models.
- Rigid governance — command-and-control process priorities over autonomy and embedded, data-driven decision making.
- Traditional mindset that emphasizes rules and protective governance (99.999% reliability at all costs) over adaptability and learning.
- Siloed approach to value creation and technology platform development.
- Point-to-point integrations.
- Complexities of legacy systems and technologies.
- Lack of a coherent approach to the technology strategy between network and IT.
- Focus on monetizing CSP customers instead of monetizing network assets.

User Recommendations

- Proactively explore value exchange enabled in digital ecosystems by collaborating with business leaders to develop platform business models utilizing all the possibilities that digital ecosystems offer. Explore participation as founders, leaders, providers or consumers.
- Identify potential business opportunities that platform business offers by uncovering relationships, roles and potential for shared capabilities.
- Develop and implement your infrastructure capabilities that enable the utmost open collaboration with various ecosystem players (such as developers, hyperscale digital players and digital natives) by adopting DevOps and agile principles, as well as open APIs and composability principles.
- Accelerate innovation and new value creation and digital transformation by aligning your I&T operating model elements and capabilities to enable business outcomes.
- Start implementing the key elements of an I&T operating model for a flexible and composable future with other technology leaders.

Gartner Recommended Reading

A Visual Guide to Digital Ecosystems

Top Technology Trends for CSPs in 2022: Intelligent Digital Ecosystems

Top Technology Trends for CSPs in 2022: Composable Networks Drive Business Agility

Routes to the Future for CSP CIOs: Invest in Platform Capabilities to Shape Business

Service and Resource Orchestration

Analysis By: Susan Welsh de Grimaldo, Amresh Nandan, Enrique Hernandez-Valencia

Benefit Rating: Transformational

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Service and resource orchestration refers to the core functions in CSPs' operational support system (OSS). Service orchestration includes service catalog, configuration, service policy management, service provisioning and service assurance. Resource orchestration includes resource catalog and inventory, resource planning and design, resource policy management, resource fulfillment, and assurance. A platform-based approach supports automated operations for end-to-end service orchestration.

Why This Is Important

Service and resource orchestration enables rapid service delivery, efficient resources utilization, and seamless management of telecom services in complex, evolving networks and service environments. As a key part of OSS, orchestration helps CSPs reduce operational costs, improve service agility, enhance customer experience and support the growing demand for diverse and innovative CSP service.

Business Impact

Service and resource orchestration is crucial for CSPs to ensure operations are flexible and agile, and carry low operational costs. Service automation, with the ability to service-chain multiple service components with minimal manual intervention, is critical to improving efficiency, time to market, product innovation, and CX. End-to-end service orchestration across different network services and systems, including 5G and network slicing, enables proper management of increased network complexity.

Drivers

- CSPs seek to increase flexibility, agility and time to market for new services beyond basic connectivity, such as network as a service (NaaS) and packaged solutions with multicloud access, with managed assurance and observability for SLAs. As CSPs move toward automation and disaggregated, cloud-native network architecture, they are moving from single domain orchestration to multidomain orchestration and end-to-end service orchestration.
- Efficient allocation and utilization of network resources require dynamic provisioning and management of resources such as server, router, switches, virtual machines and network functions.
- Successful implementations by leading CSPs are providing valuable lessons for other CSPs that seek to emulate these successes.
- CSPs are focusing on improving customer centricity. Implementation of service and resource orchestration, when complete, will transform CSPs' capabilities to serve their customers through enhanced SLAs, with automated end-to-end delivery improving time-to-market and customer experience and reduced dependency on the cognitive load of network operations teams.
- More CSPs are modernizing and rearchitecting their OSS. In the process, they are moving from single-vendor solutions to buying OSS functions as modules of a bigger integrated architecture, relying on open standards and even open source for multivendor interoperability. Most OSS vendors recognize the trend and are overhauling their products to avoid being marginalized by more aggressive players.
- Some vendors are also putting their OSS on public clouds, offering it in a SaaS model, enabling CSPs to better align their costs and utilization while experimenting moving from buying capacity to paying for consumption.
- CSPs are incorporating the management and orchestration (MANO) framework for coordinating network resources for cloud-based applications and life cycle management of virtual network functions (VNFs) into broader OSS implementation.

Obstacles

- Adjusting the mindset and technical skills of network operations teams to introduce new service and revenue orchestration with increasing levels of composability and automation is challenging and takes time. Service and resource orchestration is a critical part of the OSS, and it is challenging to replace an existing OSS without causing disruption.
- Fully automated orchestration across domains for end-to-end service delivery — for example, for network slicing — will take time to implement and optimize.

User Recommendations

- Take control of the technology change and future architecture by developing the necessary in-house capabilities, emphasizing open APIs for a multivendor environment.
- Build flexibility into your architecture so that it can evolve to support increasing levels of automated operations, evolution of 5G and business model changes.
- Develop a change management plan for operations to guide OSS transformation.
- Evaluate the benefits of developing a best-of-breed platform, sourcing interoperable components (rather than a single vendor solution) and giving preference to vendors that best align with your strategy through flexibility in engagement, solutions and multivendor support.
- Investigate SaaS solutions as an option to move to a consumption based model.

Sample Vendors

Amdocs; Ciena; Comarch; Comviva; Ericsson; Hewlett Packard Enterprise (HPE); Huawei; IBM; Netcracker; Nokia

Gartner Recommended Reading

Market Guide for CSP Service Design and Orchestration Solutions

Objectives and Principles for OSS Architecture Evolution in CSPs

Market Guide for AI Offerings in CSP Network Operations

8 Critical Functionalities for Enterprise 5G Private Mobile Network Management and Orchestration

Synthetic Data

Analysis By: Arun Chandrasekaran, Anthony Mullen, Alys Woodward

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Synthetic data is a class of data that is artificially generated rather than obtained from direct observations of the real world. Synthetic data is used as a proxy for real data in a wide variety of use cases including data anonymization, AI and machine learning development, data sharing and data monetization.

Why This Is Important

A major problem with AI development today is the burden involved in obtaining real-world data and labeling it. This time-consuming and expensive task can be remedied with synthetic data. Additionally, for specific use-cases like training models for autonomous vehicles, collecting real data for 100% coverage of edge cases is practically impossible. Furthermore, synthetic data can be generated without personally identifiable information (PII) or protected health information (PHI), making it a valuable technology for privacy preservation.

Business Impact

Adoption is increasing across various industries. Gartner predicts a massive increase in adoption as synthetic data:

- Avoids using PII when training machine learning (ML) models via synthetic variations of original data or synthetic replacement of parts of data.
- Reduces cost and saves time in ML development.
- Improves ML performance as more training data leads to better outcomes.
- Enables organizations to pursue new use cases for which very little real data is available.
- Is capable of addressing fairness issues more efficiently.

Drivers

- In healthcare and finance, buyer interest is growing as synthetic tabular data can be used to preserve privacy in AI training data.
- To meet increasing demand for synthetic data for natural language automation training, especially for chatbots and speech applications, new and existing vendors are bringing offerings to market. This is expanding the vendor landscape and driving synthetic data adoption.
- Synthetic data applications have expanded beyond automotive and computer vision use cases to include data monetization, external analytics support, platform evaluation and the development of test data.
- Increasing adoption of AI simulation techniques is accelerating synthetic data.
- There is an expansion to other data types. While tabular, image, video, text and speech applications are common, R&D labs are expanding the concept of synthetic data to graphs. Synthetically generated graphs will resemble, but not overlap the original. As organizations begin to use graph technology more, we expect this method to mature and drive adoption.
- The explosion of innovation in AI foundation models is boosting synthetic data creation. These models are becoming more accessible and more accurate.

Obstacles

- Synthetic data can have bias problems, miss natural anomalies, be complicated to develop, or not contribute any new information to existing, real-world data.
- Data quality is tied to the model that develops the data.
- Synthetic data generation methodologies lack standardization.
- Completeness and realism are highly subjective with synthetic data.
- Buyers are still confused over when and how to use the technology due to lack of skills.
- Synthetic data can still reveal a lot of sensitive details about an organization, so security is a concern. An ML model could be reverse-engineered via active learning. With active learning, a learning algorithm can interactively query a user (or other information sources) to label new data points with the desired outputs, meaning learning algorithms can actively query the user or teacher for labels.
- If fringe or edge cases are not part of the seed dataset, they will not be synthetized. This means the handling of such borderline cases must be carefully accommodated.
- There may be a level of user skepticism as data may be perceived to be “inferior” or “fake.”

User Recommendations

- Identify areas in your organization where data is missing, incomplete or expensive to obtain, and is thus currently blocking AI initiatives. In regulated industries, such as healthcare or finance, exercise caution and adhere to rules.
- Use synthetic variations of the original data, or synthetic replacement of parts of data, when personal data is required but data privacy is a requirement.
- Educate internal stakeholders through training programs on the benefits and limitations of synthetic data and institute guardrails to mitigate challenges such as user skepticism and inadequate data validation.
- Measure and communicate the business value, success and failure stories of synthetic data initiatives.

Sample Vendors

Anonos (Statice); Datagen; Diveplane; Gretel; Hazy; MOSTLY AI; Neuromation; Rendered.ai; Tonic.ai; YData

Gartner Recommended Reading

Innovation Insight for Synthetic Data

Innovation Insight for Generative AI

Data Science and Machine Learning Trends You Can't Ignore

Cool Vendors in Data-Centric AI

Case Study: Enable Business-Led Innovation with Synthetic Data (Fidelity International)

Agile Beyond IT

Analysis By: Shilpa Pental

Benefit Rating: Transformational

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Agile is no longer restricted to just IT or software development. Agile beyond IT is application of agile methods and values in functional or business areas outside IT such as in marketing, finance, HR and audit. It provides functional leaders and their teams with a flexible way of rapidly delivering work or capabilities in smaller increments.

Why This Is Important

As functional leaders strive to be more efficient and responsive in today's volatile, uncertain, complex and ambiguous (VUCA) operating environment, they are turning to agile methods and values for greater customer centricity, improved investment decision making, flexible project management practices and increased team collaboration.

Business Impact

The need to improve business performance holistically has opened the door to adopting new ways of working for functional leaders in HR, audit, marketing, finance and other business areas. Strategic portfolio leaders can support agile adoption across the enterprise by sharing and scaling existing agile best practices and establishing a common terminology. When adopted and consistently applied, agile methods and mindset can enable enterprises to deliver business value better and faster.

Drivers

- Today's VUCA operating environment increases the risks associated with waterfall-type, stage-gate projects with fixed requirements and schedules. Agile allows teams to quickly deliver value to the business and/or to fail fast so those resources can be put to better use.
- The continuous adoption of agile acts as a means to balance adaptive and innovative approaches, remove wasted motion, create greater focus on achieving business outcomes, and decentralize decision making.
- Agile, steeped in long-standing lean practices, is established as a means to create efficiency and make iterative adjustments for higher-quality results.
- With more technology decisions driven outside of IT to enable digital business transformation, it is necessary for organizations to become more agile in how they approach all types of work beyond IT.
- Increasing adoption of enterprise agile frameworks (EAFs) provide organizations with potentially transferable processes and practices to expand the use of agile practices.

Obstacles

- Organizations often underestimate the mindset and culture shift needed from both leaders and their teams for successful agile adoption. Also, existing team practices and governance processes are often not suitable for operating in an agile way of working.
- Resource capacity bottlenecks, often initially occurring as limited availability of subject matter experts (SMEs), impede organizations' ability to scale agile.
- Prioritization practices do not have adequate criteria to ensure work requests are aligned to strategic imperatives, contain defined business outcomes, and articulate the right metrics (e.g., objectives and key results, key process indicators and outcome-driven metrics). Portfolio review forums, structure and supporting metrics are not aligned and reinforcing value realization in support of goals.
- Agile adoption guidance is more heavily biased toward implementation in software development, rather than broader organization applicability.

User Recommendations

- Create awareness around agile as an approach to achieving customer-centered collaborative results under conditions of uncertainty, and do not limit yourself to IT and software development. Begin by providing general overviews to help orient everyone to the principles and practices of agile.
- Identify a pilot team of dedicated resources to achieve a specific business outcome, preferably limiting interdependencies and complexity. Enable the pilot team to commit to the shortest possible deadline required to achieve a viable outcome, without burning out people or disrupting day-to-day operations.
- Publicize the progress of the pilot team and the shift in their behaviors as they implement agile practices. Create opportunities for others to learn about the pilot through demos and pilot team metrics.
- Extend the lessons learned from the pilot to additional areas, playing forward the successes and lessons learned from each subsequent group to the next.

Gartner Recommended Reading

Enabling Value Delivery in an Agile World

Applying Agile Methods Outside IT

Adopting Agile in Audit

Translating Agile Values to HR Projects

Making the Case for Agile Marketing

Cloud-Native Telco Operations

Analysis By: Enrique Hernandez-Valencia, Susan Welsh de Grimaldo

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Cloud-native telco operations refers to the use of cloud technologies, microservices architecture and related processes in communications service provider (CSP) operational technology applications at various levels such as virtual network functions, network management applications, and operational and business support systems. These applications could be running in private or public cloud or in some cases both (hybrid cloud infrastructure).

Why This Is Important

Major CSPs are adopting cloud-native architecture principles for operations in all layers of their technology stack to support improved infrastructure flexibility, business agility, customer centricity and operating efficiencies. Adopting cloud-native operations entails fundamental changes in system architecture, operating model, and required technical and operational skill sets. Cloud-native approaches can also help reduce technology debt.

Business Impact

A cloud-native approach promises a transformational impact on CSP operations, services and products — offering benefits such as flexibility, agility, scalability, faster time to market, and improved product and feature velocity. A cloud-native approach to operations emulates web-scale operations and provides flexibility in sourcing and technology change management. CSPs can thus invest and scale as per market demand instead of upfront preprovisioning of capacity and capabilities.

Drivers

- Inadequate benefits from earlier network abstraction models and complexities of legacy business support system (BSS) and operations support system (OSS) transformation have motivated many CSPs to adopt cloud-native architectural principles in their operational technology.
- Cloud-native operations can help develop a composable and layered architecture separating core functionalities of BSS and OSS with capabilities needed for product changes and integration, resources and services observability, and customer experience/journey management.
- Greater modularity along with cloud-native infrastructure afford higher elasticity, resilience and maintainability. This modularity can also allow CSPs to upgrade specific areas of their systems and leverage the “best of component” approach instead of targeting complex multidomain transformations.
- Leveraging cloud-native principles and tools enables a composable business approach and facilitates product and service innovation.
- Adoption of cloud-native operations also increases greater control on technology introduction and change management, and thereby the potential to work with innovative vendors and reduce dependency on full-stack solutions.
- Further adoption of continuous integration/continuous delivery (CI/CD) and DevOps approaches are supporting and driving wider use of cloud-native principles and tools across all areas of CSP operations.

Obstacles

- Moving to a cloud-native approach demands a new operating model and new ways of working, which can take significant time and cost to develop.
- There is a lack of software engineering/IT skills and limited collaboration between the network and IT functions in CSPs.
- Many CSPs have significant dependence on a few technology vendors, leading to inadequate structural and business process changes due to feature incompatibility and technology deployment silos.
- Reference models, practices and guidelines are still evolving, particularly for managing across multicloud, hybrid cloud and distributed architectures.
- New security risks are introduced with disaggregation, virtualization and containerization.
- Many CSPs lack readiness to address the complexities of their business processes (including finance planning and management) and the governance mechanisms needed to fully leverage DevOps- and CI/CD-based operations.

User Recommendations

- Adopt cloud-native capabilities in phases to assure virtual network function (VNF) onboarding, container orchestration, DevOps, CI/CD, security and automation tool chain readiness.
- Develop a roadmap for specific BSS/OSS capabilities, prioritizing network function virtualization (NFV) management and network orchestration (MANO) and target life cycle management (LCM) use cases.
- Ensure that essential cloud-native service and resource orchestration capabilities are in place to take full advantage of cloud-native VNFs.
- Identify key components and processes with specific performance, capacity and latency requirements that must be understood before migrating to a cloud solution.
- Establish an integration environment that leverages open APIs and tool chains for optimal cloud-native application LCM.
- Align implementation across technology layer stacks and automation goals — such as zero-touch provisioning, service creation and closed loop service management.
- Work with suppliers in this change process to balance the benefits and complexities of moving to cloud-native.

Sample Vendors

Amdocs; Cisco; Ericsson; Huawei; MATRIXX Software; Mavenir; Microsoft; Nokia; Whale Cloud Technology

Gartner Recommended Reading

Market Guide for CSP Service Design and Orchestration Solutions

Market Guide for CSP Service and Network Assurance Solutions

Predicts 2023: CSP Technology and Operations Strategies

Cloud-Native Requires New Thinking for Cloud Operations Service Providers

Key Principles for the Design and Implementation of a Cloud-Native Telecom Infrastructure

Intelligent Automation

Analysis By: Peter Liu

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Adolescent

Definition:

Intelligent automation (IA) is a combination of process automation and artificial intelligence (AI) technologies, which together empower rapid and continuous improvements in end-to-end process automation. It also contemplates the use of analytics and AI (especially machine learning) to make automated and intelligent decisions, and case management to provide processes with enough flexibility for end-to-end case management success.

Why This Is Important

IA enables fast end-to-end automation of business and operational processes leveraging AI/ML technologies. IA ecompasses various forms of automation for operation and business processes, including data centers, workplace services, networks, the edge and application availability. IA improves efficiency, scalability and reliability while reducing operating costs, human errors and enhancing productivity.

Business Impact

Business impacts are:

- Improves the productivity of employees, getting rid of repetitive tasks and enabling employees to focus on tasks that add value for the company, like innovation and creativity.
- Optimizes operational efficiency, enhances agility and reduces costs and response times by leveraging AI/ML techniques to perform event correlations and determines optimal actions using CSPs data.
- Uses analytics and AI to make automated and intelligent decisions.

Drivers

- Economic headwinds and shocks place an even greater importance on automation for CSPsto provide the required agility and efficiencies while retaining skilled talent.
- Technology vendors are increasingly embedding intelligent automation capability into their radio, network operation and management, BSS and CRM solutions to address the operation efficiency and complex challenges.
- Operation efficiency and lower operational costs are accelerating intelligent automation adoption in CSPs. Customers are also demanding SLA guarantees and higher availability, which are easier achieved by augmenting operations with AI-based automation.
- Maturing and expanding data science initiatives are leading to better AI/ML algorithms, new capabilities from Generative AI and LLM, more cost-effective computing power and a substantial increase in available data to support the emergence of intelligent techniques.
- The use of intelligence automation will transform how IT and network infrastructure is delivered and supported, including delivering more agility to address resource demand, which is attractive for CSPs building next-generation operation and management platforms.

Obstacles

- Although automation is not a new idea in the telecom space, adding artificial intelligence and reducing human intervention in the process cycle is a relatively new concept in the telecom space. Many CSPs have misconceptions about what to expect as IA becomes part of their work life.
- Building the right vendor strategy and integrating overlapping but disperate tools together to orchestrate, reinvent or recalibrate processes is increasingly challenging, with an abundance of choice of solutions and technologies for insurers to sift through.
- Employees lack skill sets to work effectively with the new tools that are now part of their workflow.
- Lack of executive support and business user involvement. Many intelligent automation projects are treated as a technology project without a business user involvement in the beginning.
- The accuracy of algorithm models is limited by the completeness and accuracy of the data being used. Fragmented data and data quality are always a major concern of a successful intelligent-based automation adaptation.

User Recommendations

- Focus on improving the efficiency of the process before introducing intelligent automation — this is critical. Introducing intelligence and automation on top of an inefficient process tends to lead to a worse situation.
- Build a transformational mindset with respect to AI and automation across the company through accelerating your AI skills and talent development.
- Enhance context-awareness through establishing cross-team visibility and a strong data foundation for intelligence.
- Establish an automation roadmap through requesting intelligent capabilities into vendors' products — or consider how internal capabilities can be developed that can create this intelligent automation.
- Establish a new governance structure in business which has oversight of decisions made by AI. Create a safety net of what resources are allowed by AI to control and what are not.
- Avoid accelerating too fast with automation, build solid foundations in governance, organization structures and skills and competencies by growing from simpler use cases in a phased approach.

Sample Vendors

Amdocs; B-Yond; Ciena; Ericsson; Guavus; Huawei; IBM; Juniper Networks; SS&C Blue Prism; Tupl

Gartner Recommended Reading

Communications Industry: 2023 Top Tech Trends for CSP CIOs

Market Guide for AI Offerings in CSP Customer and Business Operations

Market Guide for AI Offerings in CSP Network Operations

The Gartner 2023 Predictions: Hyperautomation (Inclusive of AI, RPA & Low Code)

The Executive Guide to Maximizing Hyperautomation

Network Slicing

Analysis By: Susan Welsh de Grimaldo, Peter Liu

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Network slicing enables network-based CSPs to create multiple isolated end-to-end logical networks in the form of network slices on top of a common shared physical network infrastructure. Each slice can be customized to provide a specific service quality profile based on the requirements for distinct applications, driving revenue opportunities.

Why This Is Important

Network slicing creates multiple logical networks using a common shared physical network, enabling cost efficiencies and 5G monetization. Slices are tailored to meet specific needs of applications, services, devices, customers or operators. Slicing provides a mechanism to translate business needs of end customers into parameters that can be defined and measured (e.g., required bandwidth, speeds, latency and reliability) to deliver improved customer experience and revenue opportunities.

Business Impact

With network slicing, CSPs can run multiple independent business end services on a common physical infrastructure. This helps generate new business models, especially for vertical industries, and also increases infrastructure utilization and economic efficiency. With network slicing, business customers will be able to access highly customized network slices tailored to specific requirements in a cost-effective, timely and efficient way that are backed by an SLA.

Drivers

- CSPs seek increased agility and faster time to market for customer-centric service creation. Slicing offers a mechanism for composable services across network domains and elements, using automated processes driven by slice templates to deliver desired service parameters that can be quantified in an SLA.
- Vertical industries have specific requirements that drive a need for CSPs to deliver SLAs as they push further in their digital transformation efforts and integrate connectivity, cloud services and sensor data into their mission-critical operations. An example is for secure, reliable low-latency/high-bandwidth connectivity to AI on edge computing.
- Broader commercial deployments of 5G stand-alone (SA) with 5G core will serve as a catalyst for more rapid growth of network slicing in commercial service offerings.
- Advancements in trials and initial commercial deployments, for example with UE Route Selection Policy (URSP), slicing to support fixed wireless access (FWA), and slicing for live events use cases, are providing lessons to support commercial slicing use cases and deployments.
- Network slicing offers improved security and data traffic isolation, as each slice is isolated in operations to minimize potential interference with the traffic in other slices. This will enable slices on the public network to more cost-effectively deliver private networking services, bringing the benefits of network slicing downstream to smaller businesses through more affordable offers.
- Dynamic network slicing that can be quickly instantiated — and spun down when no longer needed — through automation will provide more agility to deliver required value propositions to customers. They can do this while reusing integratable and automatable network components to drive energy and resource efficiency.

Obstacles

- Capabilities such as comprehensive network inventory, automated data-driven operations, and test and assurance of SLAs are needed to commercialize network-slicing-related offerings, but are still in progress.
- Key areas such as dynamic orchestration for low-touch operations to support slicing at scale and manage subdomains/subnets also need further development. Multivendor environments add more complexity. Standards supporting dynamic, E2E slicing across network domains are still being developed.
- 5G SA commercial deployment is still limited, which will delay broader slicing implementation.
- Compelling monetization use cases for network slicing at scale have not been fully developed.
- For multidomain slicing, security policy coordination mechanisms among different domain infrastructures must be coordinated and managed.
- Private 4G/5G adoption by enterprises could satisfy some demands that can be achieved by public 5G's network slicing services, reducing demand.

User Recommendations

- Drive customer centricity by focusing on business outcomes. Work with product teams to translate how technology features can help solve problems or create opportunities for end customers.
- Prepare for slicing by addressing key enablers, e.g., SDN, cloud vRAN, edge computing, cloudification, real-time inventory and increased automation capabilities.
- Evaluate technologies and use cases by working with vendors and customers to co-develop solutions, identify performance gaps and measure business impact.
- Identify ways to deliver cost optimization while supporting revenue growth. Work with vendors to get the right out-of-box functionality, low-code solutions to support use by business units, flexible procurement for pay as you grow and licensing that fits the use cases.

Sample Vendors

Amdocs; Blue Planet (a division of Ciena); Ericsson; Google; Huawei; Intel; Juniper Networks; Nokia; ZTE

Gartner Recommended Reading

Create Value and Drive Revenue With 5G Network Slicing Phased Approach

Drive 5G Network Slicing From POC to Scale

Composable Solutions Are Main Drivers for CSPs Selling IoT and 5G to Enterprises

Market Guide for CSP Service Design and Orchestration Solutions

Hyperautomation for CSPs

Analysis By: Amresh Nandan, Enrique Hernandez-Valencia

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Mature mainstream

Definition:

Hyperautomation is a disciplined business-driven approach organizations use to rapidly identify, vet and automate as many business and IT processes as possible. Hyperautomation involves the orchestrated use of multiple technologies, tools or platforms to achieve business results. These include, but are not limited to, AI/machine learning, analytics, event-driven software architecture, robotic process automation (RPA), iPaaS, packaged software and process/task automation tools.

Why This Is Important

Hyperautomation in CSPs is critical because of the unrelenting demand for accelerated growth through business model innovation or disruption, coupled with the underlying need for a foundation of operational excellence across processes and functions. Communications service providers (CSPs) are gradually moving from siloed automation in specific tasks and functions to automation of business processes across network, service and commercial operations to yield operational efficiency.

Business Impact

Hyperautomation promotes cost optimization, business agility, growth and innovation. CSPs also need hyperautomation to fulfill the increasing demand for greater transparency and self-service capabilities from both consumers and enterprises. As CSPs implement network slicing and network-as-a-service concepts, hyperautomation becomes critical for delivering differentiated business outcomes. The results may be better business or IT processes, increased speed or intelligent decision making at scale.

Drivers

- **Key drivers:** cost optimization, operations efficiency and new growth opportunities.
- **Funding from business units (as opposed to IT budget):** Business units continue to hire and fund initiatives driven by fusion teams and business technologists. This includes spending on products (software, platforms, tools) coupled with services spending on consulting, system integration and managed services.
- **Continued capital investment by vendors:** Capital investment attributed to the various technology categories that enable hyperautomation initiatives has fueled the growth of offerings, with expanded breadth and depth within the vast vendor landscape (both organic growth and through acquisitions).

Obstacles

- **Lack of measurement of quantifiable value:** Very few organizations can showcase identifiable value or benefits because most need ways to measure hyperautomation initiatives. Few CSPs have improved their network resource and service monitoring and observability practices, which makes it harder to assess the impact of their hyperautomation initiatives.
- **Lack of planning for total cost of ownership (TCO) or governance:** The explosion of funded hyperautomation initiatives, coupled with the need for speed, often leaves unaddressed planning for post-production-managed operations and governance structures.
- **Siloed approach:** Concurrent, high-volume adoption of hyperautomation across business functions has been executed via siloed or diffuse purchases of technology tools, solutions and platforms. Based on client discussion and inquiries, Gartner estimates more than 70% of organizations have an average of four or more concurrent initiatives underway.
- **Technology confusion and overspend:** The high level of spend on hyperautomation initiatives has driven more vendor offerings, overlapping functionality and inconsistent pricing structures, rendering technology strategy, architecture and integration a dizzying and difficult process. The result is overspending on more vendors that are not always orchestrated across the enterprise.

User Recommendations

- Define shared ownership and value metrics for hyperautomation initiatives designed to track progress on business outcomes: higher-quality, more resilient processes; higher usage due to employee- and customer-centric experiences; speed; and intelligent, data-driven decision making at scale.
- Maximize the likelihood of successful hyperautomation initiatives by architecting and planning multiple concurrent initiatives. Demand holistic mapping of collective initiatives, rather than silos within specific functions.
- Recognize that automation technologies are not trivial, and there is no single vendor or technology that will enable all the hyperautomation initiatives. Focus on modularity, discoverability and observability in the design. Take an API-first approach.
- Ensure executive support and appropriate investment in training, vendor management and risk competencies due to the volume of services and technologies involved.
- Establish a hyperautomation center of excellence and curate an adaptive governance structure with the goals of managing risk and driving operational resiliency and agility while optimizing total cost of ownership.

Sample Vendors

Accenture; Amdocs; Ericsson; Huawei; IBM; Nokia; Oracle; Tech Mahindra

Gartner Recommended Reading

The Gartner 2023 Predictions: Hyperautomation

Executive Guide to Maximizing Hyperautomation

Future of Work Trends: Hyperautomation Growth Initiatives Delivered by High-Performance Fusion Teams

Top Technology Trends for CSPs in 2022: Hyperautomation Drives Business Outcomes

Sliding into the Trough

CSP Open APIs

Analysis By: Amresh Nandan, Juha Korhonen, Ajit Patankar

Benefit Rating: Transformational

Market Penetration: More than 50% of target audience

Maturity: Early mainstream

Definition:

Open APIs refer to application programming interfaces that are publicly available, so developers can use them for programmatic access to proprietary software. Such APIs, often developed by a commercial entity, industry body or industry standardization/specification organization, are designed for ease of integration, utilization of data and functionalities, and monetization of assets/capabilities.

Why This Is Important

Communications service providers (CSPs) are increasingly adopting open APIs for better modularity, faster integration and reduced vendor lock-in. Integration and monetization requirements have forced detailed specification and standardization by industry bodies, such as the 3rd Generation Partnership Project (3GPP), European Telecommunications Standards Institute (ETSI), TM Forum, Metro Ethernet Forum (MEF) and GSM Association (GSMA).

Business Impact

With increase in modularity of applications, there is value in adopting open APIs for faster, easier and cost-effective integration. Open APIs can have a big business impact, but their success depends on their adoption level, which varies significantly across CSPs and vendors. Vendors' implementation of open APIs has increased due to CSPs' compliance requirements in their RFPs, leading to improved and faster integration of typical business support system (BSS) and operations support system (OSS) applications.

Drivers

- Open APIs in customer, product, service and resource management functions are leading than other functions, as CSPs have prioritized use of open APIs in their BSS and OSS application integration.

- A key reason for end-user adoption of open APIs is the desire to achieve greater freedom in sourcing and integrating technologies.
- In addition, such APIs by industry bodies are often specified or developed in a collaborative manner, leading to early identification of nuanced requirements and integration challenges.
- CSPs sourcing technologies from multiple vendors is the most appropriate way for faster and cost-effective interoperability.
- As CSPs look toward developing and participating in ecosystems, open APIs (such as GSMA Open Gateway) are a necessity to expose data and functionalities, while enabling simultaneous secure integrations with industry verticals and other partners.
- CSPs are increasingly tracking the level of TM Forum open API adoption by vendors through their RFIs and RFPs.
- The 5G network data analytics function (NWDAF) and network exposure function (NEF) have further boosted the idea of standard/open APIs, for the purpose of better management and monetization of the network.
- Some leading CSPs have also started focusing on open APIs for the purpose of monetization of data, intelligence and network assets through their service management/digital enablement platforms. We see this focus to intensify in the coming years.

Obstacles

- Despite continued efforts by TM Forum and other forums in developing a library of open APIs, there are sophisticated functionalities in some vendor solutions, for which no such standard and open APIs are available.
- CSPs have the intent to use standard and open APIs. Nonetheless, many CSPs lack a proper integration and API strategy, which leads to lackadaisical adoption.
- Continuation of old solutions and architecture in many CSPs is an obstacle for open APIs implementation, though some CSPs have been working on overlay mechanisms.
- Even though vendors' adoption of open APIs has increased, they continue to exhibit reluctance in implementing open APIs, unless forced by their key customers.

- Some vendors have developed their own set of APIs and project them as analogous to open APIs. Such an approach adds complexities and fragmentation to open APIs adoption.

User Recommendations

- Develop your integration strategy as a standard guideline for using standard and open APIs, and alternate mechanisms where such APIs are unavailable.
- Use adoption of open APIs by the vendors as a critical evaluation criteria during the vendor evaluation process.
- Negotiate the implementation of open APIs by the vendors in their implementation, as and when they are available, through contract terms and conditions.
- Dedicate resources for participation in API development initiatives, trials and pilot programs, as the effectiveness of such APIs take time and investments.
- Ensure access to development resources and create the developer support to have efficient use of open APIs to enable partners. Examples of such initiatives include TM Forum's Open API Catalyst programs, where many CSPs and vendors participate to address specific challenges.
- Participate in industry open API programs that offer CSPs ways to monetize network assets with ecosystem- or platform-based business models.

Gartner Recommended Reading

Objectives and Principles for OSS Architecture Evolution in CSPs

Market Guide for CSP Service Design and Orchestration Solutions

Market Guide for CSP Customer Management and Experience Solutions

Market Guide for CSP Revenue Management and Monetization Solutions

CSP Network Security

Analysis By: Peter Liu, Jon Dressel, Sylvain Fabre

Benefit Rating: Transformational

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Telecom networks have undergone a technological shift, which will rely more on distributed, disaggregated and open cloud-native network architecture. CSPs network security mechanisms need to evolve and be able to address new threats by introducing AI/ML, zero-trust, SASE, SOAR and Container and Kubernetes security capabilities.

Why This Is Important

As telecom networks shift to rely more on distributed cloud network architecture and more widely used IT tools, the approach needed to secure them must also evolve. CSPs network security solutions must be able to address increased security risk from disaggregation and virtualization architectures, and compliance to meet the needs of CSPs future network while still securing legacy infrastructures.

Business Impact

By incorporating emerging security technologies such as SASE, ZTNA, Container and Kubernetes security, and Cloud workload protection platforms, CSPs can enhance their network security mechanisms. These capabilities allow them to apply a more proactive and agile approach in addressing future network and business requirements while improving monitoring and observability.

Drivers

- Communications service providers' (CSPs') future infrastructure's heterogeneity and complexity require security to be dealt with at multiple levels and across domains, which today's piecemeal approach is insufficient to support.
- Container as a service (CaaS) offerings, such as Amazon Elastic Kubernetes Service (EKS), Azure Kubernetes Service (AKS) and Google Kubernetes Engine (GKE), are on the rise. These increase the security exposure and require CSPs to enhance their Container and Kubernetes security capabilities.
- Risk management activities are evolving to align to the changes brought by digital transformation, requiring a more integrated approach to include strategic risks such as those relating to CSPs' operational technology environments and new digital risks in the enterprise domain.
- The expansion to the adjacent market aiming for new revenue blur the boundary of IT/OT/CT, which requested a new cross-industrial security approach.
- The need to flexibly support digital business transformation efforts with a zero trust security architecture while managing complexity is a significant factor for the adoption of SASE, primarily delivered as a cloud-based service.
- CSP networks are the target of dedicated Advanced Persistent Threat (APT) that have specialized in their inherent topology and weaknesses (such as in the GPRS Tunneling Protocol [GTP]).

Obstacles

- 5G and future network end-to-end security represents a new set of challenges — in particular when edge and/or slicing is included — such as virtualization, containerization, identification and access control, use of open source software and supply chain risk.
- Organizational silos, existing investments and skills gaps: An end-to-end CSPs network implementation requires a coordinated and cohesive security approach across network, IT, business and consumer teams, which is challenging given refresh/renewal cycles, business domain silos, and existing staff expertise.
- CSPs remain underprepared and still lack the expertise and knowledge required to handle advanced cybersecurity threats brought about from new architecture, business models and new industries integration.
- Container security must start in development, yet many security vendors and enterprises treat container security as a runtime-only problem.
- Cybersecurity specialists are knowledgeable about IT systems in general, CSP requirements for additional proficiency in the telecom architectures reduces the pool of qualified applicants.

User Recommendations

- Identify required capabilities for networking and security, including latency, throughput, geographic presence, and endpoint types to develop evaluation criteria.
- Implement end-to-end security by managing algorithm strength, secret keys negotiation, confidentiality protection, cross-domain slice orchestration and heterogeneous network layers.
- Develop specialized features to align closely to specific requirements, such as network slicing, private mobile network and edge computing.
- Extend workload scanning and compliance efforts into development (DevSecOps), especially for containers and serverless functions.
- Study ZTNA as a template for access control under zero trust networking. For workloads and applications, trust should be based on a contextual assessment of the workload
- Require vendors to support native integration with leading cloud platforms.

- Pressure existing workload protection vendors to provide complete solutions for container security that address end-to-end container security pipelines.
- Implement external Bug Bounty programs as well as internal perpetual Purple team testing.

Sample Vendors

A10 Networks; F5; Fortinet; Netcracker; Nokia; OneLayer; Palo Alto Networks; Trend Micro; VIAVI; ZScaler

Customer Journey Analytics

Analysis By: Matt Wakeman

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Customer journey analytics (CJA) tracks and analyzes customers' and prospects' interactions with an organization across multiple channels. It aims to provide a holistic view of customer experience by covering all the channels used by customers. CJA includes channels with human interaction (e.g., a call center) and those that are fully automated (a website). It also includes physical channels (a retail store), and those that provide customer assistance (live chat and co-browsing).

Why This Is Important

Consumers expect personalized, customer-centric engagement and marketers need to deliver it — challenging marketing strategies that take a business-centric approach to the customer experience. Moreover, customer activity across channels is increasing, so tools that integrate cross-channel customer behavior using CJA enable companies to identify opportunities to improve customer experience.

Business Impact

CJA is a strategic priority for a variety of internal roles in several different industries, as leaders strive to gain a better understanding of the customer journey across all phases — buying, ownership and advocacy. In many cases, marketers will be able to leverage CJA features in their existing martech stack rather than add a stand-alone vendor.

Drivers

- CJA is a strategic priority for multiple roles, as marketing, sales and service leaders strive to gain a better understanding of customers' complete journeys and touchpoints across channels and functions.
- CJA can improve marketers' personalization tactics by measuring each phase of a journey to optimize the entire journey for the customer (or customer segment) context and intent.
- CJA access is accelerating as more applications begin to add elements of journey analysis into existing tools, such as customer data platforms, personalization engines, customer analytics applications and multichannel marketing hubs.

Obstacles

- Marketers are challenged to access, analyze and activate their companies' customer data — from web activity to call center engagement. Gartner surveys show that on average, companies use nine channels for marketing, 2.9 for digital commerce and 5.4 for customer service. The greater the number of siloed customer channels or data sources, the more challenging to deliver comprehensive CJA.
- Digital data deprecation has accelerated, with changes to platforms (Apple) and regulations (across North America and Western Europe). While marketers must address regulatory and consumer concerns, this trend creates a journey analytics gap for anonymous audiences, due to the increasing challenge of linking anonymous digital activity across sessions and devices. Those challenges are larger for certain go-to-market models (primarily indirect sales models, e.g., B2B2C).

User Recommendations

- Acknowledge that valuable insights come from understanding the combination of channels used by customers, not by understanding customer (or segment) behavior within a single channel.
- Evaluate your existing technology stack to see if you're already paying for an application with journey analysis capabilities — because journey analysis functionality is often embedded into other systems.
- Avoid measuring outcomes with channel-specific key performance indicators (KPIs) (that ignore customer activities in other channels, such as single-channel conversion rates or cost per acquisition. Channel-specific KPIs can be useful diagnostic indicators for prioritizing optimizations.
- Start with customer identification and journey mapping across only two to three channels, where the journey benefits the customer and organization (high impact) and the data are both available and valuable (high feasibility).

Sample Vendors

Adobe; Cerebri AI; Splunk; Teradata

Gartner Recommended Reading

Market Guide for Web, Product and Digital Experience Analytics

What Marketers Need to Know About Customer Journey Analytics

Data Fabric

Analysis By: Mark Beyer, Ehtisham Zaidi, Roxane Edjlali, Sharat Menon, Robert Thanaraj

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Definition:

A data fabric is a design framework for attaining flexible and reusable data pipelines, services and semantics. The fabric leverages data integration, active metadata, knowledge graphs, profiling, ML and data cataloging. Fabric overturns the dominant approach to data management which is “build to suit” for data and use cases and replaces it with “observe and leverage.”

Why This Is Important

Data fabric leverages traditional approaches while enabling the enterprise to adopt technology advances and avoids “rip and replace.” It capitalizes on sunk costs and simultaneously provides prioritization and cost control guidance for new spending for data management. It leverages concepts and existing platforms/tools or implementation approaches. It offers flexibility, scalability and extensibility in infrastructure for humans or machines to assure data is consumable across multiple use and reuse cases on-premises, multicloud or hybrid deployments.

Business Impact

Data fabric:

- Increases identification, deployment and availability of data for reuse at scale.
- Provides insights to data engineers by standardizing repeatable integration tasks, improving quality, and more.
- Adds semantic knowledge for context and meaning, and enriched data models.
- Evolves into a self-learning model that recognizes similar data content regardless of form and structure, enabling connectivity to new assets.
- Enables observability across the data ecosystem.
- Reduces maintenance, support and optimization costs associated with managing data.

Drivers

- The dearth of new staffing or personnel seeking data management roles and the attrition of experienced professionals leaving the practice area has increased the demand for more efficient data reuse.
- Demand for rapid comprehension of new data assets has risen sharply and continues to accelerate, regardless of the deployed structure and format.
- Increased demand for data tracking, auditing, monitoring, reporting and evaluating use and utilization, and data analysis for content, values and veracity of data assets in a business unit, department or organization.
- Catalogs alone are insufficient in assisting with data self-service. Data fabrics capitalize on machine learning (ML) to provide recommendations for integration design and delivery, reducing the amount of manual human labor that is required.
- Significant growth in demand and utilization of knowledge graphs of linked data, as well as ML algorithms, can be supported in a data fabric to assist with graph data modeling capabilities and use-case generic semantics.
- Organizations have found that one or two approaches to data acquisition and integration are insufficient. Data fabrics provide capabilities to deliver integrated data through a broad range of combined data delivery styles including bulk/batch (ETL), data virtualization, message queues, use of APIs, microservices and more.

Obstacles

- Organizations will keep applying budget or staff to one-off and point-to-point integration solutions.
- Differing design and semantic standards used by various vendors to document and share metadata create challenges in its integration and effective analysis to support a data fabric design.
- Fabric needs analytic and ML capabilities to infer missing metadata. This will be error-prone at first with staffing and resources assigned to competing demands in advanced analytics, data science and AI near the data consumption layer.
- Active metadata management practices lag behind data fabric adoption but are critical to its implementation.
- Diverse skills and platforms demand a cultural and organizational change from data management based upon analysis, requirements and “design then build” to discovery, response and recommendation based upon “observability and leveraging.”
- Improper split from data mesh implies choosing one approach over another and not a complementary relationship.
- Inexperience in reconciling a data fabric with legacy data and analytics governance programs will confound implementers.

User Recommendations

- "Active metadata" and leveraging the inherent practices to it is mandatory in a data fabric (covered separately).
- Invest in an augmented data catalog that permits multiple ontologies over top of business data taxonomies and is alerted to new use cases for data and the related business units utilizing data.
- Deploy data fabrics that populate and utilize knowledge graphs in targeted areas where adequate metadata and metadata management practices already exist.
- Ensure business process experts can support the fabric by enriching knowledge graph capabilities with business semantics.
- Evaluate all existing data management tools to determine the availability of three classes of metadata: design/run, administration/deployment and optimization/algorithmic metadata. When adopting new tools, favor those that share the most metadata.
- Do not permit SaaS solutions to isolate their metadata from access by PaaS solutions that orchestrate across solutions.

Sample Vendors

Cambridge Semantics; Cinchy; CluedIn; Denodo Technologies; IBM; Informatica; Semantic Web Company; Stardog; Talend

Gartner Recommended Reading

Data and Analytics Essentials: How to Define, Build and Operationalize a Data Fabric

Quick Answer: What Is Data Fabric Design?

Emerging Technologies: Critical Insights on Data Fabric

API-Based Digital Commerce

Analysis By: Aditya Vasudevan

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

API-based digital commerce (also commonly known in the market as “headless” digital commerce) is the use of APIs to decouple front ends from core commerce services and to integrate commerce capabilities within any touchpoint where selling is required.

Why This Is Important

The proliferation of touchpoints requires a multichannel, multiexperience approach to applications. This, in turn, requires the decoupling of the presentation layer from commerce services that an API-based approach offers. Some vendors provide API-based commerce platforms, while others retain a native storefront but also provide full APIs for headless operation, known as “head optional.”

Business Impact

Decoupling the front end is a step toward a modern, modular commerce architecture that provides business flexibility and IT agility. As commerce journeys become multiexperience, this is an enabler for delivering consistent experiences across all touchpoints. The storefronts must be delivered independently of the commerce application, via a digital experience platform (DXP) or custom front end. Although being API-enabled does provide ultimate flexibility, it requires digital maturity to succeed.

Drivers

API-based digital commerce adoption is driven by:

- Midsize to large organizations, that are looking to move up in the digitally mature scale. It has become the standard approach for the delivery of experiences by the enterprise, even if the underlying application remains monolithic.
- Recognition of the quality of digital experience as a key differentiator across multiple touchpoints (for example, native mobile apps, marketplaces, social platforms, in-store experiences, the Internet of Things, wearables, smart homes and vehicles).
- Maturity of front-end frameworks, single-page application (SPA) and progressive web application (PWA) as the dominant “next generation” of client-side, JavaScript-based presentation and the emergence of digital experience platforms (DXPs) requires digital commerce platforms to be fully API-enabled.
- Growth in DXPs supporting “experience-driven commerce.”

- Commerce as an enabling part of a wider digital business technology platform.
- Pace of innovation in digital commerce driving more flexible, modular architectures.
- Expense and complexity of some leading “monolithic” commerce platforms, when a more agile, flexible subset of capability is desired.

Obstacles

API-based digital commerce improves business agility. However:

- The “headless” buzz has caused some disillusionment among those expecting it to be easy to achieve. Despite this, it is rapidly moving toward mainstream acceptance.
- Commerce experiences can be more complex to implement than single-vendor “full stack” solutions due to increased emphasis on integration efforts and governance of the decoupled front-end technology.
- A key challenge is ensuring business users retain no-code control over the storefront(s). This adds complexity to implementations and the business UIs required to support presentations and processes.
- Most vendors’ native commerce platform storefronts are shifting from server-side “themes” or template engines toward client-side SPA/PWA. Thus, some of the benefits of API-based digital commerce are becoming available from almost all vendors. But having an API is not the same as being “API first,” and not all the benefits of this new approach have yet to be realized.

User Recommendations

Pursue API-based commerce if you think it may fit your requirements, specifically if you:

- Want to retain granular control over multiexperiences, including by deploying a DXP, building via a multiexperience development platform (MXDP), or developing a SPA/PWA presentation tier.
- Are looking to support multiple digital and physical channels equally from the same business logic, and to support cross-channel continuity of experience.
- Already have (or are looking to implement) a DXP to provide a more consistent customer experience across commerce, brand and other digital properties.

- Have a large, inflexible, legacy, monolithic, full-stack commerce application that cannot be replaced in a single step, and want to migrate to a modular architecture.

Sample Vendors

BigCommerce; commercetools; Elastic Path Software; fabric; Infosys Equinox; Kibo Commerce; Shopify Plus; Spryker Systems; Virto Commerce; VTEX

Gartner Recommended Reading

Magic Quadrant for Digital Experience Platforms

Choose the Right Digital Commerce Platform Architecture

Quick Answer: What Does a Technology Reference Model for Digital Commerce Look Like?

Defining the Digital Experience Platform

Predictive Analytics for CSPs

Analysis By: Pulkit Pandey, Kameron Chao

Benefit Rating: High

Market Penetration: More than 50% of target audience

Maturity: Mature mainstream

Definition:

Predictive analytics is a form of advanced analytics that analyzes current and historical data or events to make predictions about future or otherwise unknown events. It is characterized by techniques such as data mining, regression analysis, multivariate statistics, pattern matching, predictive modeling and forecasting.

Why This Is Important

Communications service providers (CSPs) face more complex network and diversified business requirements, which continue to drive predictive analytics adoption in the telecom industry. Leading CSPs use sophisticated algorithms and machine learning techniques to analyze huge volumes of data to support the future-state prediction. They extract actionable insights to provide better customer experiences, improve network and business operations, and increase revenue through new products and services.

Business Impact

By understanding likely but unknown events (such as network state, traffic patterns and customer behavior), CSPs can make better decisions and anticipate threats and opportunities, being more proactive rather than reactive. Interest continues to grow in new use cases and more traditional applications of predictive analytics (for example, churn management, digital twin, network planning, and sales and financial forecasting) that impact customer retention, revenue growth, network investments, etc.

Drivers

- Maturing and expanding data science initiatives, better algorithms, more cost-effective cloud-based computing power, and a substantial increase in the availability of curated data support the emergence of predictive analytics techniques.
- A good understanding of future network states is critical, which allows CSPs to more precisely allocate resources and improve utilization and security.
- Predictive use of network data holds much potential; as CSPs gain experience and skills with predictive analytics, they extend deployment to additional uses. It can, for example, add accuracy from network planning to marketing and make service assurance and customer care more productive.
- Real-world best practices with proven performance metrics (e.g., proactive customer care, predictive maintenance, business forecasting, predictive fraud management) accelerate adoption.

Obstacles

- Current predictive analytics solutions usually require data scientists with a deep understanding of areas such as statistical modeling and Python, which CSPs normally lack.
- The accuracy of predictive analytics models is limited by the completeness and accuracy of the data used. Fragmented data and data quality are always major concerns when it comes to successful predictive analytics adoption.
- Predictive analytics alone does not guarantee better decision making but may be marketed as such, creating unrealistic market expectations.
- Current predictive analytics adoption often uses a packaged application. However, packaged applications' pretrained models do not exist for every analytics use case. Packaged applications may also not provide enough agility, customization nor competitive differentiation.
- Predictive analytics today is often consumed as an individual tool for a specific use case. This difficulty with cross-domain integration weakens its effectiveness.

User Recommendations

- Use customer centricity as the key anchor point for all kinds of decision making, and concentrate on building analytics models that have the maximum impact in meeting those objectives.
- Do not deploy predictive analytics in a siloed way, but focus on the integration and exposure capabilities (such as open API) of the predictive analytics solution to maximize impact and reusability.
- Incorporate effective data management strategies in order to integrate and unify data from different sources. Also, make sure the data is accessible for analysis, since its success is dependent on the quality and completeness of data.
- Formulate an automation strategy for your organization and align your predictive analytics initiatives with it.
- Establish a learning environment and increase the related analytics skills of your own people. Ensuring adequate and feasible use of analytics for new value creation heavily depends on the symbiotic relationship of analytics with employees' skills and competencies.

Sample Vendors

Amdocs; AsiaInfo Technologies; Cisco; Cloudera; Ericsson; Huawei; IBM; Juniper Networks; Nokia; Subex

Gartner Recommended Reading

Market Guide for AI Offerings in CSP Network Operations

How Can the Telecom Sector Be Successful With AI?

AI Vendors Selling to CSPs: Your Guide to an Effective Solution Packaging

Cool Vendors in Communications Service Provider Business and Network Operations

Cool Vendors in AI and Automation for CSP Operations and Engagement

Product-Centric Delivery Model

Analysis By: Mike West, Sarah Davies

Benefit Rating: High

Market Penetration: More than 50% of target audience

Maturity: Mature mainstream

Definition:

A product-centric delivery model allows you to take advantage of product management. That is to structure your organization's operating model to create small teams focused on product development and provide greater flexibility to meet the shifting demands of consumers. This allows organizations to adapt how software is consumed, and enables software leaders to shift from time-bound episodic delivery to continuous delivery.

Why This Is Important

The ability to respond to market trends, the economy and shifting consumer demands without complex organizational changes is driving organizations to adopt the product-centric delivery model. This model allows organizations to have greater control of their enterprise strategy and move away from the standard, functional skill-based organization and embrace multiskilled persistent teams that work together on a product or product line.

Business Impact

A product-centric delivery model enables an enterprise to:

- Focus on outcomes rather than functions, and incremental improvements to measured business outcomes.
- Use venture capital or investment funding models as financial methods to control investment at operational levels.
- Improve agility to respond to changing market demands and customer value prioritization.
- Reduce silos, improve collaboration across product value streams, and have flatter organization and more rapid decision making.

Drivers

- Organizations must adjust their delivery models to keep pace with market demands and increased volatility.
- Investment and financial models need to provide flexibility and support evidence-based market research and responses to corporate strategy.
- Organizations need rapid, incremental feedback that engineering teams can respond to flexibly to satisfy and delight customers.
- A shift to cloud-based architecture is driving the adoption of value-based operating models that reflect the customer journey rather than existing management frameworks.
- The continuous disbanding of project teams has left today's organizations feeling the need to address new talent retention strategies and to overcome inefficiencies caused by siloed data and solutions via continuous innovation and delivery.

Obstacles

The key factors hampering the adoption of product-centric delivery models include:

- Inertia from existing organizational culture and management frameworks reluctant to disband current budgets and authority positions. This is compounded by the difficulty finding experienced product management subject matter experts, e.g., product managers, to help overcome this reluctancy.

- Walls between business and IT due to the lack of alignment around outcomes, responsibilities, siloed budgets and success metrics, which leads to a lack of understanding of business outcome metrics such as leading key performance indicators (KPIs) and objective and key results (OKRs).
- The lack of senior management and organizational support, which leaves adoption in pockets across the organization, and outmoded governance processes incentivizing control and risk aversion rather than experimentation and innovation.

User Recommendations

- Establish clear goals and objectives for the transition, anchored on business priorities, building leadership support for the necessary culture and governance change.
- Establish a strong partnership with colleagues as you identify and train product managers, product owners, business leaders and team members on agile and product management practices.
- Transform governance to embrace business architecture practices such as value stream mapping, business capability modeling, and customer and employee journey mapping.
- Move to a product funding and work prioritization model that allows for reallocation of resources based on business demand and changing market conditions. Create an explicit network of dashboards to convey the outcomes of product initiatives. Manage recurring reviews of outcomes to assess the value of work underway.

Gartner Recommended Reading

Strengthen Five Key Pillars of Product Management to Scale for Digital Business Success

Prepare Now for the Future of Digital Product Management

Improve Product Team Speed and Agility by Minimizing Dependencies: Approaches From 3 Leading Organizations

Overcome Objections and Sell the Benefits of Moving From Projects to Products and Agile

Create a Product Operations Role to Improve the Strategic Focus of Product Managers

Communications PaaS

Analysis By: Daniel O'Connell

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Communications platform as a service (CPaaS) is a cloud-based middleware on which organizations can develop, run and distribute communications software. The platform offers APIs that simplify the integration of communication modules — including SMS, voice, messaging apps, email, social and video — into applications, services and business processes, complemented with development tools and documentation. A CPaaS vendor may assemble multiple CPaaS modules into richer solutions, such as e-commerce.

Why This Is Important

CPaaS is important because it easily enables organizations to integrate communications into workflows via developer-friendly software APIs. Even organizations with modest IT skills have developers that can deploy SMS, voice and two-factor authentication (2FA) for basic workflows like notifications and appointment reminders. Digital natives and large enterprises have robust developer teams that can build more complex workflows with features such as email, video, payments, web chat and WhatsApp.

Business Impact

CPaaS plays a prominent role in enterprise IT with the influx of developers joining the IT workforce. A developer ecosystem of APIs, software development kits (SDKs) and documentation provides a low-cost toolset for improving operational efficiency and customer experience. CPaaS vendors now offer visual builders so noncoding business analysts can build simple workflows. Most organizations start by deploying CPaaS for a single business unit (BU) use case, from which it is quickly adopted across other BUs.

Drivers

- CPaaS is highly correlated with the 2023 API economy. Many organizations now have a bigger developer workforce compared to 2018. Megavendors like Amazon, Cisco and Microsoft now have a CPaaS play. The companies' entrance certifies the importance of CPaaS, placing CPaaS on the radar screen of IT leadership.
- CPaaS vendors continue to build out their platforms with an expanded set of modules such as video, WhatsApp, security, authentication, email and payments. This, in turn, enables organizations to build more complex workflows, yielding higher CPaaS revenue for vendors, such as e-commerce, telehealth and insurance claims processing.
- A few CPaaS vendors are building out advanced capabilities in bots, AI, customer data platforms (CDPs) and campaign management. Many of these implementations focus on customer experience.
- CPaaS vendors are building systems integrator (SI) partnerships focused on complex vertical use cases. This provides a scaling opportunity as the SIs have strong CIO relationships for building advanced IT workflows.
- Visual builders continue to be rolled out in the market to allow the participation of noncoding business analysts. This expands the total available market (TAM) to users building simple workflows or making modifications to existing workflows.

Obstacles

- The CPaaS market struggles with brand awareness. Many IT decision makers are not sure which CPaaS providers are best-suited to align with.
- Developer talent constrains CPaaS growth. While organizations add developers to their workforce, their schedules may be booked for other projects.
- The CPaaS landscape is complicated as new vendors enter the market and with others repositioning their product offerings. In addition, CPaaS vendors are expanding their capabilities into CDP, contact center as a service (CCaaS) and campaign management.
- 2022 through 2023 economic uncertainty has forced vendors to focus on profitability rather than growth. This has led to industry layoffs, reduced risk taking and a focus on core competencies further hindering CPaaS adoption.
- CPaaS market adoption is strong with mature offerings like SMS, 2FA, and number anonymization. But they are commodities and have poor margins. CPaaS vendors need greater adoption into the newer capabilities — WhatsApp, video, and conversations — in order to restore their financial health.

User Recommendations

- Proceed first with simple solutions centered on SMS, application-to-person (A2P), 2FA, phone number anonymization and voice if you have modest IT skills.
- Explore the advanced communications modalities such as the messaging apps (e.g., WhatsApp), video, email, payments and e-commerce if you have stronger IT skills. CPaaS is now viable for organizations of all shapes and sizes.
- Adopt CPaaS across the entire business. CPaaS often starts in a single BU, before expanding to others — such as HR, operations and supply chain — to achieve maximum benefits.
- Expand the organization's developer workforce to fully leverage CPaaS for competitive edge. IT core competency is not a luxury, but a necessity for survival.
- Hire SIs or boutique CPaaS development firms for initial projects. Have your IT team learn from the third-party CPaaS firm so you can build your own core competency.

Sample Vendors

Bandwidth; CM.com; Infobip; MessageBird; Route Mobile; Sinch; Twilio; Vonage

Gartner Recommended Reading

Market Guide for Communications Platform as a Service

Quick Answer: Why You Need to Deliver on WhatsApp Business Platform for Rich Business Conversations

How to Evaluate and Select CPaaS Providers to Operationalize Customer Experience

Emerging Tech: Turnkey Yet Customizable Solutions Are Transforming Communication

Enterprise Information Management

Analysis By: Andrew White, Mark Beyer

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Adolescent

Definition:

Enterprise information management (EIM) is an integrative discipline that guides an organization's technology choices and implementation practices to assure key information assets are captured, shared and reused appropriately. EIM can accelerate the deployment and leveraging of a data ecosystem, data fabric, data mesh or microservices approach and assist in multicloud infrastructure designs. EIM helps connect the most important information assets across the enterprise.

Why This Is Important

Data fabric and data mesh are now attracting investment (across all clouds and sources) to help mitigate the challenges of information silos. The most complex business challenges require the business to engage and own the policies and decisions that govern the most important information assets, which cannot be achieved by traditional practices that do not address technology and structural silos. EIM continues to be wanted for its benefits, while challenges persist with implementation. EIM will struggle to get out the trough until organizational maturity in the practice itself improves.

Business Impact

EIM brings the following benefits and impacts:

- As technology can help streamline and automate work, EIM provides the needed business engagement to identify existing organizational and cultural silos to help identify “the least amount of information” across an organization. EIM then introduces the governance and management requirements to meet its most prioritized outcomes regardless of the technology utilized.
- EIM helps connect data, information and analytic silos across an organization with lean business information assets.
- EIM helps coordinate data that drives the biggest business impact while improving productivity across all data and analytics (D&A) initiatives.
- EIM saves time. Connected work, processes and decisions are more effective with shared information assets.

Drivers

- Digital at scale will need critically shared and trusted data at the center of every decision, business process and outcome.
- Most organizations continue with disparate and divergent data and analytics siloed capabilities. Increasingly, business pressures such as scaling digital business or improving decision making lead to a demand to connect these silos.
- Technology-centric approaches that centralize all data (such as those based on a single data warehouse or lake) are time-consuming and resource-intensive, making the prioritization capabilities of EIM compelling.
- New technologies such as the use of ML-enabled data catalogs and design patterns such as data fabric offer promise, but even they are no substitute for identifying and managing the most critical information assets across the organization and developing an appropriate information architecture.
- Whereas master data management (MDM) is in the process of being lean, EIM extends the principles to include all information types, not just master data. This could include content, records, digital, analytics, and so on shared and exchanged across the enterprise.

- Interest continues to grow in connecting governance programs such as MDM or application data management (ADM; for example, for your application data) with data privacy, security, access and analytics governance.
- It is very common for organizations to think about EIM and start with a smaller, focused program such as MDM or ADM to help govern ERP or application data. However, these programs end up becoming silos focused on their own needs. Over time, metadata from each silo might become commonly shared and governed to help reduce impact of the solos. Data fabric would also help identify such metadata for consideration.

Obstacles

- Traditional enterprise and information architectural practices that seek to design, develop and manage all data everywhere as if the variation in use cases is considered a localized issue or not addressed at all. Newer, leaner practices are needed.
- At the same time, Gartner's CDAO surveys, year-in, year-out, suggest that culture and lack of data literacy are the biggest obstacles to effective D&A initiatives like EIM (see CDAO Agenda 2023: Presence, Persistence and Performance).
- The persistent IT preoccupation with taking a system's view of the information remains a significant barrier — instead of taking a business outcome view in which information is malleable and fungible. EIM was a well-known need for some years and firms focus explicitly on EIM. Increasingly more organizations are discovering the need anew, sometimes with new terms. Since it is a major challenge to get right, EIM will likely remain in the trough for a number of years.

User Recommendations

- Leverage outcome-driven initiatives and connect them one at a time using identified, managed and governed enterprise information. Don't seek to manage all your data equally; use outcomes to prioritize the data and information assets across your business.
- Consider how to sequence all your D&A initiatives over a multiyear horizon. Use prioritized business outcomes to drive that sequence. This will gradually erode the system integration focus of IT practices while simultaneously promoting connecting governance practices (set policy, enforce policy, etc.) across the most widely shared information assets that underpin those prioritized outcomes and support D&A initiatives.
- Use Gartner's data and analytics strategy and operating model framework to implement EIM (see The Foundation of an Effective Data and Analytics Operating Model — Presentation Materials). The strategy model will prioritize initiatives with business impact. The operating model can be used to connect discrete implementations of MDM, ADM, records management, metadata management, data hub strategy, D&A governance, data fabric, composable analytics, and so on.
- Use augmented capabilities and active metadata to learn patterns, relationships and usability to help prioritize your EIM initiatives.
- Use data fabric to help automate the discovery and seeded data for potential reuse and governance in your EIM program.

Gartner Recommended Reading

5 Things a D&A Architecture Discipline Does for a CDAO

Four Steps to Start an Information Architecture Practice

Strategic Roadmap for Data and Analytics Governance

Tool: How to Connect Data to Business Outcomes

Sequence Your Data and Analytics Investments to Maximize Business Value

Privacy by Design

Analysis By: Bart Willemsen, Bernard Woo

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Privacy by design (PbD) is a set of principles about proactively creating a culture of privacy, by embedding it often and early in technology (e.g., application or customer interaction design), as well as into procedures and processes (e.g., through privacy impact assessments, data minimization and subsidiarity). There is no finite list of principles, yet PbD as a best practice is globally applicable to the basis of any privacy program.

Why This Is Important

Privacy is one of the core tenants for organizations that are seeking to earn trust with their customers and drive increased revenue opportunities. In addition, the number of new or significantly revamped regulations continues to increase worldwide. Organizations can expect to operate more efficiently by adopting PbD and embedding privacy considerations throughout their processing activities.

Business Impact

Privacy must be built-in. A proactive risk-based approach helps enhance consumer trust, prevent violations (such as costly data breaches) before they occur, and reduce the damage from them if they do (such as fines or brand damage). All technology design must account for the protection of any personal data at the core to mitigate privacy risk, which is at unprecedented heights with the current data volumes processed.

Drivers

- Systems must be designed so that the collection of privacy-sensitive data is transparent to the data subject. Some technology-focused ideas for implementing PbD are reducing retention length and amount of personal data (data minimization), working on the original data (rather than on copies) and applying anonymization or pseudonymization where possible, alongside purpose-based access controls (PBAC).
- The need persists to continuously evaluate the risks of reidentification and traceability, and include data location in the considerations for clarity on regulatory impact. Moreover, implementing PbD can lead to other positive changes such as designating a privacy officer with reach or procurement activities for new IT services, and frequently conducting privacy impact assessments.
- PbD and one of its subcomponents, privacy engineering, enable an approach to a business process and technology architecture that combines various methodologies in design, deployment and governance. Properly implemented, it yields an end result with an easily accessible functionality to fulfill the Organisation for Economic Co-operation and Development's (OECD's) privacy principles. It also helps mitigate the impact of a personal data breach by reimagining defense in depth from a privacy-centric vantage point.
- The process involves ongoing recalculation and rebalancing of the risk to the individual data owner while preserving optimum utility for personal data processing use cases. As a result, organizations can rely on the right data being available at the right time with maximized information retention and trust in a compliant operation.
- Stakeholders will also benefit from reducing the data footprint and accompanying breach exposure risk reduction. Further, PbD allows consistent delivery to subjects upon a privacy promise as well as collateral enhanced customer trust and engagement levels.

Obstacles

- Adoption and widespread recognition of PbD has been hampered by a lack of industry-recognized principles and consistent regulatory framework support. The Information and Privacy Commissioner (IPC) of Ontario described seven key elements: proactivity, privacy by default, privacy embedded into design, full functionality, end-to-end security, visibility and transparency, and user centricity. In the U.S., a report by the Federal Trade Commission (FTC) of 2012 is the most visible early support for the PbD principle, yet worldwide standards are not yet being created
- Only over the past few years, legislative requirements start to include "data protection by design and/or by default," implying a PbD approach to all activities. Precedent-shaping rulings are slowly increasing in number and depth. Vendors have added statements like "product X was designed with PbD in mind," sometimes with little reference material to support the claim. Only when privacy is truly a more organic part of the development process, the need for and benefit rating of PbD increase.

User Recommendations

- Tackle privacy by design in manageable steps; a wholesale shift will be too much to handle. Privacy by design is a cultural change about the processing of personal data. This pertains both to existing operations and to innovations.
- Adjust the existing operations through business process reengineering. Especially in innovative developments and new processes, the change begins by asking questions such as: Can we achieve the purpose set out by using less personal data? Can we end the personal data life cycle sooner? Can we provide the same functionality or customer experience without using the identifiable data? Can we adequately protect what we process? Do customers understand what we are processing about them and why?
- Identify use cases where privacy-enhancing computation (PEC) techniques can be adopted to support the embedding of privacy into current and future operational activities.

Gartner Recommended Reading

Use a Privacy Impact Assessment to Ensure Baseline Privacy Criteria

16 Frequently Asked Questions on Organizations' Data Protection Programs

5 Privacy Imperatives for Executive Leaders

Quick Answer: How Can Executive Leaders Manage AI Trust, Risk and Security?

Climbing the Slope

Continuous Delivery

Analysis By: Hassan Ennaciri

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Adolescent

Definition:

Continuous delivery (CD) is a software engineering approach that enables teams to build critical software quickly, while ensuring the software can be released reliably anytime. Through dependable, low-risk releases, CD allows continuous adaptation of the software to incorporate user feedback, market shifts and business strategy changes. This approach requires the engineering discipline to facilitate complete automation of the software delivery pipeline.

Why This Is Important

The growing success of DevOps initiatives continues to drive investments in CD capabilities. CD improves software release velocity and reliability, while simplifying compliance enforcement via automation. It is a prerequisite and the first step to continuous software deployments for organizations that aspire to push changes with zero downtime.

Business Impact

CD is a key practice for a DevOps initiative as it reduces the build-to-production cycle time. As a result, it accelerates the positive impact of new applications, functions, features and fixes by increasing velocity across the application life cycle. The positive impacts include improved business delivery and end-user satisfaction, improved business performance and agility, and risk mitigation via rapid delivery of updates.

Drivers

- Increased adoption of Agile and DevOps practices to deliver solutions.
- Pressure from digital business to improve release velocity and reliability.
- Additional compliance requirements that require automation and orchestration of release activities for better traceability and auditability.

- The need to improve delivery outcomes to deploy application builds and updates more consistently, by extending the benefits of continuous integration (CI) and automated testing to continuously build deployable software.

Obstacles

- Organizational culture and collaboration between teams with different roles and skills are major barriers to CD success. Agile practices that helped bridge the gap between business and development must be extended to deployment, environment configuration, monitoring, and support activities.
- Lack of value stream mapping of product delivery hinders visibility and quick feedback loops for continuous improvements. Teams struggle to improve and focus on value work, as they don't have insights into the critical steps in the process, the time each step takes, handoffs, and wait states.
- Manual steps and processes involved in deploying to production environments impact software flow delivery.
- Other challenges impacting the success of CD include application architecture, lack of automation in all areas of testing, environment provisioning, configuration security and compliance.

User Recommendations

- Evaluate all associated technologies when you start a CD initiative and take an iterative approach to adoption. This will require collaboration with different stakeholders from the product, development, security and operations teams.
- Establish consistency across application environments for a higher likelihood of success and implement a continuous improvement process that relies on value stream metrics.
- Evaluate and invest in associated tooling, such as application release orchestration tools, containers, and infrastructure automation tools. These tools provide some degree of environment modeling and management, which can prove invaluable for scaling CD capabilities across multiple applications.
- Explore a DevOps platform that provides fully integrated capabilities and enables continuous delivery of software.

Sample Vendors

Broadcom; CloudBees; GitLab; Harness; JFrog; Red Hat

Gartner Recommended Reading

How to Build and Evolve Your DevOps Toolchains

Market Guide for Value Stream Management Platforms

Beware the DevOps Toolchain Debt Collector

Entering the Plateau

DevSecOps

Analysis By: Neil MacDonald, Mark Horvath

Benefit Rating: Transformational

Market Penetration: More than 50% of target audience

Maturity: Mature mainstream

Definition:

DevSecOps is the integration and automation of security and compliance testing into agile IT and DevOps development pipelines, as seamlessly and transparently as possible, without reducing the agility or speed of developers or requiring them to leave their development toolchain. Ideally, offerings provide security visibility and protection at runtime as well.

Why This Is Important

DevSecOps offers a means of effectively integrating security into the development process, in a way that eliminates or reduces friction between security and development. The goal is to pragmatically achieve a secure, workable software development life cycle (SDLC) supporting rapid development. DevSecOps has become a mainstream development practice, although the specifics can vary between organizations based on their technology and the maturity of their development processes.

Business Impact

The goal of DevSecOps is to speed up development without compromising on security and compliance. Furthermore, the externalization of security policy enables business units and security organizations to define and prioritize policy guardrails and lets developers focus on application functionalities. Policy-driven automation of security infrastructure improves compliance, the quality of security enforcement and developer efficiency, as well as overall IT effectiveness.

Drivers

- Adoption of DevOps, and other rapid development practices, requires security and compliance testing that can keep up with the rapid pace of development.

- DevSecOps offerings are applied as early as possible in the development process, whereas traditional application security testing (AST) tools associated with older development models are applied late in the development cycle, frustrating developers and business stakeholders.
- Testing results need to be integrated into the development process in ways that complement developers' existing workflows and toolsets, and not require them to learn skills unrelated to their goals.
- The use of open source has greatly increased the risk of the inadvertent use of known vulnerable components and frameworks by developers.

Obstacles

- Incorrectly implemented, siloed and cumbersome security testing is the antithesis of DevOps. Due to this, developers believe security testing tools are slowing them down.
- Developers don't understand the vulnerabilities their coding introduces.
- Developers don't want to leave their development (continuous integration/continuous delivery [CI/CD]) pipeline to perform tests or to view the results of security and compliance testing tools.
- Historically, static application security testing (SAST) and dynamic application security testing (DAST) tools have been plagued with false positives or vague information, hence frustrating developers.
- The diversity of developer tools used in a modern CI/CD pipeline will complicate the seamless integration of DevSecOps offerings.

User Recommendations

- "Shift left" and make security testing tools and processes available earlier in the development process.
- Prioritize the identification of open-source software (OSS) components and vulnerabilities in development (referred to as software composition analysis).
- Opt for automated tools with fast turnaround times, with a goal of reducing false positives and focusing developers on the highest-confidence and most-critical vulnerabilities first.

- Ask vendors to support out-of-the-box integration with common development tools and support full API enablement of their offerings for automation.
- Evaluate emerging cloud native application protection platform (CNAPP) offerings for technical control implementation.
- Require security controls to understand and apply security policies in container- and Kubernetes-based environments.
- Favor offerings that can link scanning in development to correct configuration, visibility and protection at runtime.

Sample Vendors

Apiiro; Aqua Security; Contrast Security; Dazz; Lacework; Palo Alto Networks; Qwiet AI; Snyk; Sonatype; Wiz

Gartner Recommended Reading

How to Select DevSecOps Tools for Secure Software Delivery

Market Guide for Cloud-Native Application Protection Platforms

Magic Quadrant for Application Security Testing

12 Things to Get Right for Successful DevSecOps

How to Manage Open-Source Software Risks Using Software Composition Analysis

Appendixes

See the previous Hype Cycle: Hype Cycle for Communications Service Provider Operations, 2022

Hype Cycle Phases, Benefit Ratings and Maturity Levels

Table 2: Hype Cycle Phases

(Enlarged table in Appendix)

Phase	Definition
Innovation Trigger	A breakthrough, public demonstration, product launch or other event generates significant media and industry interest.
Peak of Inflated Expectations	During this phase of overenthusiasm and unrealistic projections, a flurry of well-publicized activity by technology leaders results in some successes, but more failures, as the innovation is pushed to its limits. The only enterprises making money are conference organizers and content publishers.
Trough of Disillusionment	Because the innovation does not live up to its overinflated expectations, it rapidly becomes unfashionable. Media interest wanes, except for a few cautionary tales.
Slope of Enlightenment	Focused experimentation and solid hard work by an increasingly diverse range of organizations lead to a true understanding of the innovation's applicability, risks and benefits. Commercial off-the-shelf methodologies and tools ease the development process.
Plateau of Productivity	The real-world benefits of the innovation are demonstrated and accepted. Tools and methodologies are increasingly stable as they enter their second and third generations. Growing numbers of organizations feel comfortable with the reduced level of risk; the rapid growth phase of adoption begins. Approximately 20% of the technology's target audience has adopted or is adopting the technology as it enters this phase.
Years to Mainstream Adoption	The time required for the innovation to reach the Plateau of Productivity.

Source: Gartner (July 2023)

Table 3: Benefit Ratings

Benefit Rating ↓	*Definition* ↓
Transformational	Enables new ways of doing business across industries that will result in major shifts in industry dynamics
High	Enables new ways of performing horizontal or vertical processes that will result in significantly increased revenue or cost savings for an enterprise
Moderate	Provides incremental improvements to established processes that will result in increased revenue or cost savings for an enterprise
Low	Slightly improves processes (for example, improved user experience) that will be difficult to translate into increased revenue or cost savings

Source: Gartner (July 2023)

Table 4: Maturity Levels

(Enlarged table in Appendix)

Maturity Levels	*Status*	*Products/Vendors*
Embryonic	In labs	None
Emerging	Commercialization by vendors Pilots and deployments by industry leaders	First generation High price Much customization
Adolescent	Maturing technology capabilities and process understanding Uptake beyond early adopters	Second generation Less customization
Early mainstream	Proven technology Vendors, technology and adoption rapidly evolving	Third generation More out-of-box methodologies
Mature mainstream	Robust technology Not much evolution in vendors or technology	Several dominant vendors
Legacy	Not appropriate for new developments Cost of migration constrains replacement	Maintenance revenue focus
Obsolete	Rarely used	Used/resale market only

Source: Gartner (July 2023)

Document Revision History

Hype Cycle for Communications Service Provider Operations, 2022 - 11 July 2022

Hype Cycle for Communications Service Provider Operations, 2021 - 14 July 2021

Hype Cycle for Communications Service Provider Operations, 2020 - 22 July 2020

Hype Cycle for Communications Service Provider Operations, 2019 - 11 July 2019

Hype Cycle for the Future of CSP Network and Business Operations, 2018 - 24 July 2018

Hype Cycle for the Future of CSP Network Operations, 2017 - 26 July 2017

Hype Cycle for Communications Service Provider Operations, 2016 - 11 July 2016

Hype Cycle for Communications Service Provider Operations, 2015 - 16 July 2015

Hype Cycle for Communications Service Provider Operations, 2014 - 4 August 2014

Hype Cycle for Communications Service Provider Operations, 2013 - 25 July 2013

Hype Cycle for Communications Service Provider Operations, 2012 - 30 July 2012

Hype Cycle for Communications Service Provider Operations, 2011 - 29 July 2011

Hype Cycle for Communications Service Provider Operations, 2010 - 29 July 2010

Hype Cycle for Communications Service Provider Operations, 2009 - 22 July 2009

Hype Cycle for Carrier Operations, 2008 - 9 July 2008

Hype Cycle for Carrier Operations - 3 August 2007

Recommended by the Authors

Some documents may not be available as part of your current Gartner subscription.

Understanding Gartner's Hype Cycles

Tool: Create Your Own Hype Cycle With Gartner's Hype Cycle Builder

Routes to the Future for CSP CIOs: Invest in Platform Capabilities to Shape Business

Predicts 2023: CSP Technology and Operations Strategies

Communications Industry: 2023 Top Tech Trends for CSP CIOs

2023 CIO and Technology Executive Agenda: Navigating the Triple Squeeze for CSPs

Table 1: Priority Matrix for Communications Service Provider Operations, 2023

Benefit	*Years to Mainstream Adoption*			
↓	***Less Than 2 Years*** ↓	***2 - 5 Years*** ↓	***5 - 10 Years*** ↓	***More Than 10 Years*** ↓
Transformational	DevSecOps	Agile Beyond IT API-Based Digital Commerce CSP Network Security CSP Open APIs Innovation Management Total Experience for CSPs	Cloud-Native Telco Operations Converged Cloud Management Customer Technology Platform Data Fabric Digital Twin of a Customer Human-Centric Change Leadership Network Slicing Platform Operating Model Service and Resource Orchestration	

Benefit	*Years to Mainstream Adoption*			
↓	***Less Than 2 Years*** ↓	***2 - 5 Years*** ↓	***5 - 10 Years*** ↓	***More Than 10 Years*** ↓
High	Intelligent Automation Predictive Analytics for CSPs Product-Centric Delivery Model	5G Charging Communications PaaS Continuous Delivery Customer Journey Analytics Hyperautomation for CSPs Synthetic Data	B2B Services Platform Enterprise Information Management Partner Ecosystem Management Platforms for CSPs Sustainable CSP Infrastructure	
Moderate	CSP Data Monetization	Generative AI for CSPs Privacy by Design	Digital Twins of Telecom Networks	
Low				

Source: Gartner (July 2023)

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