Hype Cycle for Digital Government Services, 2023

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Initiatives: Governmentwide Digital Innovation and Application Modernization

This Hype Cycle presents technologies and practices that are essential for governments to improve services while advancing digital transformation maturity. CIOs can use it to determine suitability, pinpoint appropriate timing for investments, and assess adoption risks.

Analysis

What You Need to Know

Delivering services digitally continues to be a priority in government transformation plans. The 2023 Gartner CIO and Technology Executive Survey revealed that about half of government CIOs are currently focused on operational excellence and citizen experience. [1]

Increasingly, CIOs are creating postdigital pathways to enduring mission outcomes. Of government CIOs surveyed, 56% reported that digital investments were making a high or extremely high contribution toward their organizations public purpose or mission outcomes. This link between digital investment and mission outcomes continues to grow in significance. It will be a crucial part of the shift toward postdigital government.

This Hype Cycle focuses on technologies and practices that have a transformative impact on how government delivers services. CIOs can use it to inform their current investment plans and to anticipate “what’s next” in digital services. These insights help ensure that government service delivery remains agile and resilient in an increasingly difficult, disruptive and uncertain global context.

The Hype Cycle

This Hype Cycle helps government CIOs evaluate, prioritize and anticipate technology investments in support of improved service delivery.

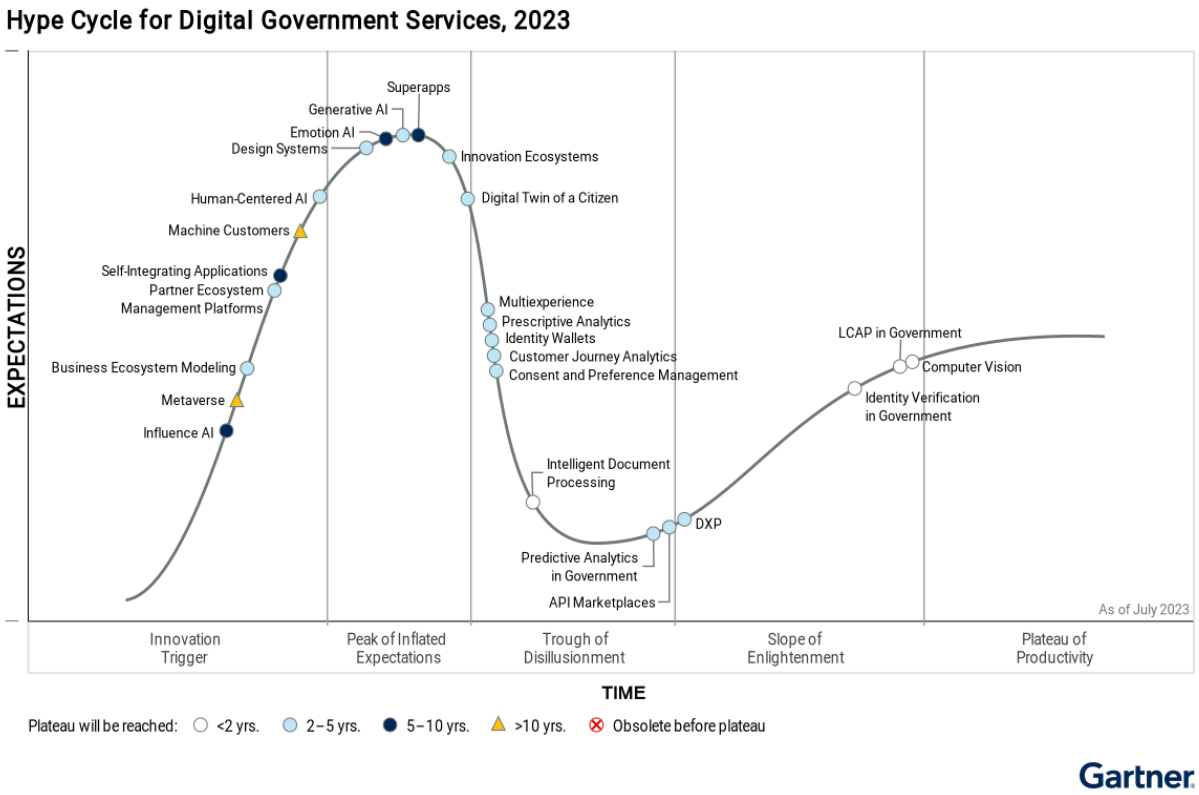
It focuses on engagement capabilities that will establish enduring outcomes while incorporating key attributes of empathy, data insights, and orchestrating ecosystems (see Quick Answer: What is Postdigital Government?).

This Hype Cycle will form the strategic planning of government CIOs as they evaluate and prioritize technology investments that will evolve service delivery for their organization around the following pillars:

- **Empathy:** Technologies like influence AI, human-centered AI and emotion AI, directly link empathy as a core tenet, allowing service design to evolve around the needs of the citizen.
- **Data insights:** Prescriptive analytics and predictive analytics offer examples of how governments are gaining better insights to serve constituent needs.
- **Ecosystem:** Business ecosystem modeling, partner management platforms, and innovation ecosystems will support efforts to orchestrate ecosystems around government services.

The timing and placement of technologies on the Hype Cycle is critical as CIOs assess when, or if, to take action. Emerging innovations like superapps and generative AI should be evaluated from a strategic perspective. Those with more short-term drivers can gain insights on practices that are becoming sufficiently mature for wider adoption and scaling.

Figure 1: Hype Cycle for Digital Government Services, 2023



The Priority Matrix

The Priority Matrix for Digital Government Services illustrates technologies mapped to the time frame by which they are expected to mature into mainstream adoption and deliver benefits, and the level and depth of benefits that can be expected from them. For those technologies in the upper-left section, transformational or high benefits can accrue immediately. Those with similarly significant benefits, but in a less-mature state, present strategic opportunities, but should be approached somewhat more cautiously. Technologies and practices with longer times to mainstream adoption should be anticipated to have changing market dynamics and changing dominant players over that horizon.

For example, rapid investments in technologies that accrue immediate benefits — such as computer vision, low-code applications or document-centric identity proofing — can be viewed as quick wins. Conversely, influence AI, self-integrating applications, metaverse or generative AI might have high transformative potential in the long run, but are still relatively immature. This means that they still pose significant risks, and organizations need to be able to absorb such risks through dedicated innovation, exploration and incubation resources.

The placement of technologies within the Priority Matrix will vary slightly by geography, sector or tier of government, particularly with respect to their potential benefit assessments.

Table 1: Priority Matrix for Digital Government Services, 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	Computer Vision	Generative AI Human-Centered AI Predictive Analytics in Government	Emotion AI Influence AI Self-Integrating Applications	Metaverse
High	Intelligent Document Processing LCAP in Government	Business Ecosystem Modeling Customer Journey Analytics Design Systems Digital Twin of a Citizen DXP Identity Wallets Innovation Ecosystems Multiexperience Partner Ecosystem Management Platforms Prescriptive Analytics	Superapps	Machine Customers
Moderate	Identity Verification in Government	API Marketplaces Consent and Preference Management		
Low				

Source: Gartner (July 2023)

On the Rise

Influence AI

Analysis By: Andrew Frank

Benefit Rating: Transformational

Market Penetration: Less than 1% of target audience

Maturity: Embryonic

Definition:

Influence AI is the production of models designed to automate elements of digital experience that guide user choices at scale by learning and applying techniques of behavioral science. Influence AI replaces the previous innovation profile called “Influence Engineering.”

Why This Is Important

Generative AI (GenAI) has shattered preconceptions about the communication limits of AI in general. Marketers are moving beyond efficiency and savings toward more effective uses of content to influence behavior, which we refer to as Influence AI. Mastering these techniques offers disproportionate control over market-shaping consumer choices but carries substantial risks and needs for ethical governance.

Business Impact

Organizations are adapting the foundational models of genAI to marketing’s commercial goals by adding data and analytics to nudge customer choices with relevant content and experiences that guide decisions. Emotion AI, content intelligence and federated learning models are powering new approaches to promotion, pricing, customer experience and product design with positive and negative implications.

Drivers

- **Proof of AI’s persuasive abilities.** Independent research has clearly demonstrated that AI can learn and model persuasive techniques that exploit cognitive biases in human decision making.
- **Acceleration of general AI development.** Although many have called for a pause, there’s no sign that AI developers will slow down as competition and investment build behind the latest technology bonanza.

- **Marketing's lead.** Marketing, with its dependence on communication and content to influence behavior, is the first target and adopter of GenAI products in most organizations.
- **Evolving consumer expectations.** Chatbots and digital people are trending, replacing legacy search prompts in search engines and advancing personalization techniques with more empathic inferences.
- **Adoption pressures.** The public deployment of ChatGPT and other GenAI applications has brought awareness of AI's uncanny abilities to millions globally, putting adoption pressure on organizations.
- **Awareness of risks.** Misuse of AI to produce deepfakes and other toxic content that attacks organizational reputations has become a boardroom concern.
- **ESG pressure.** As corporations face increasing demands to address environmental and societal impacts, success often depends on nudging consumers toward more sustainable and ethically sourced product choices and away from misinformation. The success of investments in more sustainable, healthier products and more equitable business practices is highly dependent on modifications in consumer behavior which can be reinforced with effective nudges by Influence AI.
- **Reactions to data loss.** Pressure is mounting on marketing organizations to deliver better results while losing key data sources such as browser cookies and device IDs. This is driving greater dependence on advanced analytics and content strategy to make up for loss of data.

Obstacles

- **Immaturity and danger.** Approaches to leveraging GenAI with other technologies like emotion AI are still experimental and high-risk.The potential for AI to exploit people's vulnerabilities to encourage bad choices or reinforce destructive behaviors or biases — even if this was not the intention of designers — creates poorly understood moral risks.
- **Popular backlash.** Developers and the press have raised alarms about the many dangers of AI development moving too fast, leading many organizations to take a cautious approach. High-profile blunders, such as accidental leaks of proprietary information, also signal caution. Reactions to perceived manipulative technology have been especially harsh.

- **Legal ambiguities.** Proposed regulations with nebulous scope create new legal hazards for companies contemplating use of AI for influence. The impact of new regulations on providers is also unknown.
- **Lack of skills.** Sourcing expertise needed for advanced applications of AI in marketing remains challenging.

User Recommendations

- Identify an ethicist role in the organization that reports directly to the board before experimenting with Influence AI. Work with them on articulation of guidelines and principles.
- Establish or locate a governance structure within your organization where opportunities for influence AI are best investigated. Discover use cases and debate the goals and extent of potential commitments. Solicit cross-functional representation.
- Recruit user test groups from within and outside your organization for research and experimental projects, or seek providers for such projects. Be transparent about goals and technologies. Assume such research requires informed consent and privacy controls.
- Motivate staff to learn the basics of prompt engineering and other skills needed to build and test GenAI applications. Develop a sense of scope as projects costs and complexity vary widely.
- Build a knowledge center and include assessment of competitors' and platform providers' activities. Play defense as well as offense.

Gartner Recommended Reading

Predicts 2023: AI, Social Toxicity and Disappearing Customers Forge the Future of Marketing

Use Generative AI to Enhance Content and Customer Experience

Board Brief on Generative AI

Beyond the Hype: The Impact of Generative AI on Marketing

Metaverse

Analysis By: Marty Resnick, Matt Cain, Tuong Nguyen

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Gartner defines a metaverse as a collective virtual 3D shared space, created by the convergence of virtually enhanced physical and digital reality. A metaverse is persistent, providing enhanced immersive experiences. Gartner expects that a complete metaverse will be device-independent, and will not be owned by a single vendor: It will have a virtual economy of itself, possibly enabled by digital currencies and non-fungible tokens (NFTs).

Why This Is Important

A metaverse is the next level of interaction in the virtual and physical worlds. It will allow people to replicate or enhance their physical activities. This could happen either by transporting or extending physical activities to a virtual world or by transforming the physical one. Although the goal of a metaverse is to combine many of these activities, there are currently many emerging metaverses with limited functionality.

Business Impact

Enterprises can expand and enhance their current businesses in unprecedented ways, opening up innovative opportunities. The following are examples of opportunities that metaverse offers to enterprises:

- Spatial computing (e.g., real-time shopping recommendations)
- Gaming (e.g., collaborative “serious games” for training)
- Digital humans (e.g., customer service representatives)
- Virtual spaces (e.g., live virtual events)
- Shared experiences (e.g., immersive meetings)
- Tokenized assets (e.g., NFTs)

Drivers

There are three drivers for the metaverse:

- **Transport:** The ability to “go and immerse oneself” in a virtual world. That world may be a 3D simulation and/or in virtual reality.
- **Transform:** Bringing digital to the physical world. This allows the user to have access to real-time information, collaboration and experiences in the physical world.
- **Transact:** The economic foundation of the metaverse through the use of cryptocurrency, NFTs and blockchain.

Some of the main activities for the metaverse that will require one or more of these drivers are:

- **Collaboration:** Encouraging collaboration and participation from a diverse group of stakeholders, wherever they may be located.
- **Engagement:** Employees and customers are often disengaged. The metaverse facilitates a feeling of presence (“being there”) as if the participants were in-person, turning their focus to the task at hand with less distraction.
- **Connectedness:** Metaverse enables us to connect in a more immersive way with shops, work environments, schools and communities of interest — regardless of where or if they exist in the physical world.

Ultimately, people desire to enhance and/or augment their lives in digital and physical realities.

Obstacles

- The adoption of metaverse technologies is nascent and fragmented. Furthermore, this is a time of learning, exploring and preparing for a metaverse with limited implementation. The financial and reputational risks of early investments are not fully known, and caution is advised.
- Current manifestations of metaverses are siloed, app-based, noninteroperable experiences that do not satisfy the decentralized and interoperable vision of the metaverse. This current, walled-garden approach also strongly limits users' control of experiences.
- While technology plays a key role in achieving a mature metaverse, another challenge involves establishing user-centric guidelines for ethics and governance covering different aspects of the metaverse. This must include topics like privacy, data sovereignty, acceptable terms of use, accountability, identity and legal protections.

User Recommendations

- Task a specialized innovation team and/or vendors to look for opportunities where metaverse technologies could optimize digital business, or create new products and services.
- Identify metaverse-inspired opportunities by evaluating current high-value use cases vis-a-vis your product or service (internally and externally). Focus on ways the metaverse can enhance an experience and can accomplish engagements the physical world may find impossible.
- Be careful when investing in a specific metaverse, as it is still too early to determine which investments will be viable in the long term.
- Remember that the metaverse is an evolutionary stage. Similar to the shift from the original web to Web 2.0 and to Web3, it does not indicate a formal change in the nature of the web, or in this case, digital interactions and digitization in general, but describes a general change that will happen over time.

Sample Vendors

Animoca Brands (The Sandbox); Decentraland; Linden Lab; Meta; Microsoft; NVIDIA; Roblox

Gartner Recommended Reading

Emerging Tech: Top Enabling Technologies for Metaverse

Top Strategic Technology Trends for 2023: Metaverse

Building a Digital Future: The Metaverse

Infographic: Impact Map of the Metaverse

Emerging Tech Impact Radar — The Metaverse

Business Ecosystem Modeling

Analysis By: Ian Reynolds, Auria Asadsangabi

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

A business ecosystem model is a dynamic network of entities that interact to co-create and exchange sustainable value for participants. Business ecosystem modeling focuses on extending the scope of business architecture to the customers, suppliers, devices, partners and other entities that make up an organization's ecosystem.

Why This Is Important

All organizations exist in business ecosystems that include customers, partners, competitors, regulators, suppliers and other entities. The business ecosystem is made up of a complex set of relationships, roles and dynamics. Ecosystem modeling can provide insight into a business ecosystem and its dynamics, and aid in developing effective business strategies.

Business Impact

Although organizations have always existed in business ecosystems, the digital age has accelerated the complexity and the number of connecting relationships between participants. Business ecosystems now extend around the globe, mediated by technology, and many business models are based on business ecosystems. Business ecosystem modeling enables organizations to better understand and operate within their ecosystem.

Drivers

- Business strategy in a digital era increasingly relies on adopting an ecosystem mindset to ensure organizations are maximizing value realization from ecosystem opportunities.
- Business ecosystems are, by nature, complex adaptive systems. Effectively modeling them enables decision makers to play out scenarios and shape more-sophisticated strategies.
- Business ecosystems facilitate trust-based partnerships and enable open innovation — using the resources of partner organizations and building them into the organization's business and operating model.
- Advancements in technology have helped forge new, and develop existing, interconnections between organizations and their macro environment. Ecosystem modeling helps organizations understand the nature and dynamics of these interconnections.

Obstacles

- Business ecosystems represent a substantial change in perspective, away from zero-sum thinking toward a positive-sum perspective.
- New skills, competencies and tools are needed to model and understand the dynamics of the business ecosystem. This is particularly important as the volume of inputs into the model increases and makes understanding ecosystems more complex.
- Data science, simulation and statistical analysis are all complementary skills for more advanced ecosystem modeling, but they are in short supply.
- Some modeling tools are available, but they are not fully mature and lack widespread adoption and understanding.

User Recommendations

- Begin by learning how organizations have used business ecosystem modeling to optimize and transform their operations.
- Use business ecosystem modeling to identify the participants, their roles, their relationships and their interrelationships. A business ecosystem model can highlight monetization opportunities, threats and challenges.
- Foster a mindset shift among enterprise leaders, promoting openness toward modeling and engaging with the organization's business ecosystem.

Sample Vendors

Avolution; Bizzdesign; Inlecom; Tr3Dent; WorkSpan

Gartner Recommended Reading

Model Your Ecosystem to Identify the Partners Needed for Digital Business

EA's Evolving Role in Digital Business Ecosystems: Benchmark Data

Case Study: An Ecosystem Lens Optimizes End-to-End Customer Journeys (Premera Blue Cross)

Case Study: Methods to Build Trust-Based Ecosystem Partnerships to Optimize Business (RubyMeadow*)

Case Study: Ecosystem Modeling Workshops to Develop Partnerships (Standard Bank Group)

Partner Ecosystem Management Platforms

Analysis By: Ilona Hansen, Guy Wood

Benefit Rating: High

Market Penetration: 5% to 20% 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 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 the indirect sales channel.

Why This Is Important

Partner ecosystem management platforms change the traditional indirect sales market, which commonly relies on partner portal functionalities. It enables all stakeholders to open up data sources for collaboration and exchange with multiple parties within the ecosystem with the necessary security applied — across one virtual environment. It is seeing higher demand, as it provides alternatives to PRMs and is not limited to the use case of improved collaboration with an organization's resellers.

Business Impact

Partner ecosystem management platforms allow vendors and partners to enable a new level of collaborative decision making and execution efficiency. Users can interact with any type of content and present it on one application across all stakeholders. These platforms enable working with each party's data in one core application based on the common virtual platform. They also support indirect selling, co-selling models and alliance management strategies.

Drivers

- During the next three to five years, new capabilities being added to the partner ecosystem management platform will allow additional business activities to be performed, such as real-time insights and comprehensive business analytics.
- Some vendors in this space provide additional capabilities such as business planning support, marketing distribution funds (MDFs) management, marketing functionalities and partner learning features.
- The use cases of partner ecosystem management platforms are expanding far beyond the indirect sales or resell use cases by also allowing for co-selling, co-marketing, referral management and promotions of the community.

Obstacles

- Partner ecosystem management platforms provide the infrastructure for collaboration in the first place, while partner relationship management (PRM) apps are managing tasks, mostly operated at a 1:1 level. Organizations wanting to collaborate on more resell opportunities with their partners should use a combination of partner ecosystem management platforms and PRM investments.
- Capabilities for performing business activities like real-time insights and comprehensive business analytics are not currently available. These capabilities are expected to be added as partner ecosystem management platforms develop further during the next three to five years.

User Recommendations

- Assess partner ecosystem management platforms for their ability to support sales activities between providers and sales partners, especially by making it easy to share the wealth of unstructured and structured data available, without custom coding and complex data models.
- Compose an indirect technology stack by integrating existing PRM app investments into the partner ecosystem management platform.

Sample Vendors

360insights; ChannelXperts; Crossbeam; Impartner; Mindmatrix; PartnerStack; Pronto; Vartopia; WorkSpan

Gartner Recommended Reading

Market Guide for Partner Relationship Management Applications

Tool: Partner Relationship Management Vendor Evaluator

Emerging Tech: Strengthen Your Marketplace Through Proactive Partner Identification and Recruiting

Top Tech Provider Trend for 2023: Co-innovation Ecosystems

Research Connections: How Ecosystem Community Sites Can Help Buyers Map Solutions to Targeted Outcomes

Self-Integrating Applications

Analysis By: Keith Guttridge

Benefit Rating: Transformational

Market Penetration: Less than 1% of target audience

Maturity: Embryonic

Definition:

Self-integrating applications will use a combination of automated service discovery, metadata extraction and mapping, automated process definition, and automated dependency mapping to enable applications and services to integrate themselves into an existing application portfolio with minimal human interaction.

Why This Is Important

Integrating new applications and services into an application portfolio is complex and expensive. Gartner research shows that up to 65% of the cost of implementing a new ERP or CRM system is attributable to integration. The technology for enabling applications to self-integrate exists in pockets, but no vendor has yet combined all the elements successfully. As applications develop the ability to discover and connect to each other, the amount of basic integration work will dramatically reduce.

Business Impact

Self-integrating applications can:

- Improve agility, as the time to onboard applications and services is massively shortened.
- Cut costs by up to 65% when onboarding new applications and services.
- Reduce vendor lock-in, as platform migration becomes simpler.
- Improve the ability to focus on differentiation and transformational initiatives, as the “keeping-the-lights-on” burden is dramatically reduced.

Drivers

- Cloud hyperscalers provide features such as service discovery, metadata extraction, intelligent document processing and natural language processing.
- Automation or integration vendors provide features such as intelligent data mapping, metadata extraction, next-best-action recommendations, process discovery and automated decision making.
- SaaS vendors provide features such as process automation, packaged integration processes, portfolio discovery and platform composability.
- In the new era, intelligent application portfolio management is placed on top of augmented integration platforms in order to properly address the challenge.
- Generative AI simplifies the build process to create integration processes.

Obstacles

- Embedded integration features within SaaS are good enough to enable organizations to get started quickly, thus stalling investment in improving self-integration capabilities.
- Generally, organizations are not well aware of the availability of augmented integration technologies for enabling self-integrating applications. Many organizations still view integration as a complex issue requiring specialist tools.
- There is not a clear market leader that is looking to push this technology forward as the major application vendors look to protect their customer bases.
- Complex scenarios across multiple datasets and service interfaces are too challenging for the current technology. Organizations place too much trust in the solution to do the right thing. Ownership and visibility of the integrations might become contentions within the organizations.

User Recommendations

Software engineering leaders responsible for integration should:

- Ask your major application vendors about the interoperability of applications within their portfolios. This is the area where self-integrating applications are most likely to emerge first.

- Investigate integration vendors that have augmented artificial intelligence features to automate the process of onboarding applications and services into a portfolio.
- Manage your expectations for ease of integration. Self-integrating applications will provide just enough integration with the rest of the application portfolio to enable a new application to work efficiently.
- Keep track of governance capabilities. Who can authorize access? Has the appropriate observability been established? Is everything fully audited? Does something need to change? An organization's integration landscape is an ever-evolving environment, and each integration has a life cycle that needs to be maintained.

Sample Vendors

Boomi; IBM; Microsoft; Oracle; Salesforce; SAP; SnapLogic; Tray.io; Workato

Machine Customers

Analysis By: Don Scheibenreif, Mark Raskino

Benefit Rating: High

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Definition:

Machine customers are nonhuman economic actors that obtain goods or services in exchange for payment. Examples of machine customers include virtual personal assistants, smart appliances, connected cars and Internet of Things (IoT)-enabled factory equipment. Machine customers act on behalf of a human customer or an organization.

Why This Is Important

Currently, there are more internet-connected machines with the potential to act as customers than humans on the planet. We expect the number of machine customers, such as virtual assistants with AI capabilities, to rise over time steadily. Machines are increasingly gaining the capacity to buy, sell and request services. Further, machine customers will advance beyond the role of simple informers to advisors and, ultimately, decision makers.

Business Impact

Over time, trillions of dollars are expected to be in control of nonhuman customers. This will result in new opportunities for revenue, efficiencies and managing customer relationships. Leaders seeking new growth must reimagine their operating and business models to take advantage of this emerging market of billions of machine customers. Organizations that miss this opportunity will be marginalized, just like those retailers who missed the digital commerce wave.

Drivers

- In the next few years, machine customers are expected to become significant players in the retail and consumer industry.
- In the forthcoming years, billions of connected products might have the potential to behave as customers — that is, to shop for services and supplies for themselves and their owners.
- Currently, most machines merely inform or make simple recommendations. However, some machines are emerging as more complex customers. For example, HP Instant Ink is a service that enables connected printers to automatically order their own ink when supplies run low. Also, some Tesla cars already order their own spare parts and Amazon offers its Dash Replenishment Service for a variety of household appliances. Advances in generative AI, and applications like ChatGPT, will accelerate the development and deployment of machine customers. These tools can diagnose and break down complex tasks to make the right recommendations, service requests and other functions.
- In B2B, Datapred uses machine learning (ML) to recommend optimized purchasing strategies and generate related financial risk reports based on commodity, raw material price predictions and organization-specific internal constraints. For example, in the future, an autonomous vehicle could determine what parking garage to take its human passengers to. This decision would be based on criteria such as distance from destination, price, online review score, parking space dimensions and valet options.
- Machine customers have the potential to generate new revenue opportunities, increase productivity and efficiency, improve health and well-being, and enhance the security of physical assets and people.

Obstacles

Machine customers across industries may not reach the Plateau of Productivity for the next 10 years because of:

- **Operating models:** Marketing, selling and serving a machine customer will upend your operating model. A new definition of customer experience (CX) for a machine customer will be needed.
- **Lack of trust:** Humans may not trust the machine customer technology they use to predict, execute and maintain privacy accurately. Conversely, machine customers may not trust the supplier organization to do the same.
- **Fear of machines:** Some humans may initially be uneasy about delegating purchasing functions to machines. Organizations must consider what ethical standards, legal compliance, fraud and risk mitigation are needed to operate in a world of machine customers.

User Recommendations

- Identify specific use cases where your products and services can be extended to machine customers. Initiate collaboration with your chief digital officer, chief data officer, chief strategy officer (CSO), sales leaders and chief customer officer (CCO) to explore the business potential of machine customers.
- Pilot the ideas compiled during the identification of use cases to understand the technologies, processes and skills required to implement machine customers adequately.
- Build your organization's capabilities around digital commerce and AI, especially generative AI, for the next few years. Use APIs and enterprise bots to enable machine customers for low-complexity transactions. Then, extend your organization's capabilities to other facets involved in machine customers processing information to make informed decisions and perform purchase transactions. Alternatively, join other platforms with these capabilities if you don't have the resources to build them yourself.
- Follow examples from organizations such as Amazon, AutoGPT, Google, HP Inc. and Tesla for evidence of capabilities and business model impact.

Sample Vendors

Amazon; Datapred; Google; HP Inc.; Significant Gravitas; Tesla

Gartner Recommended Reading

Why Machine Customers May Be Better Than Human Customers

CIOs Can Maximize Product Lifetime Value by Embracing Machine Customers

Infographic: A Day in Your Life in a World of Machine Customers

Podcast: When Machines Become Customers

Human-Centered AI

Analysis By: Svetlana Sicular

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Human-centered AI (HCAI) is a design principle calling for AI to benefit people and society. It assumes a partnership model of people and AI working together to enhance cognitive performance, including learning, decision making and new experiences. HCAI is sometimes referred to as “human in the loop,” “augmented intelligence” or “centaur intelligence,” but in a wider sense, even a fully automated system must have human benefits as a goal.

Why This Is Important

HCAI, when AI serves human and societal goals, continues to emerge as a design approach to deliver the most value from AI. An early idea that AI is simply a neutral technology is passing. Organizations see that HCAI allows them to manage the AI risks, and to be ethical and more efficient with automation, while complementing AI with a human touch that balances common sense. Many AI vendors have also shifted their positions to the more impactful and responsible HCAI approach.

Business Impact

HCAI compensates for human limitations and expands the possibilities for AI in the following key scenarios:

- Certain job tasks are done by AI, and the rest are done by people.
- People complete the job started with AI when AI reaches the limits of its capabilities or resources.
- Assistive AI develops and expands people's skills and talents.
- Innovation when neither AI nor people can accomplish the task without each other.
- Fully automated or autonomous systems where humans have an override capacity.

Drivers

- AI solutions must support human goals and objectives. This includes nonhuman, beneficial to people, ways of optimizing a process or solving a problem in order to arrive at new and different results, taking advantage of machine learning working differently from human learning.
- People are the ones who adopt AI (they can sabotage it too). It is human nature to use what we like, understand and trust. AI can remove many avoidable limitations, biases and blind spots. However, there are many intrinsically human irrationalities that we admire and want to preserve as a society. People do not want to be treated as robots. These people are your employees and your customers, and they are the key to AI adoption.
- More organizations are turning to the HCAI approach where they lead an ongoing discussion about what's right and wrong to do with AI before and during the progress of AI projects.
- HCAI is an intentional approach that questions and validates AI optimization goals. AI systems that solely focus on optimizing for a single business metric, like making customers click on the next news item or video, lead to dangerous societal outcomes and damage reputation in the eyes of customers, partners and employees.
- AI is probabilistic: It means that AI's mistakes are unavoidable. AI-related opportunities promise to do what only people could do in the past — diagnose diseases, play games and maintain cogent conversations. Some results could be (egregiously) incorrect, although most of them are amazingly accurate. AI mistakes without a human in the loop lead to unintended consequences.
- People's flexibility compensates for automation's limitations. Properly orchestrated autonomy makes AI impactful, for example, when AI substitutes a human in harsh working conditions. But unattended automation may lead to a misappropriation of investment and often presents insurmountable complexity.

Obstacles

- Many data science and AI teams include technical reviews for AI projects, while the resulting human impact might invalidate the entire project.
- AI systems often make decisions and take actions, but miss a feedback loop or include it as an afterthought. This doesn't mean that a human must validate every single decision, but there must always be a review and an override possibility to mitigate unintended consequences. For example, autonomous vehicle design is centered on human safety and always includes a possibility of giving control to a human driver.
- It is hard to define what AI solution is socially beneficial and human-centered. Not everything that is socially beneficial is human-centered — for instance, a social credit system.
- Anthropomorphizing AI does not mean it is human-centered. For example, virtual assistants might not give users enough understanding and control over AI-enabled answers, thus impairing AI adoption.

User Recommendations

- Establish HCAI as a key principle and a design approach. Always determine who will benefit from an AI solution. Implement AI to focus human attention where it is most needed in order to accelerate organizational competencies that fulfill your vision for digital transformation.
- Create an AI oversight board that reviews your AI plans from the HCAI position as part of its charter. Make AI goals explicit and a decision process about AI planning and validation transparent. Ensure all people can voice their concerns.
- Ensure human safety — for example, for AI moderation in social media.
- Include user experience design to facilitate HCAI. This design could be abstract (software, services, digital) or in the physical space (physical robots).
- Maximize the effects of AI-augmented roles via ongoing education, experience labs, AI-enabled just-in-time training and other methods, so the company, ecosystem and the entire society can take on more exceptional and forward-looking work.

Gartner Recommended Reading

AI Ethics: Use 5 Common Principles as Your Starting Point

Activate Responsible AI Principles Using Human-Centered Design Techniques

Building a Digital Future: Emergent AI Trends

At the Peak

Design Systems

Analysis By: Will Grant, Brent Stewart

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Design systems are collections of reusable assets that are based on clear visual, user interfaces and technical standards. They serve as building blocks to quickly and consistently design and develop digital products. Organizations can deliver better user experience for customers and reduce development effort, while preparing to leverage emerging generative AI technologies. A complete design system is composed of: style assets, structural assets, code components and documentation.

Why This Is Important

Using a design system is one of the most effective ways of ensuring design consistency across digital product offerings. Building a design system into your software development process contributes to increased brand consistency, better user experiences and higher front-end developer productivity. Popular SaaS platforms — including Salesforce and SAP — maintain their own design systems to facilitate application design and development on their platforms.

Business Impact

A design system is one of the most important strategic assets for an organization that builds and configures digital products. A robust design system that is resourced and maintained well will drastically shorten design and development timelines. It will ensure the user interface (UI) design is consistent, predictable and usable, and guarantee brand compliance across an organization's full portfolio of digital products both customer and employee facing.

Drivers

- **Speed:** Design systems drastically reduce the time required to design and code the presentation layer of software by reducing the need to repeatedly design from a blank template. Design systems enable easy component assembly and fast screen design tweaks that allow designers to work at pace.
- **Usability:** Design systems are typically composed of time-tested, proven UI design patterns that are familiar to most users. Foundational UI design heuristics, such as "visibility of system status" or "recognition rather than recall" are built into these patterns.
- **Consistency:** Design systems enable the creation of consistent user experiences across disparate teams, whether they are feature teams delivering into a single product or multiple product teams sharing a design system across a larger product portfolio.
- **Scale:** Design systems make it easy for designers and developers to share common, approved design assets and code components across an entire portfolio of digital products, and to work independently using the same assets.
- **Reduction of defects:** Over time, design system code components become "hardened," leading to far fewer production defects in the presentation layer.
- **Brand compliance:** Design systems reinforce a brand identity and infuse key elements such as color and typography into every single design and code asset.
- **Accessibility:** Design system assets can be created in compliance with the latest Web Content Accessibility Guidelines (WCAG), eliminating unnecessary rework downstream.
- **AI-Ready:** Looking forward to emerging generative AI tools, a codified design system will be essential to enable generative AI to work with your in-house style.

Obstacles

- **Effort to create and maintain:** While design systems bring many benefits, they need to be resourced and maintained like any other internal product.
- **Lack of governance:** Without a clear process to update and encourage the use of a design system, it quickly becomes outdated and less impactful.
- **Cross-discipline buy-in:** Without the whole software engineering team getting behind a design system, there's a risk that *several* ad-hoc design systems emerge, multiplying effort and reducing impact.

- **Executive buy-in:** Few executive leaders outside of the design field are aware of the strategic importance and tremendous business value of design systems. Without strong leadership support, design systems easily become underutilized and diminished in terms of the value they add.
- **Originality:** Many UX practitioners are concerned that their designs will become too uniform and lack originality. This fear is generally unfounded as a well-implemented design system will still look and feel unique, while enhancing usability.

User Recommendations

- Conduct a regular review of available design systems by auditing leading examples.
- Assemble a team including UX, product development and product marketing to gather, organize, define and launch an enterprisewide design system, like an internal product.
- Don't start a new design system from scratch unless you're prepared for a significant multiyear investment to catch up with established systems.
- Update design and development processes to mandate the use of the design system rather than starting from scratch for new initiatives.
- Document your design system with style guides, technical component documentation, usage guides and accessibility considerations.
- Set up a structure of governance and stewardship to treat the design system as a vital internal product, with a backlog, roadmap and dedicated resource.
- Consider design system solutions that support design tokens and reusable components to enable the operationalization of your design system, and its readiness for AI-augmented design tools in the future.

Sample Vendors

Figma; Google; IBM; Knapsack; Sketch; Storybook; UXPin; zeroheight

Gartner Recommended Reading

Start Using Design Systems, Accelerate Digital Product Delivery

Predicts 2022: Generative AI Is Poised to Revolutionize Digital Product Development

How Design, Development and Product Management Can Work Together Successfully

The 4 Secrets of Design-Led Companies

How to Build a User Experience Team

Emotion AI

Analysis By: Annette Zimmermann

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Emotion artificial intelligence (AI) technologies (also called affective computing) use AI techniques to analyze the emotional state of a user (via computer vision, audio/voice input, sensors and/or software logic). Emotion AI can initiate responses by performing specific, personalized actions to fit the mood of the customer.

Why This Is Important

Emotion AI is considered transformational as it turns human behavioral attributes into data that will have a large impact on human-machine interface (HMI). Machines will become more “humanized” as they can detect sentiments in many different contexts. Furthermore, applying deep learning to computer vision or audio-based systems to analyze emotions in real time has spawned new use cases for customer experience enhancements, employee wellness and many other areas.

Business Impact

Contact centers use voice analysis and natural language processing (NLP)-based algorithms to detect emotions in voice conversations, in personal chat conversations and chatbots. Computer vision (CV)-based emotion AI has already been used for more than a decade in market research with neuromarketing platforms that test users’ reactions toward products. In addition, we see the technology expanding to other verticals and use cases, i.e., healthcare (diagnostic), sales enablement and employee wellness.

Drivers

The increasing number of use cases we have identified indicates an increase in commercialization as emotion AI finds applicability in new domains:

- One of the drivers for detecting emotions/states is the need for a system to act more sympathetically. For instance, it creates anthropomorphic qualities for personal assistant robots (PARs) and virtual beings, making them appear more “human.” This “emotional capability” is an important element in enhancing the communication and interaction between users and a PAR.
- This can be an empathic avatar or an emotion-detection-enabled chatbot. A person’s daily behavior, communication and decisions are based on emotions — our nonverbal responses in a one-to-one communication are an inseparable element from our dialogues and need to be considered in the human-machine interface (HMI) concept.
- Combinatorial technology solutions such as computer-vision-based and audio analytics, or language-based and computer vision, enable customer experience enhancements.
- Strongest adoption is currently happening in the context of contact centers where voice-based emotion analysis supports multiple use cases such as real-time analysis on voice conversations, emotion detection in chat conversations, emotional chatbots and more.
- Market research and neuromarketing tools are continuously leveraging emotion detection in various user scenarios including focus groups and product testing. Vendors have been extending their offerings toward remote/online interviews during 2020 — due to the pandemic.
- In the creation of virtual beings in customer service or other consumer-facing scenarios, emotional responses are a critical element.
- As the metaverse unfolds, virtual beings will play an important role as business models evolve and the entire ecosystem of this new digital world emerges.

Obstacles

- Privacy concerns are the main obstacle to rapid adoption in the enterprise. This is especially a concern in real-life situations (vs. lab/research environments) for both consumer-facing (e.g., monitoring emotions in a retail environment via cameras) and employee-facing situations. Research environments like product testing have the advantage that the emotion AI is used for this specific purpose and the user (product tester) is fully aware that their emotions are being captured to improve usability or other features.
- Bias: When using facial expression analysis, models are likely to be retrained in different geographies to get the system to detect the different nuances present due to different cultural backgrounds.
- Variation across modalities. Certain emotions can be better detected with one technology mode than with another. For instance, “irony” can be detected using voice-based analysis while this is close to impossible to detect with facial expression analysis.

User Recommendations

- Review vendors’ capabilities and reference cases carefully. As the market is currently very immature, most vendors are focused on two or three use cases in two or three industries. At the same time, identifying and processing human emotion is currently a gray area, especially in the EU. The EU Commission has started an initiative to review the ethical aspects of AI technologies, and emotion AI will certainly be part of this debate.
- Enhance your customer analytics and behavioral profiling by applying emotion AI technologies bringing your customer experience strategy to the next level.
- Be use-case-driven. The use case will determine the emotion AI technology to be used and vendor selection.
- Appoint responsibility for data privacy in your organization — a chief data privacy officer or equivalent.
- Work with your vendor on change management in order to avoid user backlash due to sensitive data being collected.

Sample Vendors

Behavioral Signals; Cogito; DAVI; Intelligent Voice; kama.ai; MorphCast; Soul Machines; Superceed; Symanto; Uniphore

Gartner Recommended Reading

Competitive Landscape: Emotion AI Technologies

Emerging Tech: Computer Vision, Voice Analysis and CGI Evolve Into Emotionally Intelligent Virtual Beings

Tool: Vendor Identification for Natural Language Technologies

Generative AI

Analysis By: Svetlana Sicular, Brian Burke

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

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 exploration is accelerating, thanks to the popularity of Stable Diffusion, Midjourney, ChatGPT and large language models. End-user organizations in most industries aggressively experiment with generative AI. Technology vendors form generative AI groups to prioritize delivery of generative-AI-enabled applications and tools. Numerous startups have emerged in 2023 to innovate with generative AI, and we expect this to grow. Some governments are evaluating the impacts of generative AI and preparing to introduce regulations.

Business Impact

Most technology products and services will incorporate generative AI capabilities in the next 12 months, introducing conversational ways of creating and communicating with technologies, leading to their democratization. Generative AI will progress rapidly in industry verticals, scientific discovery and technology commercialization. Sadly, it will also become a security and societal threat when used for nefarious purposes. Responsible AI, trust and security will be necessary for safe exploitation of generative AI.

Drivers

- The hype around generative AI is accelerating. Currently, ChatGPT is the most hyped technology. It relies on generative foundation models, also called “transformers.”
- New foundation models and their new versions, sizes and capabilities are rapidly coming to market. Transformers keep making an impact on language, images, molecular design and computer code generation. They can combine concepts, attributes and styles, creating original images, video and art from a text description or translating audio to different voices and languages.
- Generative adversarial networks, variational autoencoders, autoregressive models and zero-/one-/few-shot learning have been rapidly improving generative modeling while reducing the need for training data.
- Machine learning (ML) and natural language processing platforms are adding generative AI capabilities for reusability of generative models, making them accessible to AI teams.
- Industry applications of generative AI are growing. In healthcare, generative AI creates medical images that depict disease development. In consumer goods, it generates catalogs. In e-commerce, it helps customers “try on” makeup and outfits. In manufacturing, quality inspection uses synthetic data. In semiconductors, generative AI accelerates chip design. Life sciences companies apply generative AI to speed up drug development. Generative AI helps innovate product development through digital twins. It helps create new materials targeting specific properties to optimize catalysts, agrochemicals, fragrances and flavors.
- Generative AI reaches creative work in marketing, design, music, architecture and content. Content creation and improvement in text, images, video and sound enable personalized copywriting, noise cancellation and visual effects in videoconferencing.
- Synthetic data draws enterprises’ attention by helping to augment scarce data, mitigate bias or preserve data privacy. It boosts the accuracy of brain tumor surgery.
- Generative AI will disrupt software coding. Combined with development automation techniques, it can automate up to 30% of the programmers’ work.

Obstacles

- Democratization of generative AI uncovers new ethical and societal concerns. Government regulations may hinder generative AI research. Governments are currently soliciting input on AI safety measures.
- Hallucinations, factual errors, bias, a black-box nature and inexperience with a full AI life cycle preclude the use of generative AI for critical use cases.
- Reproducing generative AI results and finding references for information produced by general-purpose LLMs will be challenging in the near term.
- Low awareness of generative AI among security professionals causes incidents that could undermine generative AI adoption.
- Some vendors will use generative AI terminology to sell subpar “generative AI” solutions.
- Generative AI can be used for many nefarious purposes. Full and accurate detection of generated content, such as deepfakes, will remain challenging or impossible.
- The compute resources for training large, general-purpose foundation models are heavy and not affordable to most enterprises.
- Sustainability concerns about high energy consumption for training generative models are rising.

User Recommendations

- Identify initial use cases where you can improve your solutions with generative AI by relying on purchased capabilities or partnering with specialists. Consult vendor roadmaps to avoid developing similar solutions in-house.
- Pilot ML-powered coding assistants, with an eye toward fast rollouts, to maximize developer productivity.
- Use synthetic data to accelerate the development cycle and lessen regulatory concerns.
- Quantify the advantages and limitations of generative AI. Supply generative AI guidelines, as it requires skills, funds and caution. Weigh technical capabilities with ethical factors. Beware of subpar offerings that exploit the current hype.
- Mitigate generative AI risks by working with legal, security and fraud experts. Technical, institutional and political interventions will be necessary to fight AI's adversarial impacts. Start with data security guidelines.
- Optimize the cost and efficiency of AI solutions by employing composite AI approaches to combine generative AI with other AI techniques.

Sample Vendors

Adobe; Amazon; Anthropic; Google; Grammarly; Hugging Face; Huma.AI; Microsoft; OpenAI; Schrödinger

Gartner Recommended Reading

Innovation Insight for Generative AI

Emerging Tech Roundup: ChatGPT Hype Fuels Urgency for Advancing Conversational AI and Generative AI

Emerging Tech: Venture Capital Growth Insights for Generative AI

Emerging Tech: Generative AI Needs Focus on Accuracy and Veracity to Ensure Widespread B2B Adoption

ChatGPT Research Highlights

Superapps

Analysis By: Jason Wong

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

Definition:

A superapp is a mobile app that provides end users (e.g., customers, partners or employees) with a set of core features, as well as access to independently created miniapps. The superapp is an open platform to deliver a miniapps ecosystem. Users can choose miniapps from this ecosystem to activate for consistent and personalized app experiences. There is no separate app store or marketplace for miniapps; instead, superapp users discover, activate and deactivate miniapps in the superapp.

Why This Is Important

Users demand mobile-first experiences that are powerful and easy to use. Superapps have expanded outside China and South Asia to India (e.g., Tata Neu, MyJio and Paytm); Latin America (e.g., Rappi, PicPay, Mercado Libre); and the Middle East/Africa (e.g., M-PESA, Careem and Yassir). The superapp concept is rapidly expanding to employee-facing use cases, such as frontline workers, and employee communications and engagement, such as Walmart's me@Walmart and Wipro's MyWipro apps.

Business Impact

Organizations can create superapps to consolidate multiple mobile apps or related services that reduce user experience (UX) friction (such as context switching) and development effort. Superapps can achieve economies of scale and leverage the network effect of a larger user base and multiple providers. Superapps provide a more-engaging experience for their customers, partners or employees. They improve UX by enabling users to activate their own toolboxes of miniapps and services.

Drivers

- Superapps are gaining interest from forward-thinking organizations that embrace composable application and architecture strategies to power new digital business opportunities in their industries or adjacent markets.
- Superapps are growing beyond mobile apps for consumer use cases. Frontline and remote work trends are driving the evolution of employee communications apps into workforce superapps through the addition of plug-ins for HR, payroll, shift management and other miniapp functions.
- The superapp concept is expanding into enterprise software as a service (SaaS) applications and tools, such as workflow, collaboration and messaging platforms (e.g., Slack and Microsoft Teams, which already have a large number of add-on apps to their main applications). Superapps are starting to expand to support a wide range of modalities, including chatbots, Internet of Things (IoT) technologies and immersive experiences.
- To achieve agility and digital transformation, a superapp advances the concept of a composite application that aggregates services, features and functions into a single app. Multiple internal development teams and external partners can provide discrete services to users by building and deploying modular miniapps to the superapp. This development ecosystem also amplifies the superapp's value, by providing convenient access to a broader range of services in the app.

Obstacles

- There are numerous technical ways to build a superapp, but creating the business ecosystem can become a bigger challenge than technology implementation. A superapp serves as a platform for internally developed miniapps across the business and for third-party, externally developed miniapps. Business partners are needed to create an extended ecosystem for monetization by deploying miniapps to an established user base.
- Another obstacle is getting the UX design of a superapp right for the audience, and also having consistency of the miniapps published to the superapp. Different user personas prefer to interact differently with miniapps — for example, some prefer single, task-focused miniapps versus others preferring everything at their fingertips. Inconsistent UX patterns in a superapp could negatively affect adoption and retention.
- Data sharing could be complex, including simple user authentication, such as single sign-on (SSO), and tracking user preferences or app usage history.

User Recommendations

- Educate partners on the innovations and business value a superapp strategy can drive to improve or consolidate mobile apps.
- Ensure that there is a sound business model and organizational structure to support the distributed development ecosystem for miniapps.
- Secure executive sponsorship by preparing the partnership strategy and financial case for funding as a digital business initiative.
- Identify core features in your superapp (e.g., commerce, communications or collaboration) that will drive a critical mass of adopters and create interest on the part of developers to serve those users
- Offer an easy developer experience and convenient developer tools (e.g., APIs, design guidelines, software development kits [SDKs] and frameworks) for partners to build, test, register and submit miniapps for potential monetization.
- Define security and data protection needs by establishing governance reinforced with common platform implementation to satisfy security and data protection constraints.

Sample Vendors

Alipay; DingTalk GeneXus; Ionic; KOBIL; LINE; Microsoft; PayPay; Paytm; Slack; WeChat

Gartner Recommended Reading

Quick Answer: What Is a Superapp?

Quick Answer: How Does a Superapp Benefit the Digital Employee Experience?

How Banks Can Take On Super-Apps

Top Strategic Technology Trends for 2023: Superapps

Innovation Ecosystems

Analysis By: Daniel Sun, Tsuneo Fujiwara, Nick Jones

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

An innovation ecosystem is an interconnected network of entities that co-evolve capabilities around a shared set of technologies, knowledge or skills, and work cooperatively and competitively to develop new products, services and seamless customer experience to create value.

Why This Is Important

Many digital business models are ecosystem-oriented, such as smart cities, healthcare, smart homes and agriculture. Innovations in such areas often use ecosystems, especially when an individual organization might lack the skills, resources or information to fully develop an idea. Such ecosystems can span startups, academics, vendors and competitors. For example, healthcare ecosystems could involve parties as diverse as academics, insurance companies, physicians and pharmaceutical manufacturers.

Business Impact

Facing economic headwinds, companies must be smarter with their innovation efforts. They must spend less and act faster than competitors. Innovation ecosystems are a good option since they:

- Accelerate ideation, experimentation and collaboration.
- Reduce time to market.
- Share investment costs and the risk of innovation bets.
- Provide broader evidence of customer pain points and opportunities.
- Enable innovations that could not be achieved by an organization acting on its own.

Drivers

- Lack of a portfolio of capabilities and expertise often required for combinatorial innovations involving multiple technologies.
- Growth in ecosystem-oriented business models involving many collaborating participants.
- A need to reduce the cost and risk of complex innovations.
- A need to access a larger pool of ideas to drive innovation.
- A need to reduce time to market for complex innovations.
- A need to access a larger pool of information and insights than from within one enterprise.

Obstacles

Obstacles to innovation ecosystems are mostly related to the challenges of managing relationships and collaboration between organizations with different goals and cultures. These include:

- Management and ownership of co-created intellectual property.
- Allocation and distribution of funding and benefits.
- Culture clashes among the participants.

- Internally focused mindset at some organizations that prefer to go alone.
- The challenge of defining a clear operating model and legal basis for collaboration.
- Shift in mindset to reflect the fact that profits are shared across multiple participants.

User Recommendations

Consider innovation ecosystems as a component of their overall innovation strategy to be used when:

- Conducting any innovation activity as part of your innovation strategy that could benefit from an external perspective, such as when evaluating vendors or tracking startups.
- Exploiting an innovation that demands an ecosystem business and operating model.
- Lacking the expertise, market information or funding at the organization to develop an idea alone, or wanting to spread the risks associated with innovation more widely.

Leverage innovation ecosystems fully for digital success by:

- Constructing the “DNA” of innovation ecosystems, which includes the value exchange, diverse partners, shared capabilities and rules of engagement.
- Evolving their innovation ecosystems by continuously managing, measuring, monitoring and improving their performance.

Gartner Recommended Reading

Innovation Ecosystems Are the Right Way to Innovate in a Downturn

A Visual Guide to Digital Ecosystems

Digital Twin of a Citizen

Analysis By: Milly Xiang, Alfonso Velosa

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

A digital twin of a citizen (DToC) is a technology-enabled proxy that mirrors the state of a person. National, state and local governments use DToC to support citizen services such as health or safety management. Its elements are the model, data, a unique one-to-one association and the ability to monitor it. It integrates data into the DToC from siloed sources such as health records, credit scores, phone logs, criminal records, customer 360 records, and sensors such as cameras.

Why This Is Important

Governments are developing DToCs to address health, safety, environment, travel and contextualized social media impacts on society. The spectrum of the complexity of the models and tools can help governments make better decisions for monitoring and supporting constituents, such as patients, prisoners, passengers or the elderly. The Chinese government has been building and improving its social credit scoring methodology. Aggregated DToCs can help map broad patterns and drive resource allocation.

Business Impact

Governments can use DToC to better orchestrate personalized services and manage crises, for example, modulate climate crisis against human loss. Aggregated data can help citizens expedite government services, especially in smart city environments. Citizens or governments can drive DToC-based crowdsourcing analysis that mirrors reality to assess government services in real time. Governments can integrate services into systems such as passport control, social credit system and shopper tracking solutions.

Drivers

- The Chinese government is gradually improving and optimizing regulatory and organizational foundations. Examples include Data Security Law of the People's Republic of China, Personal Information Protection Law of the People's Republic of China, and the upcoming National Data Bureau, to promote secure and controllable data exchange across public and private sectors.
- There is an increasing proliferation of both structured and close-to-structured data on creating digital citizen journey maps.
- Increased integration of government, financial and commercial systems, and interest in creating citizen 360 models are driving pilots of DToC in multiple areas.
- Citizens' interest in improved health and safety systems is increasing. And the need for proactive, real-time, personalized government services customized to citizens (for example, for emergency medical services) and longer-term, more complex solutions that serve elderly patients or inmates is driving investment from a broad range of government organizations. Some examples include solutions to monitor elderly patients using IoT-enabled trackers, smart camera monitoring systems that track a specific police officer, or inmate tracking solutions under home arrest.
- The flexibility of digital twin models from simple to complex models, and the ability to integrate data from siloed services, enable government agencies to build out citizen services to serve individuals as well as the public at large.

Obstacles

- Concerns around privacy and government access to citizen data are leading to citizen concerns and pushback.
- High costs for DToC projects inhibit scaled deployment, especially with a lack of commensurate benefits to citizens or government agencies.
- Conflicting government agencies' objectives, political infighting on data rights, and incompatible regulation on the use of citizen data and on how to respect rights to privacy.
- Incompatible systems across government, commercial and healthcare silos, driving high costs for data governance, integration and analytics, affecting incident handling efficiency and limiting communication.
- Lack of skills to drive the use of the citizen twin and knowledge on possible use cases in government agencies slow down adoption.
- There is an overall low awareness of DToC by government organizations and urban partners, in terms of how a DToC approach can be built and used in an effective manner.

User Recommendations

- Establish clear benefits for the government agency(ies) to justify not just the cost of developing the DToC, but also of changing the culture and adapting processes to the new data.
- Establish clear benefits to citizens such as shortening passport control lines, simplifying access to medical care, or aligning payments from citizens for use of a toll road.
- Test and validate acceptance by the public by communicating the DToC offering and its benefits.
- Build robust privacy and digital ethics policies that clarify what data is collected, who has access to it, how it is protected, and citizen remediation processes.
- Test IoT sensor and analytics capability to ensure accuracy and validity for the physical part of a DToC.
- Invest in integration skills to connect into a heterogeneous set of applications and data sources and critical incident handling.
- Build data exchanges to protect data, while enhancing the granularity of citizen data used to drive government services.

Sample Vendors

Alibaba Cloud; Apple; Google; Taiji Computer; Tencent; Vantiq; ZKBRAIN

Gartner Recommended Reading

Market Insights: Unique Regional Dynamics Require Tailored Strategies for Smart Cities in Asia

Life Cycle Management of Software-Defined Vehicles: Step 3 — Vehicle Digital Twin 2.0

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

Emerging Tech: Tech Innovators for Digital Twins — Digital Business Units

Sliding into the Trough

Multiexperience

Analysis By: Tigran Egiazarov

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Multiexperience (MX) describes interactions that take place across a variety of digital touchpoints (i.e., web, mobile apps, conversational apps, AR, VR and wearables), using a combination of interaction modalities in support of a seamless and consistent digital user journey. Modalities include text, voice, vision and gesture. Multiexperience is part of a long-term shift from the individual computers that we use today to a multidevice, multisensory and multilocation ambient computing experience.

Why This Is Important

Through 2030, the digital user experience (UX) will undergo a significant shift in terms of how consumers, partners, citizens and employees experience their environments. MX represents a shift in both UX perception and interaction models — creating a multisensory, multidevice, multilocation and multitouchpoint digital journey for the user.

Business Impact

To achieve digital business transformation, it is essential to understand and exploit multiexperience. Applying multiexperience design to digital experiences removes friction and effort for the users — both customers and employees. MX delivers positive business outcomes by serving customers and employees in ways that best suit their needs and expectations. Adopting MX enables optimization and reuse of business capabilities, implementation components and data.

Drivers

- Organizations are shifting their delivery models from projects to products, but beyond products is the experience — the collection of feelings, emotions and memories. Web and mobile apps are already commonplace, but they are undergoing UX changes driven by new capabilities like progressive web apps, WebXR and artificial intelligence (AI) services. Conversational platforms, powered by Generative AI such as ChatGPT, allow people to interact more naturally and effortlessly with the digital world. Reinforced by hardware innovations and AI, immersive technologies such as virtual reality (VR), augmented reality (AR), mixed reality (MR) and the metaverse are changing the way people interact with and perceive the physical-digital world.
- As organizations continue to invest in customer experience (CX) and employee experience (EX), they will need to apply MX front-end architecture and technology strategies to be more agile at serving business needs and user expectations. When MX discipline is applied with great UX in support of CX and EX strategies, total experience (TX) transformation is achieved. TX requires MX to be executed with CX, EX and UX in harmony and synchronicity.
- The long-term manifestation of MX is a composable digital experience that is adaptive, seamless, collaborative, consistent, personalized and ambient. Design and architecture patterns, such as micro-front-ends, backends for frontends and superapps are important enablers.
- Greater availability of development technologies to build for multiexperience more easily, including multiexperience development platforms, digital experience platforms and cross-platform frameworks (i.e., Flutter, .NET MAUI, React Native, Vue Native).

Obstacles

- Privacy and security concerns may dampen the enthusiasm and impact of MX adoption. Multiple devices or digital touchpoints with different levels of security capabilities will increase risk of security breaches.
- On the technical front, the fragmentation of many consumer devices and the inconsistency of interoperability standards are enormous barriers to seamless MX integration of front-end technologies. Legacy noncomposable and non-API-ready service architecture makes those barriers even higher.
- The cost and effort, required for implementing MX, often do not justify the benefits of the resulting output.

- The skills needed for MX development, such as immersive interaction design, are still lacking in most enterprise software engineering teams.
- Currently, automatic plug and play of off-the-shelf devices, applications and services is not feasible for MX. Instead, proprietary hardware and software ecosystems of MX solutions will exist in the near term.

User Recommendations

- Identify three to five high-value pilot projects in which MX design can lead to more effortless, compelling and transformative experiences, such as e-commerce, healthcare, frontline workers and edge computing.
- Evaluate business applications, frameworks and platforms, such as field service management and digital experience platforms, for their native MX capabilities and support for custom MX development.
- Collaborate with UX design teams to create a design system that spans desired MX touchpoints and modes of interaction.
- Establish a multidisciplinary fusion (product) team including (but not limited to) IT, product managers, UX designers and business stakeholders.
- Invest in modern service architecture and technologies to ensure a seamless integration between MX applications with back-end services through APIs.
- Focus on understanding how unified digital experiences impact the business, and use evolving MX technologies to create targeted solutions for customers, partners and staff.

Gartner Recommended Reading

Adopt a Mesh App and Service Architecture to Power Your Digital Business

Market Guide for Multiexperience Development Platforms

2023 Strategic Roadmap for Adopting Modern Application Architectures and Technologies

How to Make the Right Technology and Architecture Choices for Front-End Development

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

Identity Wallets

Analysis By: Michael Kelley, Akif Khan, Arthur Mickoleit

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Definition:

Identity wallets, both in the form of mobile and web apps, enable users to store, manage and selectively disclose digital identity data from different sources and for various purposes. Users can also use identity wallets to hold their credentials to validate claims. Overall, identity wallets represent an interface for issuing and verifying credentials.

Why This Is Important

A digital identity wallet provides individuals greater control over their identity data and has the potential to enable higher trust for validation of identity claims. For service providers, identity wallets can enable new service models that require consented sharing of identity data. Use cases can involve commercial and government entities for verifiers and issuers of credentials and attributes. Governments are exploring the need for standards and regulations around identity wallets.

Business Impact

Identity wallets help individuals manage personal data from any public or private source. For example, ID cards, driving license data, employer data, COVID-19 vaccination, digital passports and tickets. Use cases span from in-person identity verification and online transactions to contactless check-ins. The data managed by identity wallets include verifiable claims for decentralized identity (DCI), digital representation of electronic data, like airline or concert tickets, and even cryptocurrency and non-fungible tokens (NFTs).

Drivers

- **Privacy and security:** Digital wallets prioritize benefits like security, privacy and anonymity through zero-knowledge protocols and data minimization.
- **Health information:** Digital wallets can safely and securely communicate health information from patients to medical providers.
- **Citizen credentials:** Mobile driver's licenses and other documents providing proof of citizenship. These specific use cases contribute to the growing public interest and debate about digital wallet services on the smartphone.
- **Growing traction of decentralized identity:** Interest in identity wallets is growing with increased interest in DCI. Global standards, like World Wide Web Consortium (W3C) verifiable credentials (VCs) and decentralized identifiers (DIDs), are driving additional use cases for verifiable claims in digital wallets. These enable the creation of open, interoperable identity wallet services.
- **Payments and fintech:** Identity wallets are serving payment-related use cases. For example, to manage financial assets and transactions. The confluence of identity and payment use cases in mobile apps, like Apple Wallet, are already visible today.
- **User experience (UX):** Identity wallets will reduce the need for users to repeatedly prove their identity across multiple service providers. Mobile devices will become the primary means for proving identity claims. Asserting an identity claim from already verified identity attributes will reduce onboarding friction and likely become a competitive advantage.
- **Future monetization of identity data:** Today's identity wallets are focused on nonremunerated consent for sharing personal identity data. Future iterations and use cases for identity wallets may include an individual granting consent of their personal data for commercial use in return for remuneration or other rewards.

Obstacles

- **Market understanding:** There is confusion about the term “identity wallets.” The term can refer to proprietary mobile ID apps — where identity data is confined to a centrally defined ecosystem — and to open standards-based wallets that enable decentralized, portable and interoperable identity.
- **Wallet standards:** The market and governments are actively working on standards and strategies for interoperability. The OpenWallet Foundation is currently working on defining an open standard for interoperability.
- **User acceptance:** The adoption of identity technologies will be driven by relevant use cases. Focus on use cases that effectively communicate the tangible benefits of identity wallets.
- **User experience (UX):** The interface for the identity wallet must be easy to use and intuitive. Alternatives to mobile devices must be explored.
- **Trust and recoverability:** When users begin to store and manage personal or payment data with their wallet, data security, encrypted keys and recoverability after loss or theft will be a top priority.

User Recommendations

- As soon as standards evolve, be prepared to support multiple wallets for varied use cases. For example, a wallet for concert tickets, a government-issued wallet for citizen-identity information, a personal wallet holding banking, employment and educational credentials, or a wallet for storing cryptocurrency or processing payments.
- Explore emerging use cases, like verifiable claims for decentralized identity, cryptocurrency and NFTs, while supporting traditional use cases — for example, digital representations of physical things, such as airline and events tickets, driver’s licenses, digital passports and other government-related documents.
- Observe or participate in shaping regulations, standards and reference frameworks that are relevant to your geography. For example, the EU’s ongoing large-scale pilots and electronic identification, authentication and trust services (eIDAS) regulation revision.
- Investigate the value of digital wallets for representing identity in online digital communities, like Web 3.0 and metaverse applications.

Sample Vendors

1Kosmos; Apple; Evernym; ID.me; Google; Microsoft; Nuggets; Ping Identity; Scytáles; SecureKey

Gartner Recommended Reading

Guidance for Decentralized Identity and Verifiable Claims

Innovation Insight for Decentralized Identity and Verifiable Claims

Predicts 2023: Users Take Back Control of Their Identities With Web3 Blockchain

Predicts 2022: Identity-First Security Demands Decentralized Enforcement and Centralized Control

Top Trends in Government for 2022: Digital Identity Ecosystems

Prescriptive Analytics

Analysis By: Peter Krensky

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Prescriptive analytics is a set of capabilities that specify a preferred course of action and, at times, take automated actions to meet a predefined objective. The most common types of prescriptive analytics are optimization methods, a combination of predictive analytics and rules, heuristics, and decision analysis methods. Prescriptive analytics differs from descriptive, diagnostic and predictive analytics in that the technology explores multiple outcomes and provides a recommended action.

Why This Is Important

Prescriptive analytics capabilities either automate or augment decision making to improve business responsiveness and outcomes. From a “purist” perspective, the term “prescriptive analytics” is a broad category with little hype, encompassing components with varying positions across the Hype Cycle and various levels of maturity. Such components include optimization, rules combined with predictive techniques and decision intelligence. The increasing focus on composite AI is further propelling the importance of prescriptive analytics.

Business Impact

Prescriptive techniques support:

- Strategic, tactical and operational decisions to reduce risk, maximize profits, minimize costs, or more efficiently allocate scarce or competing resources
- Recommendations for a course of action that best manages the trade-offs among conflicting constraints and goals
- Exploration of multiple scenarios and comparison of recommended courses of action
- Strategic and tactical time horizons as well as real-time or near-real-time decision making

Drivers

- Prescriptive analytics benefits from maturing and expanding data science initiatives, better algorithms, more cost-effective cloud-based computing power, and a substantial increase in available data.
- With improvements in analytics solutions, data quality and user skills, prescriptive analytics will continue to advance.
- The increasing popularity of graph techniques provides a great substrate for prescriptive analytics. Graph techniques highlight early signals, causality links and paths forward, facilitating the implementation of decisions and actions.
- Demand is shifting away from traditional reactive reporting to actionable, proactive insight, placing greater focus on optimization, advanced techniques, composite AI and prescriptive analytics.
- AI platforms and decision management tools increasingly include prescriptive techniques, driving user acceptance and potential value to the organization.
- Prescriptive analytics continues to evolve, ranging from relatively straightforward rule processing to complex simulation and optimization systems. To respond to ever-greater complexity in business, organizations need more advanced prescriptive analytics and composite AI (e.g., combining rules/decision management with machine learning or optimization techniques).
- Organizations continue to improve, optimize and automate their decision making by applying decision intelligence and decision modeling. Prescriptive analytics is a key enabler of this approach.

Obstacles

- Expertise on how and where to apply prescriptive techniques is lacking.
- The industry lacks formal operationalization methods and best practices.
- Historically, organizations have required separate advanced analytics software specializing in prescriptive techniques. Such point solutions offer little cohesion across the analytics capability continuum from descriptive to diagnostic to predictive to prescriptive.
- Even established use cases can fall victim to common data science challenges, such as data quality issues, bias and talent shortages.
- Although it is a necessary competency, prescriptive analytics does not automatically result in better decision making.

User Recommendations

- Start with a business problem or decision involving complicated trade-offs, multiple considerations and multiple objectives.
- Explore the breadth of prescriptive analytics approaches and decision models available. Identify the ones that best cater to your specific business problems and skills.
- Analyze packaged applications to determine which provide specific vertical or functional solutions, and which service providers have the necessary skills.
- Make sure that the enterprise is willing to rely on analytics recommendations, by gaining buy-in from stakeholders — ranging from senior executives to frontline workers carrying out the recommended actions.
- Ensure that your organizational structure and governance program will enable the enterprise to implement and maintain functional, as well as cross-functional, prescriptive analytics recommendations.

Sample Vendors

AIMMS; Amazon Web Services; FICO; Frontline Systems; Google; Gurobi Optimization; IBM; Microsoft; River Logic; SAS

Gartner Recommended Reading

Combine Predictive and Prescriptive Analytics for Better Decision Making

Innovation Insight for Composite AI

How to Use Machine Learning, Business Rules and Optimization in Decision Management

Consent and Preference Management

Analysis By: Tia Smart

Benefit Rating: Moderate

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Consent and preference management platforms consolidate end-user choices regarding how their personal data should be handled. Choices are synchronized across legacy, active and incoming repositories, both on-premises and in the cloud. The intent is to extend visibility and control to digital visitors, allowing them to determine and change how much of their data to expose, to whom and for what purpose. This also empowers marketers to respect customers' choices with a minimum of manual overhead.

Why This Is Important

Protections for personal data collected digitally continue to expand across the globe as more countries and U.S. states consider legislation similar to or stronger than GDPR, CCPA, CPRA and CPA. Technologies and organizations must quickly adapt to the global transformation. Consent and preference management platforms (CPMPs) empower organizations to comply with new laws, preserve and extend essential capabilities, and demonstrate to customers and stakeholders that they care about privacy.

Business Impact

- As new legislation is introduced worldwide, organizations must use CPMPs to demonstrate to consumers that they value their privacy and are in compliance to avoid costly violations and consumer mistrust.
- Protecting your organization from compliance violations while maintaining the ability to utilize customer data for business purposes can be technically and operationally challenging. CPMPs help to address these issues.

Drivers

- **New laws and variations in legislation.** With additional countries and regions seeking to implement their own consumer privacy laws, tracking laws in each country and region is a tedious but integral task to ensure compliance. CPMPs address specific requirements, such as auditing websites, enforcing consent choices and making data available for subject rights requests.
- **Reliance on first-party data.** The shift to an increased dependence on first-party data instead of third-party cookies forces organizations to reevaluate the enterprise's data structure. Managing consent and preference choices throughout the ever-convoluted enterprisewide structures takes time, and some CPMPs try to solve this. CPMPs' importance is ever more apparent in countries like the U.S., where implicit consent is still allowed in most states. Organizations need to take a state-by-state approach or risk messing up direct marketing opportunities available to them.
- **Societal norms and consumer expectations.** Consumers now expect to have control over their personal data as well as transparency from organizations on how it is used. However, consent flow banners and dialogues can significantly downgrade user experience, driving the need for better design solutions enabled by certain CPMPs.

Obstacles

- **Ever-changing global laws and best practices.** With regions and countries implementing their own data privacy legislations, organizations must adapt to each one to remain in compliance. CPMPs tend to oversell their ability to make managing consent options simple, often downplaying the complexity of managing an organization's internal and external databases.
- **Lack of UX design support.** Forcing too many privacy choices on consumers degrades UX and leads to high opt-out and abandonment rates. Yet, having too few choices limits the ability to tailor experiences. To strike the right balance requires cross-functional, collaborative activities across the organization.
- **Complex technology architectures.** Digital transformation acceleration efforts propelled organizations to rethink how technology solutions work together and how data flows throughout the ecosystem. Adopters need to factor in the number of connections — both native and customized (e.g., APIs, ETL) — that are needed to effectively use a CPMP.

User Recommendations

- Prioritize consent management policies and initiatives as a critical priority for all functions. Establish a cross-functional customer data and privacy council to review and update policies and processes for the enterprise to follow.
- Avoid “dark patterns” or deceptive language for consent dialogues that attempt to influence users’ choices (see the FTC’s Press Release).
- Use a “telescoping” approach to disclosures and preference dialogues that allow users to go as deep as they choose into specific details. Offer consistent, easy access to preference settings that can be viewed and changed on demand to ensure that you are undertaking a privacy-by-default approach.
- Compare and assess CPMP offerings against your organization’s highest-priority data privacy protection and integration requirements and internal costs.
- Develop a CPMP where the market cannot effectively connect and integrate with legacy internal tools.
- Take a modular approach to adoption and avoid excessively broad project scopes. Anticipate sufficient time to resolve unforeseen complications in these projects.

Sample Vendors

BigID; Didomi; Ketch; OneTrust; PossibleNOW; Syrenis; TrustArc

Gartner Recommended Reading

Market Guide for Consent and Preference Management

Market Guide for Consent and Preference Management for Marketers

Intelligent Document Processing

Analysis By: Shubhangi Vashisth, Stephen Emmott, Anthony Mullen

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Adolescent

Definition:

Intelligent document processing (IDP) solutions extract data to support automation of high-volume, repetitive document processing tasks and to provide analysis and insight. IDP uses natural language technologies and computer vision to extract data from structured and unstructured content, especially from documents, to support automation and augmentation.

Why This Is Important

IDP is increasingly important to create operational efficiencies in business processes that need to extract information from semistructured and unstructured data as part of automation of any workflow. Such tasks are routine, repetitive and primarily dependent on human effort. IDP caters to a wide variety of use cases — from digitization initiatives to more complex processes such as document-centric taxation processing and pension fund management. IDP is one of the technologies within a spectrum of technologies that enable hyperautomation.

Business Impact

IDP can benefit the business by:

- Reducing the human labor needed to process documents and improving document-based workflows
- Extracting relevant data from different input formats for further analysis, validation and/or automation
- Preprocessing unstructured data for analysis
- Automating document and email classification and extraction
- Enabling discovery and insight
- Creating workflows to support process automation or integration with existing automation solutions

Drivers

Key drivers include:

- The desire to consolidate document processing across multiple applications into one component.

- The need to ingest data from diverse sources and formats (e.g., PDFs, images) and extract information from it.
- Pressure to improve the accuracy and efficiency of extraction and automation processes.
- The desire to leverage generative AI for document classification and data extraction. Many vendors are already contextualizing large language models (LLMs), such as BERT and GPT-3, for specific industries and use cases.
- Enhanced capabilities to denoise and preprocess semistructured and unstructured data. Many vendors are expanding with additional capabilities for intelligent content processing (ICP) to process various content types, such as video, audio and images.
- Support for additional capabilities, such as document classification, metadata extraction, knowledge graphs, search and natural language question answering.
- Increased leverage of human in the loop (HITL) training methods to simplify adoption, ease deployment and continuously improve automation accuracy.

Examples of use cases span many enterprise departments and vertical industries, including:

- **Accounts payable/receivable:** Processing of invoices, purchase orders, payments, expense reports and receipts.
- **Healthcare:** Processing of medical forms.
- **Banking and financial services:** Processing of loan applications, driver licenses and other collateral; customer onboarding; environmental, social and governance (ESG) initiatives; and compliance.
- **Government:** Processing of forms, driver licenses, passports and other IDs.
- **Manufacturing:** Processing of equipment maintenance records, RFPs, business contracts and operating agreements.
- **HR:** Employee onboarding, travel and expenses.

Obstacles

- **Complex, consolidating markets:** The market has a competitive vendor landscape, with dedicated solutions and offerings from adjacent technology markets. These markets include insight engine vendors, OCR vendors, RPA vendors, cloud providers and, increasingly, service providers. Selecting the right solution gets tricky, as vendors offer overlapping capabilities and differentiation is low.
- **Integration challenges:** Many organizations already have either a homegrown solution or an existing IDP tool, but are looking for enhanced features, such as sophisticated text analytics, to cater to wider use cases and growing business needs. However, a single tool may not be able to cater to all requirements, and integration complexity makes it challenging to have multiple tools.
- **Category bleed, which confuses buyers:** With semantic platforms, insight engines, RPA and conversational AI vendors all offering IDP-like solutions to interpret and mine document form factors, buyers may not feel compelled to purchase an additional format-specific (document) solution.

User Recommendations

- Evaluate the entire business process to understand where and how IDP solutions can be integrated. Treat IDP as a component that integrates with other platforms/applications.
- Adopt industry- and/or business-domain-focused solutions for a quick time to implementation.
- Align with stakeholders on accuracy and efficiency baselines for the process.
- Investigate the difference between placed-framed extraction and semantic-framed extraction. The former is not IDP, and only the latter can scale to unstructured content. If you want to use IDP as a launchpad for broader handling of semistructured and unstructured data, evaluate insight engine or semantic AI platforms that offer IDP along with other services.
- Design the HITL validation process either by leveraging internal sources or by outsourcing the task to the IDP solution provider.
- Discuss specialized requirements, such as the ability to process documents in entirely new formats, data preprocessing needs and SLAs around processing time.
- Compare the ease of integration of new tools, if looking to complement the capabilities of an existing solution.

Sample Vendors

Alkymi; Altilia; Applica; DocDigitizer; Eigen Technologies; Hyperscience; Infrrd; Indico Data; Kofax; OpenText

Gartner Recommended Reading

Infographic: Understand Intelligent Document Processing

Market Guide for Intelligent Document Processing Solutions

Quick Answer: How to Prioritize Requirements in the RFP for Intelligent Document Processing

Tool: RFP for Intelligent Document Processing

Intelligent Document Processing Growth Opportunities: Top Strategies for Tech CEOs

API Marketplaces

Analysis By: Andrew Humphreys

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

An API marketplace is a platform to share APIs. Consumers, mainly developers, use API marketplaces to discover APIs and, in some cases, may purchase access to them. They can be either public commercial marketplaces with APIs from multiple providers, public with APIs from a single provider, or private marketplaces for promoting an organization's internal APIs.

Why This Is Important

API marketplaces enable organizations to publicize their APIs. Marketplaces are usually associated with external marketplaces, which share APIs with a community of developers and enable partners to implement solutions using the APIs. However, as most APIs are meant for consumption by teams within an organization, marketplaces are more frequently internal. They make it easier to find APIs internally, helping with wider sharing of capabilities between different business units and product and development teams.

Business Impact

API marketplaces increase developer visibility and consumer mind share, drive API usage, and, by extension, increase business impact. API consumers can use marketplaces to simplify finding and comparing different APIs when they are looking for specific functionality but have not selected exactly which API to use. There is typically a cost involved with listing in a public API marketplace, but the benefits include exposure to a larger number of API consumers and access to features to enable monetisation.

Drivers

- The number of APIs within an organization is climbing, driving the need for developers to more easily discover which APIs and services are available.
- Composable business, including composable commerce, relies on the use of API marketplaces to share APIs and packaged business capabilities.
- Increased use of low-code platforms, integration platforms, robotic process automation (RPA) and analytics tooling enables more citizen development using APIs that may be sourced from API marketplaces.

Obstacles

- Public API marketplaces that provide a public directory of APIs from multiple providers have had disappointing results, as developers are more likely to go directly to API providers to sign up for APIs. This has resulted in API marketplaces in the Trough of Disillusionment. However, internal API marketplaces have had more success, since they enable developers to share APIs across multiple teams.
- API portals provided as part of API management platforms are typically basic in nature, resulting in significant customization work to create a customer-oriented API marketplace based on such an API portal.
- New open-source platforms, such as Backstage from Spotify, are driving the creation of internal API catalogs as part of larger developer hubs. If your developers are collaborating on solutions around their APIs already, then a simple catalog may be sufficient and a full marketplace is probably overkill.

User Recommendations

API providers:

- Create an internal API marketplace, focused on the needs of software engineers to share APIs across the organization.
- Examine billing terms to understand what the cost of using the marketplace is when considering commercial API marketplaces.
- When considering a commercial API marketplace, examine listing fees and value to your organization before committing.

API consumers:

- Ensure that you use APIs from trusted marketplaces and trusted API providers, examining usage agreements, licensing and billing terms carefully.
- Investigate whether consuming an API directly from the API provider offers better pricing or usage terms than consuming the API via a marketplace.

Sample Vendors

Achieve Internet; Bump; Postman; Pronovix; Readme; Smartbear (Swagger); Spotify (Backstage); Stoplight

Gartner Recommended Reading

Innovation Insight for Internal Developer Portals

Reference Model for API Management Solutions

Predictive Analytics in Government

Analysis By: Ben Kaner

Benefit Rating: Transformational

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Predictive analytics in government uses data mining and modeling techniques to achieve mission outcomes. It leverages internal and external data to inform public policy development, optimize government processes and improve real-time decision making. The responsible and ethical use of predictive analytics in government requires care and due diligence to limit the impact of biases inherent in historical datasets.

Why This Is Important

Swift, quality decisions are critical to outcomes in all branches of government. Predictive approaches allow consequences of decisions to be considered ahead of time and enable plans to be adapted accurately as needed. This delivers better outcomes at lower risk than a reactive approach. Predictive analytics, enabled by advances in machine learning, makes this shift feasible and scalable. To maintain the public's trust and ensure accountability, it should be deployed transparently.

Business Impact

Government agencies that use predictive analytics can change service delivery models to proactively achieve mission outcomes:

- Resources can be optimized based on demand.
- Interventions — in all areas, including public safety, human services and taxes — can be made more swiftly and more accurately.
- Closing the loop to feed outcomes back into the predictive model will deliver evidence-based and constantly improving interventions.

Drivers

- Advances in machine learning provide a broader set of models and reduce implementation and operational costs.
- Solution providers are supplementing their solutions with emerging technologies from ecosystem partners to gain competitive advantage.
- Society is pushing for equity in service delivery; predictive analytics helps anticipate the impacts, including those that are unintentional, on all impacted recipients.
- There is demand for government organizations to reduce costs and operate more efficiently.
- A growing number of providers are developing predictive analytics, location intelligence and machine learning solutions that are being delivered in a SaaS model. Therefore, agencies are not required to have data science, AI modeler or other related skills in-house.
- Expanded datasets available through cross-disciplinary response efforts are making additional, previously untapped data available through improved data sharing efforts.

Obstacles

- Data quality and management capabilities may limit government agencies' ability to leverage predictive analytics.
- Public concerns about using data collected to provide support being used instead for enforcement predictions may limit trust in data necessary for essential human services or even create open resistance.
- Public concerns over access to significant sensitive data, data bias and misuse may cause leadership to be hesitant in experimenting with predictive analytics.
- Agencies' aversion to change, particularly where there have been previous difficulties, may manifest as hesitation to implement a new solution.
- Predictive approaches will work only if decision makers adapt their decision-making process and understand both the power and the limits of such models. This requires an uplift in the adaptability and data maturity of both the executive and operations.
- Limited data discovery and data sharing capabilities can limit the ability to develop the needed models for predictive analytics.

User Recommendations

- Establish, if not already active, a data governance program that supports data quality and management. Exploit data standards where available, such as the U.S.-based National Information Exchange Model (NIEM).
- Engage current vendors to understand their roadmaps for implementation of predictive analytics or what partnerships they have to bring these capabilities to their solutions or platform.
- Work with internal and external stakeholders to establish standards for the acceptable use of predictive analytics and processes to determine continual acceptance of its use.
- Establish guidelines for adopting predictive analytics solutions that build trust by requiring models that are explainable to leadership, staff, stakeholders and the public.
- Include predictive analytics and AI in the risk management process. Implement regular, independent audits of predictive analytics and AI solutions to check for system bias and data misuse. Be transparent with finds and activity to remediate any findings.

Sample Vendors

Alteryx; DataWalk; IBM; Microsoft; Palantir; Qlik; SAS; Semantic AI

Gartner Recommended Reading

Market Guide for Multipersona Data Science and Machine Learning Platforms

Top Trends in Data and Analytics, 2023

Combine Predictive and Prescriptive Analytics for Better Decision Making

Tool: Predictive Analytics Use Case Prioritization

Quick Answer: What Changes Are Expected in Data and Analytics as Governments Become Postdigital?

Quick Answer: How Should Data and Analytics Vendors Respond as Governments Move to Postdigital?

Climbing the Slope

DXP

Analysis By: John Field

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

A digital experience platform (DXP) is an integrated set of technologies designed to enable the composition, management, delivery and optimization of contextualized digital experiences across multiexperience customer journeys.

Why This Is Important

Organizations need a solution to enable the composition, management, delivery and optimization of contextualized digital experiences throughout multiexperience customer journeys. A DXP addresses these needs, creating digital experiences across a wide range of engagement scenarios, audiences, channels, devices and modes. The integrated nature of a DXP means faster time to market and lower deployment costs, as well as higher levels of customer and employee engagement and satisfaction.

Business Impact

Poor digital experiences, often delivered in silos, lead to customer and employee frustration. DXPs help enterprises deliver compelling digital experiences for consumers, employees, citizens and partners. They provide significant efficiencies in composition, management, delivery, contextualization and optimization of digital experiences throughout multiple touchpoints. DXPs face disruption from headless content management systems as priority for composability increases.

Drivers

- DXPs have the ability to bring multiple silos of engagement into a single seamless experience.
- There is a growing need to improve customer and employee experiences, and to establish a stronger competitive position.
- Multiexperience strategy adoption is leading to a total experience model.

- Organizations want the ability to scale and pivot as business needs/environments change — DXPs help them do that.
- Business agility, elasticity, flexibility, extensibility and faster time to market are all enabled by DXPs.
- DXPs embrace a composable user experience, supporting a composable business model.
- There is a need for an integration layer, supporting API, integration platform as a service (iPaaS) and other models.
- Many organizations want to manage content and digital experiences with minimal IT support.

Obstacles

- Lack of digital maturity
- Cost
- Conservative verticals or use cases with low DX aspirations
- Limited agility and complexity of deployment
- Rise in composing DXPs from multiple capabilities/vendors instead of buying a core solution
- Organizational inertia or resistance to change

User Recommendations

- Ensure a business-aligned and streamlined DXP strategy by focusing on business outcomes, along with governance, including key business and IT stakeholders.
- Create an architecture for DXP that best meets your vision by examining the current state, determining gaps in current functionality and assessing opportunities to employ innovations required to achieve the future vision.
- Create an internal roadmap based on desired outcomes, technology maturity, potential disruptors and risks for the next three to five years, keeping composable DXP and the ideal user experience in mind.

Sample Vendors

Acquia; Adobe; Bloomreach; Magnolia; Optimizely

Gartner Recommended Reading

Magic Quadrant for Digital Experience Platforms

Critical Capabilities for Digital Experience Platforms

Defining the Digital Experience Platform

Adopt a Composable DXP Strategy to Future-Proof Your Tech Stack

Identity Verification in Government

Analysis By: Arthur Mickoleit

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Definition:

Identity verification (sometimes called “Selfie +ID”) typically involves capturing a photo identity document and checking for signs of tampering or forgery. Additional capture and analysis of the person via photo or video determines genuine presence. Finally, a comparison of the person’s biometric data with reference data extracted from the identity document or official registers determines whether the person is who they claim to be.

Why This Is Important

Establishing confidence in identity is the foundation of interactions between the government and its constituents and employees. Acceleration in digital service delivery, remote and hybrid work models spurs the need for establishing high levels of trust in a person’s identity. Identity verification is a mature technology to establish a tolerable level of assurance and trust in the genuine presence of a person for many use cases.

Business Impact

Identity verification offers security and convenience when onboarding citizens to digital services, notably if they have not previously registered for a high-assurance digital identity. This may include activating a mobile Driving License (mDL) or official identity wallet on a smartphone. Further use cases include elevating the trust level of authentication during high-risk transactions or establishing higher confidence during in-person interactions — for example, visitor identification or access to premises.

Drivers

- **Fraud, breaches and identity theft:** Identity verification is superior to traditional data-centric identity affirmation. Public sectors have experienced massive amounts of benefits fraud from the illicit use of personally identifiable information (PII) and are therefore moving away from solely using such data to assert identity claims.
- **Remote services delivery:** Shifts to digital delivery create the need to securely and conveniently register first-time service users, often onboarded exclusively via digital channels. This may include activation of mDL and identity wallets, for example, as part of a revised eIDAS in Europe.
- **Government identity verification services**: Some governments, like Argentina, Australia, India and Singapore, offer a set of identity verification capabilities at a national scale that designated service providers can leverage. Others deployed such capabilities in specific domains or temporarily only, for example, Germany, Norway and the U.K.
- **Official biometric records:** In countries like Argentina, India, Saudi Arabia, and Singapore, designated service providers may be permitted to verify against biometric records maintained by the government. This can replace or add to verifying against an ID document captured during the transaction. The practice may not be replicable or desired in other countries and political contexts.
- **Convergence with authentication:** Organizations are exploring identity verification use cases beyond the point of initial registration. For example, to step up assurance when accessing sensitive information; for recovery of accounts and credentials; or for periodic verification of entitlements.

- **Remote working needs:** Hiring today can happen without meeting your employer face to face, which leads organizations to adapt their recruitment processes for higher security. Organizations are also looking for ways to establish high trust in the identity of an employee before accessing sensitive information or transactions.

Obstacles

- **Privacy and societal concerns:** Use of biometrics to secure an interaction can be met with reservation, even resistance, by citizens or advocacy groups. One-off face comparison against a document without further storage of biometric data might be less concerning than further reuse of the captured data. But such nuances can be hard to convey.
- **Costs:** Commercial costs per verification transaction can be prohibitive for some governments.
- **User experience:** Especially for lower-risk transactions, going through the process of handling an identity document and taking a selfie can be viewed as too onerous.
- **Inclusion and bias:** It cannot be assumed that everyone has a smartphone, a camera-enabled computer or a suitable document. Concerns persist regarding demographic bias in the face-recognition process. Vendor transparency in this respect is not uniform.
- **Product proliferation**: An increasingly mature and saturated market makes it hard to differentiate which offering will best meet requirements.

User Recommendations

- Consider identity verification as a mature technology in your digital identity plans by evaluating its suitability for remote onboarding of new users, initiation of mDL or identity wallets applications, step-up authentication in high-risk transactions, or credentials recovery.
- Address citizen concerns by being clear and transparent about how the decision to use identity verification in a given context was made. Be clear about what the security and privacy benefits are in comparison to alternatives, and what happens to biometric data captured during and after the verification process.
- Manage a carefully considered vendor selection process by following the guidance in Buyer's Guide for Identity Proofing.

Sample Vendors

IDEMIA; IDnow; ID.me; Nect; Nexi Group (Nets); Thales Group; Veridas; VU

Gartner Recommended Reading

Top Trends in Government for 2022: Digital Identity Ecosystems

Market Guide for Identity Proofing and Affirmation

Buyer's Guide for Identity Proofing

Case Study: Digital Transformation of a Legacy Paper-Based Process (U.N. Joint Staff Pension Fund)

Computer Vision

Analysis By: Nick Ingelbrecht, Shubhangi Vashisth

Benefit Rating: Transformational

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Computer vision is a set of technologies that involve capturing, processing and analyzing real-world images and videos to extract meaningful, contextual information from the physical world.

Why This Is Important

Computer vision comprises a transformational collection of technologies that are essential to sensing and understanding the physical environment. Computer vision technology is driving innovation across many industries and use cases and is creating unprecedented business applications and opportunities.

Business Impact

Computer vision technologies are used across all industries and address a broad and growing range of business applications. These include physical security, retail and commercial property, automotive, robotics, healthcare, manufacturing, supply chain/logistics, banking and finance, agriculture, government, media and entertainment, and Internet of Things (IoT). Computer vision exploits the visible and nonvisible spectrum, including infrared, hyperspectral imaging, lidar, radar and ultraviolet.

Drivers

Computer vision adoption is being driven by improvements in the application of machine learning methods, tools and services, hardware processing efficiencies, and data generation and augmentation techniques:

- **New neural network architectures, models and algorithm enhancements** are steadily improving the price/performance of computer vision applications; combinations of CNNs and vision transformers are delivering leading levels of performance; model compression and chip advancement enable larger workloads to be run on edge devices.
- **The economics of computer vision are being enhanced by the growth of the market for computer vision tools and services.** These include annotation and data preparation services and automated machine learning (autoML) capabilities, reaching across computer vision data pipelines, from model development and training through to deployment and model management, maintenance, and governance.
- **The proliferation of cameras and other sensors is generating exponential increases in image data,** creating a critical and growing demand for methods to automate analysis and manage and extract value from that data. Dynamic vision systems and lower cost lidar products are opening new areas for innovation.
- **Edge-enabled cloud frameworks,** developer ecosystems, products and support are further expanding the opportunity and enabling non-experts to train and deploy their own computer vision models.
- **New business models and applications** are emerging, ranging from smartphone cameras and fun filters, through to global video content production and distribution, life-saving medical image diagnostics, autonomous vehicles, video surveillance for security, robotics and manufacturing automation.

- **Sensor fusion,** multimodal analysis, generative AI, multispectral and hyperspectral imaging are expanding the opportunities.
- **Improved reliability,** price, performance and functionality are generating compelling business value and driving adoption.

Obstacles

Enterprises struggle with how best to exploit their visual information assets and automate the analysis of exponential volumes of image data:

- High-end systems are expensive to maintain and support, and building business cases with adequate ROI is challenging.
- The computer vision market lacks independent standardization and performance benchmarks, and advanced solutions are far from being commoditized.
- Integration with existing systems is problematic due to a lack of open interfaces, off-the-shelf solutions and plug-and-play capabilities.
- Enterprises struggle to activate computer vision models in business processes and face data security and privacy risks.
- Scaling solutions is challenging due to the high levels of customization and service support needed.
- Adequate training and testing data may be hard or expensive to acquire, especially in areas where available open-source computer vision datasets are declining.
- Proprietary algorithms and patent pools deter innovation.

User Recommendations

- Assess change management impacts of computer vision projects on the organization and its people.
- Focus initially on a few small projects, using fail-fast approaches and scale the most promising systems into production using cross-disciplinary teams.
- Test production systems early in the real-world environment because lighting, color, object disposition and movement can break computer vision solutions that worked well in the development cycle.
- Build internal computer vision competencies and processes for exploiting image and video assets.
- Exploit third-party computer vision tooling and services to accelerate data preparation and reduce costs.
- Evaluate legal, regulatory, commercial and reputational risks associated with computer vision projects at the outset.
- Reduce the barrier to computer vision adoption by addressing two of the main challenges, lack of training data and costly and constrained hardware, by investing in synthetic and augmented data solutions and model compression to improve model performance and expand the range of more valuable use cases.

Sample Vendors

Amazon Web Services; Baidu; Clarifai; Deepomatic; Google; Matroid; Microsoft Azure; Tencent

Gartner Recommended Reading

Emerging Technologies: Emergence Cycle for Computer Vision

Emerging Tech: Revenue Opportunity Projection of Computer Vision

Emerging Technologies: Computer Vision Is Advancing to Be Smarter, More Actionable and on the Edge

Emerging Technologies Tool: Video Analytics Functionality Matrix

Emerging Technologies: Tech Innovators for Computer Vision

LCAP in Government

Analysis By: Michael Brown

Benefit Rating: High

Market Penetration: More than 50% of target audience

Maturity: Mature mainstream

Definition:

A low-code application platform (LCAP) supports rapid application development, one-step deployment, execution and management using declarative, high-level programming abstractions, such as model-driven and metadata-based programming languages. They support the development of user interfaces, business logic and data services, and improve productivity at the expense of portability across vendors, as compared with conventional application platforms, and are typically delivered as cloud services.

Why This Is Important

LCAPs enable software development by government organizations where commercial off-the-shelf (COTS) or software as a service (SaaS) products cannot meet business needs. LCAPs allow cloud-based software development without requiring scarce talent, like cloud and DevOps expertise, enabling business unit participation throughout the process. LCAP products provide development capability where an agency lacks ability, or desire, to maintain a traditional custom software development environment.

Business Impact

IT support teams and government business/mission units are the key stakeholders for use of LCAP products. Speed of delivery for custom solutions provided by LCAPs is a universal benefit for any government entity. When used across multiple development teams, a universal platform for custom software has significant advantages in talent management and simplicity that government entities often view as beneficial.

Drivers

Drivers for use of LCAP by government include the need for:

- **Simplicity** — Talent requirements and the complexity of establishing a modern cloud-based, DevOps software development environment are burdens that force government entities to seek alternatives. LCAP products' simplification of software development is a common basis for adoption.

- **Versatility** — The ability to address business needs across the full range of government functions is another factor that has encouraged government use of LCAPs.

- **Maturity** — Technology maturity is critical where government departments and agencies are concerned. Experimentation and risk are antithetical in many government settings. That LCAP products are plentiful, mature and widely used by government agencies make for a lower-risk choice.

- **Overlays** — Prebuilt customizations, or overlays, for common governmental functions are available from a number of LCAP providers. These overlays have varying names, such as module or layer or may even be described as applications, but generally require subscription to the underlying LCAP. Government functions such as investigative case management, license and permit management, inspection management, grants management, and others can be obtained as overlays. That sensitivity to government mission needs helps drive use of these products by governments.

Obstacles

- **Cost** — LCAPs are sold as subscription services and budgets for operating expenditure (opex) need to accommodate the recurring cost. Shifting costs from capital expenditures to opex is often a challenge in government settings.

- **Lock-in** — LCAPs are proprietary. Business logic captured in these platforms cannot be easily transferred. IT teams are likely to understand the lock-in aspect, which may deter their use of LCAP products.

- **Unrealistic Expectations** — Perceptions of the simplification that LCAPs offer may not match reality. Each of the platforms requires familiarity and training on its use — platform expertise. Expectations that staff without any IT skills can produce well-constructed software can result in disappointment and abandonment of LCAP products.

- **Business Process Reengineering** — LCAPs do not preclude automating inefficient processes Without coupling to business process reengineering, LCAPs could inappropriately solidify workflows and processes that should be changed.

User Recommendations

Use of LCAPs is common with a projected compound annual growth rate of more than 20% (see Magic Quadrant for Enterprise Low-Code Application Platforms). Hence, government IT teams should:

- Gain the most from use of LCAP products by first examining, and redesigning as needed, business processes.
- Plan for recurring opex by conducting market research and including the cost in budget requests.
- Temper expectations for these products by explaining the training and skills that are required. Help set expectations by exposing appropriate business unit staff to sample development processes.
- Select an LCAP vendor by use of competition and, where practical, technical challenges.
- Accept that the relationship with an LCAP vendor is likely long term by expecting the land-and-expand business model. Initial successes producing applications with an LCAP will foster expanded use. Use LCAP to your advantage by negotiating a contract that locks-in price caps for a longer period of time.

Sample Vendors

Appian; Microsoft Power Apps; Pegasystems; Salesforce; ServiceNow

Appendixes

See the previous Hype Cycle: Hype Cycle for Digital Government Services, 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)

Evidence

[1] **2023 Gartner CIO and Technology Executive Survey** was conducted online from 2 May 2022 through 25 June 2022 among Gartner Executive Programs members and other CIOs. Qualified respondents are each the most senior IT leader (e.g., CIO) for their overall organization or some part of their organization (for example, a business unit or region). The total sample is 2,203 respondents, with representation from all geographies and industry sectors (public and private), including 241 from government.

Disclaimer: The results of this survey do not represent global findings or the market as a whole, but rather, they reflect the sentiments of the respondents and companies surveyed.

For more information, see 2023 CIO and Technology Executive Agenda: A Government Perspective.

Document Revision History

Hype Cycle for Digital Government Services, 2022 - 1 August 2022

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

Top Technology Trends in Government for 2023

Quick Answer: What Is Postdigital Government?

Toward a Postdigital Government Maturity Model

Table 1: Priority Matrix for Digital Government Services, 2023

Benefit ↓	*Years to Mainstream Adoption*			
	Less Than 2 Years ↓	***2 - 5 Years*** ↓	***5 - 10 Years*** ↓	***More Than 10 Years*** ↓
Transformational	Computer Vision	Generative AI Human-Centered AI Predictive Analytics in Government	Emotion AI Influence AI Self-Integrating Applications	Metaverse
High	Intelligent Document Processing LCAP in Government	Business Ecosystem Modeling Customer Journey Analytics Design Systems Digital Twin of a Citizen DXP Identity Wallets Innovation Ecosystems Multiexperience Partner Ecosystem Management Platforms Prescriptive Analytics	Superapps	Machine Customers
Moderate	Identity Verification in Government	API Marketplaces Consent and Preference Management		

Benefit	Years to Mainstream Adoption			
↓	Less Than 2 Years ↓	2 - 5 Years ↓	5 - 10 Years ↓	More Than 10 Years ↓
Low				

Source: Gartner (July 2023)

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