



NUCLEUS
RESEARCH

LCAP TECHNOLOGY VALUE MATRIX 2021

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THE BOTTOM LINE

The employee shortage and rise of digital transformation initiatives are driving the adoption of low-code application development platforms (LCAPs). With tools to simplify and accelerate the DevOps cycle, businesses can build their own solutions to fit specific needs and avoid expensive third-party applications. LCAPs bridge the gap between business users and IT, resulting in solutions that best address pain points, are developed faster, and are cheaper than outsourcing a software development firm. Generalist vendors are prioritizing the development and acquisition of low/no-code tools to enhance the extensibility and configurability of their solutions to benefit existing customers. Some even enable the production of standalone applications. Servicing large corporations are LCAPs that accelerate the build-out of solutions for virtually any use case. While pure no-code LCAPs help SMBs digitize simple processes and develop quick apps that drive productivity. In this report, Nucleus showcases 17 leading vendors, describes the role they occupy in the market, and highlights key updates from the past year to inform potential buyers' decisions.



OVERVIEW

With the proliferation of cloud technology lowering the entry barrier to SaaS and PaaS products and staff shortages across the board, digital transformation has become a priority for many organizations. Regardless of industry and company size, Nucleus has observed

increased LCAP adoption as organizations leverage the technology to develop and manage their IT stacks. LCAP technology has disrupted the age old “buy vs build” conversation, giving organizations a third option. By leveraging low- and no-code tools to accelerate and lower the technical requirements of software development, companies can take the development of enterprise solutions into their own hands.

In the past, organizations that chose to hire in-house developers or outsource development for purpose-built software would often face drawn out DevOps cycles that would cause costs to balloon and for the company to miss time-sensitive opportunities. Alternatively, if organizations sourced their technology from vendors, they would sacrifice solution flexibility, surrender control over upgrades and product roadmap, incur license or subscription fees, and undergo costly or lengthy implementations. In response, it has become increasingly common for organizations to launch a low-code app development initiative, where the company would source an LCAP as the primary development environment to be used for both internally and externally facing applications. Organizations have found a middle ground with LCAPs, where they have the support of a vendor and the tools to create solutions specific to their needs.

Interviewing both users of LCAPs and the resulting solutions, we have found that organizations could better address pain points, reduce IT costs, and pursue new ventures with greater agility. LCAPs drive these benefits in a variety of ways: By accelerating the development of solutions with variety of low/no-code tools and pre-built components to reduce the amount of hard coding; By enabling the development of enterprise solutions to replace and avoid multiple point solutions; By digitizing unique business processes to improve standardization, work quality, and employee productivity; And by quickly deploying self-service forms and portals to support new product and service launches.

While LCAPs offer an attractive value proposition, organizations must make careful considerations in-terms of the target users and use-cases, pricing method, and development roadmap of their preferred vendor. Within the LCAP market, competition and consolidation has increased hand-in-hand with demand. Vendors differentiate their offerings with the intuitiveness of toolsets, ease of application publication, and complexity and performance of developed solutions. As such, vendors race to develop or acquire robotic process automation (RPA), business process management (BPM), and AI/ML-enabled analytics functionality.

Customers should be wary of vendors touting capabilities of acquired technologies that have yet to be integrated within the platform or development studio. Vendors at the forefront of the market offer a single development environment with tools that share a common language to eliminate the need for developers to export and import projects across multiple solutions and switch coding languages. Vendors also find an edge by growing their developer community to support users and partnering with universities to train

new specialists. Customers need to be cognizant of the professional developer shortage and the specialization required by the product of their choice. Despite the marketing claims, the majority of LCAPs still require skilled coders for the final build-out.

In this Technology Value Matrix, Nucleus assesses the LCAP market based on the value customers realize from the product usability and functionality that vendors are delivering with their solutions (Nucleus Research V67 – Understanding the Value Matrix, April 2021). The Matrix is a snapshot of the market designed to help customers and prospects understand where vendors are differentiating in how they deliver value and where vendors are making significant product investments.

LEADERS

Leaders in the LCAP Technology Value Matrix include Appian, OutSystems, Mendix, Microsoft PowerApps, and Zoho Creator.

APPIAN

Appian is a leader in this year's LCAP Value Matrix. The Appian low-code development platform provides professional and non-professional developers alike with an intuitive user interface (UI) to build and deploy business applications and automated workflows at an accelerated pace. The vendor's platform is delivered via SaaS and is entirely browser-based, which does not require any installation, enabling users to get started as soon as possible.

- One of Appian's core value propositions is a unified platform that combines comprehensive workflow automation and app development capabilities. Appian provides a variety of end-to-end process automation tools, such as business process management (BPM), robotic process automation (RPA), AI, case management, decision rules, API integration, document processing, data analytics, and process mining with the acquisition of Lana Labs in August 2021.
- Appian's drag-and-drop app builder democratizes app development to citizen developers. All applications developed on the platform are automatically built for mobile versions as well, reducing the time-to-market. Organizations can replace IT legacy systems by utilizing the platform's front-end UI tools, workflow builders, back-end connectors, and process automation tools.
- With Appian's cloud architecture, users have the freedom to integrate any data source for their composite applications, whether it is a new input source or a third-party output storage database. In addition, Appian offers its proprietary managed

cloud service with built-in security policies and certifications, enabling users to be within compliance standards.

- The LCAP vendor made continuous enhancements over the last year. Appian's recent acquisition of Lana Labs enhanced its capabilities in process mining to improve process analysis and optimization. Appian also improved its data integration capabilities, such as the real-time synchronization of enterprise data via API, eliminating the need for database administrators.

Appian's continued investment in its capabilities and UI positions the vendor as a leader in functionality and usability. We expect Appian will soon be able to eliminate most of an organizations' reliance on third-party business solutions, as more use-cases can be addressed in-house with Appian's platform. Nucleus believes Appian will face increased competition with other leading LCAP vendors as it moves upstream, taking on larger clients and market share.

OUTSYSTEMS

OutSystems is recognized as a leader in this year's LCAP Technology Value Matrix. The vendor's low-code development platform is specialized to help professional developers accelerate their productivity in the entire software development life cycle (SDLC). Since the platform can develop enterprise-class and complex applications, OutSystems often competes and replaces traditional development teams in banking, insurance, professional services, government, education, high tech, consumer goods, energy and utilities, healthcare, and logistics industry.

Organizations, typically enterprises, leverage OutSystems to develop web-based and mobile applications, for internal and external use cases. Customers build enterprise-grade applications with OutSystems to consolidate much of their technology stack under a single platform and avoid the purchase of multiple solutions. As such, OutSystems' platform can be used both as a SaaS product for application development or BPM and as a PaaS to integrate and consolidate data from various systems. To reduce the risk of vendor lock-in another differentiator is that OutSystems generates .NET code allowing customers to continue to run and evolve their applications should they disconnect. Furthermore, OutSystems has a DevSecOps approach, implementing over 200 security best practices across the entire SDLC, including Static Code and Security Analysis that can be conducted with partners.

Notable product updates over the past year include:

- August 2020, Case Management Framework (CMF) was released to build case management applications faster with specific functionalities and pre-built workflows.

- August 2020, Workflow Builder was released to empower business users and IT managers to quickly design processes and promote collaboration amongst multidisciplinary teams.
- September 2020, AppShield, a priced platform add-on was released to augment the embedded mobile app dev security for Android and iOS apps, such as preventing code injections, screenshots, and hijacking.
- December 2020, new DDoS protection features were added to OutSystems Web Application Firewall to improve platform and application security.
- February 2021, new AI-powered Help Suggestions were added to Service Studio to improve usability by predicting the contextual help required in the form of documentation, community, and blog posts without leaving the development environment.
- April 2021, parallel flow design tools were added to Workflow Builder to enable developers to model multiple process pathways to be executed in parallel.
- July 2021, a new Service Studio IDE and a macOS IDE were released featuring user experience enhancements and a native development environment for Mac users.
- July 2021, Integration Builder was released to streamline the integration of data sources as developers can leverage the new tool to quickly build connectors with simplified configurations.

Over the past year, OutSystems has focused extensively on providing simplified application builders (Experience/Workflow/Integration) in conjunction with Service Studio to enable the citizen developers. By expanding the parties involved in the DesignOps and DevOps cycles, OutSystems is better prepared to compete with LCAP vendors whose platforms center on bridging the gap between professional developers and business users. If OutSystems continues to deliver on usability improvements to empower citizen developers, Nucleus anticipates the vendor to maintain and improve its leading positioning in future editions of the Value Matrix.

MENDIX

Mendix is a leader in the 2021 edition of the LCAP Technology Value Matrix. With its low-code application development platform, Mendix provides non-technical and advanced developers with tools for visual and model-driven application design. Operating natively within the cloud, Mendix offers single-click deployment across on-premise, public cloud, and private cloud environments with easy-to-use self-service scaling. Mendix applications are containerized by default with an architecture promoting scalability and deployments to Docker, Kubernetes, and Cloud-Foundry. Mendix's architecture also supports enterprise

microservices, granting created applications access to existing external data and logic. Mendix's model-driven development brings users of all skillsets extensive application design capabilities while reducing expertise bottlenecks. Mendix also offers AI-assisted development with Mendix Assist, featuring built-in logic and bidirectional contextualized recommendations using deep learning.

With the Mendix Studio's online, collaborative, no-code application development users can create, view, and edit Mendix applications without delving into technical details. The Mendix Studio features drag-and-drop design, building block and widget management, and drop-down menus to drill down into application pages, domain models, microflows, and workflows. For more technical application development, Mendix offers its Mendix Studio Pro desktop application on the same platform as Mendix Studio. Mendix Studio Pro enables advanced users to leverage complex coding, logic, and integrations as needed. Both Mendix Studio products support DevOps, allowing users to merge model changes to version control repositories and trigger downloads of the most up-to-date version of applications.

Since the 2020 edition of the LCAP Technology value matrix, Mendix delivered multiple new releases and updates, expanding the value proposition of its application development platform.

- Mendix released the Atlas 3.0 design system with custom templates, building blocks, and widgets to speed up application development.
- Mendix also released Mendix Data Hub 2.0 with a kafka-based event broker elevating business events into native, plug-and-play elements. Mendix further improved its AI-powered Mendix Assist feature with the addition of a page bot that investigates application architecture patterns to assist in UI and UX development. Mendix Data Hub 2.0 also brings notable improvements to Mendix's version control and control center capabilities.
- In June 2021, the 9.3.0 release of the Mendix platform was made available with new features, including a toggle switch for the MxAssist Logic Bot and new non-experimental Metrics APIs such as counters, timers, and gauges. This update also improved the performance of application building by reducing the time needed to export pages by up to 60 percent and decreasing the time required to export metadata by up to 90 percent.
- In July 2021, Mendix released the 9.4.0 version of its low-code platform. In this update, Mendix added the 'switch to' menu, streamlining access to other areas within the Mendix Platform. Mendix also added optionality to its Synchronize activity by enabling users to only synchronize changed objects, decreasing synchronization time.

- In August 2021, Mendix released the 9.5.0 update to its LCAP solution. Improvements include automatic conversion of microflows to nanoflows using the MxAssist Performance Bot, better mobile deployments using React Native v0.64.2, and configurable 'abort on validation' errors for each action property of a pluggable widget.

In September 2021, Mendix announced its expansion into Industry Clouds, beginning with Mendix for Manufacturing Industry Cloud with new connectors, solutions, and industry-tailored templates for smart warehousing, predictive maintenance, and smart workforce planning, and Mendix for Financial Services Industry Cloud boasting solution templates for credit rating, claims management, and portfolio management. The vendor's roadmap for 2022 includes further catering to public sector, retail, and healthcare industries. These Industry Clouds feature tailored building blocks, templates, data source connectors, APIs, AppServices, and workflows to address common challenges within the vertical.

Mendix continues to drive value for non-technical and experienced developers through parallel improvements to its Mendix Studio and Mendix Studio Pro offerings. These solutions enable users of all skill sets to efficiently design applications to replace legacy solutions and fill gaps in their organization's software environment. By expanding into Industry Clouds, Mendix looks to better serve key verticals with more applicable out-of-the-box functionalities and better-informed AI-driven modeling. Over 2022, Nucleus expects this industry focus to improve the LCAP's value proposition through enhanced usability and expanded functionality, which will be reflected with improved placement in future editions of the LCAP Technology Value Matrix.

MICROSOFT

Microsoft is a leader in the LCAP Value Matrix 2021 with its Microsoft Power Apps product offering. Powers Apps can be used as a standalone product or as part of the Power Platform, to be supplemented with Power BI for embedded Analytics, Power Automate for robotic process automation (RPA), and Power Virtual Agents for no-code chatbot integrations. The LCAP vendor provides a combination of tools to enable organizations to develop new applications in a no-code environment to either complement or retire existing workflows. The Power App product is hosted on the Azure Cloud infrastructure, along with Azure Services and Data Management capabilities for professional developers to access code when needed during the DevOps cycle. Microsoft's LCAP offering includes AI modeling, process automation, app development, collaboration, and integration capabilities.

- Users are enabled to create AI models without the need to code, using templates and guided processes. The AI models include prediction, form processing, object detection, category classification, language detection, and text recognition

capabilities. Once a specific AI model is selected, it can be integrated into apps in current development to further enhance the features.

- With the point-and-click workflow interface, developers can build out complex business processes, which can include a variety of actions, validation rules, and data inputs. For example, users can create a multi-phased workflow to process customer service requests, which requires approvals depending on a user role. With over 350 data connectors, the automated workflows can be easily integrated across different sources and shared with other stakeholders to facilitate collaboration.
- Citizen developers benefit from an intuitive user interface (UI), which provides a broad range of app scenarios. Apps can be developed from scratch via the canvas module or from pre-built templates via the model-driven module. Users can choose from a variety of common business scenarios, such as expense reporting or site inspections, to streamline the development process.
- Microsoft Dataverse, Power Apps' designated database, stores all business applications and associated data points in a set of tables. These tables are formatted into records and attributes, which can be repurposed for other applications, empowering organizations to scale up operations. Dataverse offers preconfigured tables that store for example names, ages, salary, and ID numbers, as well custom tables that can store any data required by the organization.

Power Apps can be leveraged for a variety of use cases from adding an extra layer of features on top of an existing application to building out an entire business application that covers numerous functionalities, used across an entire organization. Microsoft's continued improvements, such as new quick search actions, additional app preview options, and in-app notifications, will further improve its positioning in usability. Nucleus believes with the improvements in usability, Microsoft can expand its customer base to SMB's who were previously reluctant to use Power Apps, because of the steep learning curve.

ZOHO

Zoho Creator is recognized as a leader in this year's LCAP Technology Value Matrix for its graphical drag-and-drop low-code platform. Zoho Creator enables both non-technical business-level users and developers to build custom applications centered around their business infrastructure. While built with a cloud-based focus, the vendor also offers an on-premises solution for those industries and businesses that may require it. Users are also provided with updates to improve performance, usability, and functionality on a weekly basis.

With an intuitive UI and drag and a drop visual builder, Zoho Creator provides functionalities for one-click deployment, cross-platform compatibility, and auto-scaling for diverse

architectures. Users can create forms, pages, reports, and dashboards and simplify processes surrounding integration, workflows, and customer portals. Developers can build, design, preview, and deploy applications that are compatible with web, mobile, and tablets at once, and allows users to build and run applications without investing in exhaustive on-premises infrastructures. For non-technical users and developers, Zoho Creator provides toolkits to assist throughout the development cycle. Additionally, Zoho Creator supports web and mobile SDKs, widgets, and extensions to meet developers' customizability standards. For security, Zoho Creator supports SAML, LDAP, and OAuth2 protocols to ensure users have extensive access management control. Zoho also offers ready-to-use applications that can be rapidly deployed without sacrificing flexibility and customizability. Zoho Creator also provides REST APIs that are immediately available without building endpoints. Earlier this year, Zoho rolled out a set of updated features to support granular application governance controls with Zoho Creator. Key highlights of the rollout include:

- Users can now define security policies, which are customizable rules that govern how users can access apps.
- There are now interface-level point-and-click options to set user permissions at module, record, feature, and field levels. In addition, pro developers can enforce stricter control by defining dynamic constraints programmatically using the built-in IDE.
- The platform now supports provisioning across the building, staging, and production environments without any additional setup. With the sandbox environment, users can execute preliminary testing in a restricted environment and publish changes at will in a single click. In addition, sandbox supports testing from the different persona POVs such as an admin, developer, or user, to ensure quality.

Zoho now provides advanced analytics features in the Zoho Creator platform to help users discover contextual information from continuously growing business data. Some of the key highlights of the enhancement include:

- A new DataPrep feature that allows users to connect, prepare, cleanse, transform, model, and catalog data through point and click.
- Augmented analytics driven by AI and ML technologies deliver faster, better, and powerful insights from the data residing inside the app.
- Conversational queries through ZIA, Zoho's Intelligent (AI) Assistant, provide capabilities to generate instant reports, one-click instant inferences, scenario-based what-if analysis, cognitive analytics, and forecasting models.
- Capabilities to build analytical presentations by embedding reports and dashboards along with narrative elements to craft insightful data stories to different stakeholders.

Nucleus has observed Zoho Creator service a wide range of company sizes and industries, often at a lower price-point than comparable solutions. With the continuous improvements to low/no-code app development capabilities, Zoho Creator is an attractive choice to both net-new and existing Zoho customers.

EXPERTS

Experts in the LCAP Technology Value Matrix include Infor, Nintex K2, Oracle APEX, and ServiceNow.

INFOR

Infor Mongoose is an expert in this year's value matrix. Infor provides a low-code application development framework to simplify the process of designing and deploying software applications. The LCAP solution is part of the Infor OS ecosystem, which can be leveraged in combination with Infor ION, the middleware cloud platform used to integrate different enterprise systems, and Infor CloudSuite, the ERP cloud solution used to scale operations. With Mongoose comprehensive capabilities organizations can cover a wide range of applications from small web portals to large enterprise software applications. Some of the main components of the application environment include the data maintenance wizard, form wizard, and report wizard.

- The data maintenance wizard can be leveraged to create intelligent data objects (IDO's) to logically group data points together. Users can select numerous attributes, such as name, property class, data types, SQL data types, and property length. Once the IDO's are created they can be used as fields in the application interface.
- The form wizard enables developers to create new component types that can be integrated into an application. Users can select the form type, data source, and property type. This empowers developers to implement new widgets, for example, a new custom picture import button, into the application they are currently working on.
- The report wizard equips users with the tools to create custom report templates. The new templates can include auto-generated fields that are updated in real-time from different data sources.

The Infor Mongoose app development platform is underpinned by its inheritance model, which provides the ability to streamline and reuse components, classes, properties, and other templates for other applications. All information is stored as metadata, separate from business applications, and allows organizations to scale up operations, by extending

existing applications or adopting new ones. For example, users can extend any business process by defining rules that execute whenever a data input or update occurs within a specific field in the application, thus upgrading legacy applications with IDO fields. Mongoose further enhanced its functional capabilities by including a new data connector that bi-directionally synchronizes the information between the application development platform and Infor DataLake.

Infor Mongoose is a comprehensive platform with a broad range of technical functionality that is mostly adopted by power users with prior coding expertise. Infor is prioritizing the democratization of Mongoose to a broader range of users through Project Stratus, an initiative to overhaul the Infor framework and introduce Infor OS Portal 2.0 in 2022. Users can expect tighter out-of-the-box integrations, best practices documentation, a UI uplift to standardize the user experience across multiple Infor products, a homepage widget SDK, and multi-form page functionality. If Infor delivers on its Project Stratus roadmap, Nucleus believes the upcoming usability enhancements will provide Infor customers with more opportunities for IT and business collaboration to build more powerful solutions faster.

NINTEX K2 SOFTWARE

Nintex K2 Software is an expert in this year's LCAP Technology Value Matrix, recognized for its expertise in process automation from a low-code perspective. With a focus on automation, Nintex provides business with low-code tools for process management (BPM) and robotic process automation (RPA). Nintex acquired K2 Software, Inc. in October 2020 and is planning to fully integrate its best-of-breed process automation and app development capabilities within the Nintex Process Platform. With Nintex K2 Software, organizations can automate enterprise-wide business processes, leveraging the combined capabilities of Nintex K2 SmartObjects, data management and integration, RPA, process modeling, and document generation.

- Map and manage business processes utilizing Nintex Promapp, the visual process mapping tool with integrated workflow builder. With one-click integration with Nintex Workflow Cloud, Nintex Promapp enables operations professionals and citizen developers to convert complex procedures into well-understood processes. Personalized dashboards allow users to bookmark specific actions relevant to them by filtering, editing, and approving specific processes.
- Nintex Promapp also provides collaboration tools to share team updates and receive feedback in real-time. Developers benefit from improved version control leveraging automated changelogs, RACI table updates, and email notifications.
- Automate manual and repetitive steps with online forms, mobile apps, workflow and RPA bots, and auto-generated documents. With Nintex K2 SmartForms, users can

create online forms to capture and display accurate and current data from different systems. Advanced logic, such as conditional formatting and validation rules ensure data accuracy. The Nintex K2 Mobile app empowers organizations to access forms, documents, and tasks on any device and build customized apps around specific roles. For example, users can submit a form on their mobile device to process a workflow request or collect signatures. Nintex RPA automates routine tasks by leveraging AI/ML algorithms that can mimic human interactions, such as specific keystrokes and clicks. Nintex DocGen automatically creates contracts, work orders, and invoices based on preconfigured fields that can be updated from any source in real-time.

- Optimize the automated workflows created to further improve efficiency and reduce processing times. Customizable analytics dashboards consolidate workflow metrics and line-of-business data from different systems into one intuitive dashboard. Users can measure and monitor an organization's workflow performance by comparing it to preconfigured benchmarks and can drill down into specific process metrics to track the number of instances, users involved and status of each task or step in the workflow.

With Nintex further expanding its capabilities and network through acquisitions, partnerships, and technical improvements, the company is positioning itself to compete with larger LCAP providers. Nucleus believes customers will benefit from further improvements in the user interface (UI) once Nintex fully integrates K2 Software capabilities into its platform.

ORACLE APEX

Oracle is an expert in the 2021 edition of the LCAP Technology Value Matrix with its low code development platform, the Oracle Application Express (APEX). Oracle APEX offers an intuitive graphical user interface (UI) with drag-and-drop page design and prebuilt application themes/templates to streamline an organization's development projects. Using Oracle APEX, developers can leverage advanced toolsets to delve deep into custom application development, and non-technical users can rapidly build forms, reports, visualizations, and simplified applications via intuitive wizards. Operating as a no-cost feature within the Oracle Database, Oracle APEX enables higher-order data-driven insights while benefiting from Oracle's data security and monitoring, built-in bug tracking, zero latency performance, and DevOps lifecycle management. Leveraging Oracle APEX's Quick SQL offering, users can generate reusable SQL queries using no/low code tools. This grants non-technical users the ability to interact with data held within the Oracle Database to create tables, triggers, and index structures with little to no coding expertise. Oracle APEX's features also include highly granular faceted search, customizable charting and visualizations, customizable UI, and web/database integration with Oracle representational

state transfer (REST). Unlike some Java and .Net applications, Oracle APEX lacks the need for middle-tier servers to function at scale, minimizing the server footprint of developed applications. The Oracle APEX platform also facilitates simplified operational reporting as business users can create, edit, and customize reports in a single environment with little to no code required.

Oracle continues to enhance its offerings for developers and non-technical users with continued updates to the APEX platform. In May 2021, Oracle released version Oracle APEX 21.1 with these key features:

- The APEX platform added interactive maps to better represent spatial data within APEX applications using Oracle eLocation Service.
- Extended data uploading of CSV, XLSX, XML and JSON formats into APEX applications with new append, replace, merge, and data conversion capabilities.
- Further enhancements to faceted search including new map and calendar specifications, and display toggling of facets.
- APEX's compatibility with REST Data Sources was expanded with improvements including support for web-based CSV files, visualization creation over-top of REST Data Sources, and new built-in data conversions.
- The addition of an API to convert Markdown to HTML using a new procedural language SQL (PL/SQL) Markdown parser
- Improvements to reporting including Lazy Loading capabilities and support for PDF exports in Hebrew and Arabic.

The Oracle APEX low-code platform provides broad development capabilities catered to both experienced developers and non-technical users. APEX's extensive data management, security, and extrapolation continue to drive value for users, securing its role as an expert. We expect APEX to further invest in third-party integrations and AI-enhanced functionalities with the eventual result of improving positioning in the LCAP space.

SERVICENOW

ServiceNow is an expert in the 2021 edition of the LCAP Technology Value Matrix with its flagship offering, the Now Platform. This cloud-based platform connects people, functions, and systems from across a user's organization to enable process automation and optimization, system integrations with the IntegrationHub, and application development via the ServiceNow App Engine. The Now Platform has pre-built applications to support IT, HR, customer service, legal and finance workloads. Beyond these out-of-the-box offerings, the Now Platform also provides low-code tools to accelerate new app development across IT, employee, and customer workflows. Customers can leverage a variety of development tools,

including Studio IDE to create and manage web-based and mobile apps, the Automated Test Framework to simplify and accelerate app testing, the Guided App Creator to facilitate development for non-technical users, and the Flow Designer to create process flows in a natural language environment. Overtop of these developer tools, ServiceNow customers can access AI and analytics tools for anomaly detection, predictive modeling, peer benchmarking, and performance forecasting using Now Intelligence.

Since the 2020 edition of the LCAP Technology Value Matrix, ServiceNow has extended the value proposition of its Now platform through organic development and acquisitions. In March 2021, ServiceNow released the Quebec upgrade to its Now Platform for general availability bringing improvements to the platform's no/low code app development capabilities. This update enhanced the App Engine by streamlining script debugging using the Script Trace and adding flow templates and the best practice app to shorten development timelines. No/low code virtual agents, AI search, and chat were added to the Now Platform's Engagement Messenger advancing customer self-service. The Quebec release also extended Now intelligence with easily configured AI search, chatbots, and natural language query. Other improvements to the Now Platform include the addition of bi-directional integrations and ETL nested payment support to IntegrationHub, optimization of IT workflows, configure management database (CMDB) and common service data model (CSDM) synchronization, and management of IT services, operations, and assets. ServiceNow also added several capabilities to its Now Platform through the following acquisitions:

- Swarm64, which boosts PostgreSQL query performance with its flagship offering, the Swarm64 Database Accelerator. This acquisition improves ServiceNow's value proposition to companies running complex queries in object-relational databases.
- Lightstep, which uses distributed tracing and metrics to understand and resolve bottlenecks to application performance, reliability, and development. This move improves ServiceNow's IT service management by enhancing visibility into organizational silos and continuous integration/continuous delivery (CI/CD).
- Intellibot, an India-based robotic process automation (RPA) vendor. This acquisition brings further integration of legacy and modern systems to ServiceNow customers while adding repetitive task automation and actionability to the Now Platform.
- Element AI, an artificial intelligence company bringing data science expertise to accelerate AI innovation within the Now Platform. This acquisition particularly benefits Now Intelligence with expanded AI-powered chat, search, and prediction.

By leveraging the Now Platform's no/low code development tools, common tasks and processes can be automated without the need for experienced developers. This allows IT departments to focus their resources on more complex programming and development

tasks. These no-code capabilities accelerate time to live while improving user productivity and eliminating IT intensive labor. ServiceNow's organic development of existing capabilities and expansion into other no/low code areas such as RPA furthers the value proposition for service-based businesses. Over time, Nucleus expects this growth plan to be represented with improved positioning in future editions of the LCAP technology value matrix.

FACILITATORS

Facilitators in the LCAP Technology Value Matrix include BettyBlocks, Creatio, Oracle Visual Builder, and Salesforce App Builder.

BETTYBLOCKS

Betty Blocks is a facilitator in this year's LCAP Value Matrix. The Betty Blocks low-code development platform provides non-professional developers an intuitive UI to build and deploy business applications at an accelerated pace. The vendor's platform is delivered via SaaS and is entirely browser-based, which does not require any installation, enabling users to get started as soon as possible.

One of Betty Block's core value propositions lies in its extensive library of modules, called "Blocks" per company namesake. The blocks simplify complex algorithms into small drag-and-drop modules, which can be strategically placed into the development flowchart. An organization can replace most of its IT legacy systems with a citizen development approach by utilizing the platform's front-end UI tools, workflow builders, and back-end connectors, and process automation tools. Users are empowered to reuse data models from previous applications to develop new ones, which saves time significantly. Betty Blocks enables customers to choose between public or private clouds to run their applications on.

The vendor is continuing to expand its network of partners and library of connectors to further its platform capabilities. For example, Betty Blocks recent partnership with SoftwareONE facilitates the data migration from SAP's on-premises solution to AWS cloud, by building new applications that are available as a desktop version, as well as a browser version, to transfer on-premises information into the cloud.

The LCAP platform offers a hybrid development approach, which lets professional developers write custom-code and create any unsupported connections. The simple UI offers an attractive value proposition for customers that do not require a full suite of solutions for every segment of their organization but target specific pain points with in-house applications. Betty Block's continued investment in its capabilities and partnerships

prepares the vendor to compete with larger LCAP providers. Nucleus believes Betty Blocks is heading in the right direction to become a leader in the coming years, as usability and functionality improvements keep developing.

CREATIO

Creatio is a facilitator in this year's LCAP technology Value Matrix with its low code platform, Studio Creatio. This platform enables organizations of all sizes to automate business processes and build custom applications without the need for IT expertise. Creatio also offers prebuilt solutions for marketing, service, and sales with industry-specific solutions for financial services, public sector, telecommunications, professional services, media and advertising, manufacturing and distribution, transportation and logistics, pharma and retail.

Although Creatio offers many out-of-the-box functionalities, its low-code platform allows non-IT users to build custom applications bridging any gaps in an organization's technology stack. With a foundation and history as a CRM provider, Creatio's most common use cases center around automating sales and customer service processes. Creatio's business process management platform features a breadth of capabilities, including process monitoring and in-depth performance analytics, no/low code process design and execution, dynamic case management (DCM) for unstructured processes, and a ready-to-use process library to store processes and workflows. Creatio also facilitates non-technical intelligent app development without extensive coding and data wrangling using built in native artificial intelligence and machine learning capabilities.

Since the 2020 edition of the LCAP Technology Value Matrix, Creatio has extended the value proposition of its low-code platform through organic development and partnerships. In 2021, Creatio released its 7.18 update improving the platforms low-code capabilities with new tools and extended existing offerings including:

- Homepages, which brings no-code customizable dashboards and KPIs to sales, marketing, and service workplaces. Users can also set up homepages as they develop new workplaces using the same no-code homepage customization tool.
- Batch data prediction which leverages machine learning processes to facilitates classification of opportunity category based on patterns within the existing data. Creatio pairs this with visibility of key words and phrases with high influence extending prediction transparency.
- Process to role assignment, which uses custom no-code tools to delegate tasks to select users who are a member of a given role. This promotes efficient task distribution and streamlines workflows.

With various pre-built templates and no/low code tools, Creatio enables businesses to drive efficiency in their common workflows while minimizing required technical expertise.

Customers have cited value with Creatio's rapid deployments relative to other enterprise-scale solutions. By focusing on no/low code offerings for CRM and BPM solution classes, Creatio has built an established foundation of services. Over time Creatio intends to build upon this foundation by extending its no/low code offerings into other verticals and markets. As further functional areas and industries are supported, we expect Creatio to improve its position in future editions of the LCAP Technology Value Matrix.

ORACLE VISUAL BUILDER

Oracle's Visual Builder is recognized as a facilitator in the 2021 LCAP Technology Value Matrix. This cloud-based software development platform specializes in visual tools and user experience complimenting Oracle APEX's low-code data management and modeling capabilities. Oracle Database customers can leverage both Oracle LCAPs in unison to maximize adjacency benefits. Oracle cloud service customers can create web-based and mobile front-end applications using Oracle Visual Builder and develop back-end data management, modeling, and REST API connections with Oracle APEX. Oracle Visual Builder enables experienced developers and technical business users to extend existing Oracle cloud applications and rapidly develop new applications with pre-built templates, drag-and-drop page design, and WYSIWYG interfaces. Customers also see value in the business rule development native to Oracle Visual Builder. With this capability, users can validate business objects with simple rules or complex logic featuring conditional action triggers in response to events or field changes. Visual Builder customers can also build in microservices offered by other vendors using REST APIs. Visual Builder also offers two-way editing with no-code tools and direct access JavaScript code using the Oracle JavaScript Extension Toolkit. By leveraging organic connectivity with Oracle's ERP systems and other Oracle Cloud applications customers can maintain a consistent user experience and achieve high returns on their data. This native integration also enables users to extend the value proposition of their existing Oracle investments, including HCM, ERP, and customer experience solutions.

Oracle released multiple updates to its Visual Builder over 2021, including the latest 21.10 release in August. Platform improvements include:

- Enhanced page flows displaying the hierarchical structure of an applications data and page flows with redesigned page flow diagrams using the Redwood design language.
- Individual JSON files for each action chain, improving performance and decreasing Git merge conflicts while automatically transferring depreciated actions to new enhanced ones.

- Updated business objects with adjustable overrides for Groovy timeouts, performance tracing for REST requests, and streamlined formulas and aggregation functions.
- Oracle JET dynamic tables, forms, and containers giving customers conditional display at runtime control.

Nucleus observes that the complimentary Visual Builder and APEX's LCAPs use provides users with the consistent experience, easily digestible usability, and functional depth to create market-leading enterprise applications.

SALESFORCE APP BUILDER

Salesforce App Builder is a facilitator in this year's LCAP Value Matrix. App Builder provides an intuitive user interface (UI) to develop new applications with point-and-click tools. The apps can be easily integrated with the Salesforce CRM system and other applications via pre-built API connectors. App Builder, available as part of the Salesforce Platform, is complemented by a comprehensive set of low-code solutions to support the entire DevOps cycle. Solutions such as Process Builder and Lightning flow for workflow design, mobile app development tools, and Lightning Object Creator to transform spreadsheets into custom objects are often used with App Builder to develop complex applications for large enterprises.

At Dreamforce this year, Salesforce announced several 2022 roadmap updates that will improve the functionality and usability of its platform for low-code app development:

- Multi-Object Pages will provide a point-and-click tool to place relevant objects and fields into one page, thereby eliminating the need to flip between records to view or edit information.
- Admin Filterable Related Lists will allow users to view multiple related lists with different scopes to organize and find relevant information faster.
- App Builder for Slack provides no-code app development tools and the ability to bring Salesforce data into the Slack environment.
- Code Builder Powered by AWS will bring no-code development into the web browser for developers to build apps, extensions, and integrations from anywhere.
- Salesforce Functions will allow developers to build reusable custom logic that can be released to all users with just a few clicks. Developers will also have the option to write functions with the coding language of their choice.
- CLI Unification, in beta now, will provide the 'sf' executable that will allow developers to incorporate commands for cross-Salesforce app development and deployment.

With executables that are interoperable across Salesforce's many solutions, developers can leverage a single toolset across different environments without the need for reworking scripts or switching languages.

App Builder's developer framework includes numerous components, acting as widgets, that can be integrated into the workflow and application process. App Builder can also be used in combination with Schema Builder, the data modeling tool, and Community Builder, the website and customer portal development tool. The LCAP platform provides comprehensive data import, flow creation, app development, and AI capabilities.

- A variety of data points can be imported from numerous sources, such as third-party applications via API connectors, Heroku Connect's bi-directional database, and private and public clouds.
- With the drag-and-drop interface, users can create the business logic to automate workflows. For example, a developer can include in the application a process to automatically configure the price, based on a customer's input.
- Einstein, Salesforce's proprietary AI technology can be integrated into the app development process. AI models with prediction capabilities can be specified, such as the risk of cancellations based on a customer's selected product attributes.
- All apps developed with the App builder are by default mobile-native but can be viewed on a desktop version. With further enhancements to the mobile app building capabilities, users can update record pages, page templates, and component visibility rules on their phones.

One of the core value propositions of Salesforce's App Builder is its developer community. Citizen developers benefit from an extensive App Exchange platform, which includes thousands of other applications, components, connectors, and extensions that be seamlessly integrated into the application process. The web components are on an open-source framework, which enables developers to build components on any platform. The winter '22 release offers additional improvements to Salesforce's App Builder platform, which include messaging integration with service cloud, appointment distribution, and digital process automation (DPA).

With the recent MuleSoft and Slack acquisition for RPA and collaboration functionality, respectively, and expanding homegrown low-code toolset, Salesforce's ecosystem is a differentiator. Nucleus believes with new innovations to the low-code platform, in combination with the expansion of the developer community, Salesforce App Builder will be used for an increasing range of industry use cases and challenge dedicated LCAP vendors.

CORE PROVIDERS

Core Providers in the LCAP Technology Value Matrix include Google AppSheet, OpenBots, QuickBase, and TrackVia.

GOOGLE APPSHEET

Google AppSheet is a core provider in this year's LCAP Value Matrix. AppSheet is a no-code application and automation development tool available as both a standalone product and for existing Google customers. Users can choose between different starter, core, and enterprise versions, which offer different capabilities, such as advanced data authentication, governance, and automation tools, depending on the requirements of the organization. With the intuitive user interface (UI), users can develop apps without any code, utilizing the platform's intelligent, data-driven approach. Unlike a drag-and-drop platform, AppSheet leverages AI and ML by ingesting connected data sources, analyzing data schemas, and producing a prototype for customization within a matter of moments. Users are equipped with data modeling, customizable UI/UX, behavior configuration, and security tools.

- The data section enables citizen developers to choose from a variety of data sources, such as Google Sheets, Excel, SmartSheet, and SQL databases. Once a database or data table is connected to AppSheet, users can define how the data is processed in the application. For example, users can specify input options, data types, validation rules, and functions to adjust how the app is using the information provided.
- With UX, users are equipped with customization tools to design the app layout. Developers have the freedom to change themes, colors, logos, arrange text fields, and include view types, such as calendars, maps, forms, and charts. In addition, the platform provides numerous pre-configured design templates that can be copied for use in an instant.
- Workflows and actions can be set up and automated in the behavior or automation sections. Users can define new actions for a variety of use cases. For example, an email that is automatically sent out when a customer registers on the app or a custom trigger that updates information when a specific button is pressed.
- With comprehensive security features, users can adjust authentication, application access control, data access control, and auditing options. This provides granular control on who has access to sensitive data within the organization, as controls can be configured based on individual user roles and specific data sets.

One of the core value propositions of Google AppSheet lies in its UI. Developers have a real-time preview of the app next to the editor and can see any changes they have made.

The mobile version is the default preview but can be changed with just a click to desktop or tablet preview as well.

Google AppSheet presents a good option for organizations that need a simple and rapid no-code solution, as it is easy to use and does not require a long implementation process. Nucleus believes the vendor needs to expand on its functionality to cover a greater amount of use cases and replace legacy point solutions.

OPENBOTS

OpenBots is a core provider in the 2021 edition of the LCAP Technology Value Matrix. Serving as an operating system for automation, OpenBots provides scalable RPA without restrictive per bot licensing. The vendor offers enterprise-class functionality with its low-code studio for RPA bot development, on-premises and cloud orchestration, attended and unattended bots, and process discovery and intelligent documentation tools. Using the OpenBots platform, customers can develop new process automations and manage existing RPA bots from multiple other vendors. Leveraging OpenBots' Element Recorder, users can capture HTML elements, CSS Selectors, and XPath's from browser applications to create a variety of automation scripts. With OpenBots Documents, customers can use intelligent document data extraction to automate model configuration, pre-processing, classification, extraction, and document validation from structured and unstructured documents across different formats. This OpenBots documents platform uses automated machine learning (AutoML) based model generation and auto-learning capabilities to streamline implementations by eliminating the need for large training sets and test datasets. Using OpenBots Business Center, organizations can configure functional workflows by stitching various bots and human tasks together to establish enterprise-level orchestration. The OpenBots Business Center also includes no-code tools for business logic enabling business users to manage business events and write event triggers without technical coding knowledge.

Over the past year, OpenBots added to its core offering extending the platforms ease-of-use and functional capabilities. OpenBots launched the following new offerings:

- OpenBots Cloud Server, which hosts, orchestrates, and schedules, RPA bots enabling users to instantly scale process automation tasks as needed.
- OpenBots Cloud Agents, enabling users to easily provision virtual machines in the cloud directly within OpenBots Cloud Server orchestration tool.
- UI upgrades to the OpenBots low-code studio with overviews of projects, commands, and prospective actions.
- Cross platform orchestration of RPA bots with support for Python and TagUI.

- A migration tool to convert UiPath automations to OpenBots automations.

OpenBots also extended its RPA development platform's core functionality through the acquisition of RPA-as-a-Service startup, MyOfficeBot. This deal provides OpenBots with pre-built templates for professional services, including accounting bots for invoicing, A/R, A/P, and reconciliation, HR bots for onboarding, payroll, and employee care, operations bots for account creation, data entry, and scheduling, and marketing bots for lead follow-up and analytics. As a result, OpenBots can deliver on short 2-month automation service contracts and generally provide customers with faster implementations.

OpenBots continues to expand the scope of its RPA bot development and management capacities to provide users with an operating system for process automation. OpenBots plans to expand its orchestration capabilities to include bots created via UiPath, Blue Prism, and Automation Anywhere. As these offerings are implemented, Nucleus expects customers to recognize further value from OpenBots' license-free RPA development model as will potentially be represented with improved placement in future editions of the LCAP Technology Value Matrix.

QUICKBASE

Quickbase is a core provider in the 2021 edition of the LCAP Technology Value Matrix. Quickbase caters to non-technical business users and professional IT staff enabling secure and sustainable application development. Business-level users leveraging Quickbase's customizable LCAP tools can derive actionable insights in real-time across multiple use-cases. By unifying processes under a single platform, Quickbase streamlines IT and citizen developer collaboration at enterprise scale while reducing IT ecosystem complexity. Quickbase customers can leverage Quickbase Pipelines' APIs to connect data, manage automated workflows, and visualize process dependencies in one central environment. As a result of this modern integration, Quickbase users also experience continuous deployments with real-time implementation of changes and updates to developed applications.

Since the 2020 edition of the LCAP Technology Value Matrix, Quickbase has improved its platform's UI and performance with monthly update releases throughout 2021. In January 2021, Quickbase extended its Pipeline API integrations to include Twilio, Google Contacts, Google Calendar, and Google Sheets. In February 2021, Quickbase introduced the My Pipelines page to organize and analyze each integration. Quickbase also added new Pipeline Channels for Google Docs, Google Drive, and Google Workspace. In March 2021, the platform added integration with Microsoft Teams, and bidirectional synchronization with files and folders within Microsoft SharePoint. In April 2021, Quickbase added usage pattern analytics to its LCAP platform capable of drilling down into individual applications and users. In May 2021, new dashboards were introduced to the LCAP platform featuring bubble, funnel, and area charts alongside summary reports. Quickbase's highly iterative

development drives value as customers have continuous access to modern integrations and development capabilities. As further analytics, integration, and automation functionalities are added to the LCAP solution, Quickbase will provide greater value to business users and IT staff promoting collaboration. We expect Quickbase to improve its position in future editions of the LCAP Technology Value Matrix as these expected improvements are implemented.

TRACKVIA

TrackVia is a no/low-code business application development platform serving to fill the gaps in an organization's tech stack and optimize business processes. Through TrackVia's online database platform, customers can deploy workflow management and automation software while orchestrating already developed applications. TrackVia's LCAP is code-optional with drag-and-drop configuration and integration for citizen developers and advanced coding tools for professional IT teams. Using these capabilities, TrackVia LCAP customers can digitize their operational processes and create applications for web and mobile deployment. TrackVia boasts API connectivity with existing ERP and CRM systems such as Oracle NetSuite and salesforce, and connections with over 300 external applications, including QuickBooks, Google web apps, Tableau, and financial systems. TrackVia provides developers with a sandbox environment to safely implement changes along with a pervasive security stack and certifications, including ISO 9001, ISO 27001, SOC 1/SAW 3402, SOC 2, and HIPPA compliance.

In August 2021, TrackVia launched a new Photo-to-App offering allowing users of any expertise level to convert a picture of a form into a functional application with centralized data storage, integration, and modern security. TrackVia is a core provider in the 2021 edition of the LCAP Technology Value Matrix. As TrackVia continues to develop improvements to overall functionality with expanded third-party integrations, data import and export, configurable workflows, and workflow management, Nucleus anticipates improved placement on future editions of the LCAP Technology Value Matrix.