

Deciphering Low-Code/No-Code Hype – Study of Trends, Overview of Platforms, and Rapid Application Development Suitability

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Abstract- Low Code and No Code (LCNC) are platforms that allow for the development of software application with little to no coding. These platforms are latest on the block and are surrounded by a large amount of buzz. This paper analyses the LCNC trends, overview of common platform features, and its suitability for Rapid Application Development (RAD).

Index Terms- Low-Code, No Code, LCNC, System Implementation, IT Process Management, Architecture and Technology Strategy, Digital Transformation, Leading IT Trends, Packaged Solution, Modern Platforms, Citizen Developer Tools, Automation, Rapid Application Development, Rapid Prototyping.

I. INTRODUCTION

Digital strategy is at the core of every organization's growth and customer experience journey. This strategy is enabled by developing and timely delivering software applications to support the digital vision. Most businesses have complex and evolving software application needs that are historically supported by the organization's Information Technology (IT) departments. The reliance on IT has been due to their technical expertise which also meant that organizations have to compete internally for a narrow pool of resources. Even if the IT resources are secured, the traditional Waterfall based Software Development Life Cycle (SDLC) approach involves long cycle of requirements gathering, application design, development, and UAT before being deployed to the end user. IT resource crunch along with a long SDLC has been the Achilles heel for the organizations to innovate at speed.

In early 2000, the Agile Manifesto [2] was created by a group of 17 industry thought leaders which supported Rapid Application Development [2] by shifting away from Waterfall to Scrum/Agile using iterative SDLC concepts. Even with this shift in SDLC, the reliance on IT within an organization has been persistent. LCNC has the potential to reduce this dependency by providing an integrated software development environment with a user-friendly interface that supports rapid application development. The degree of "coding" for developing applications on these platforms depend on the type of vendor selected and the

baseline expectation is support for dragging and dropping configuration widgets and UI components. As a result, non-IT resources also referred as "citizen developers" [3] are able to learn these LCNC platforms for developing applications in conjunction or independently of the organization's IT, thereby reducing the tactical reliance on IT with an estimate of making application development to be 10 times faster [4] than traditional code-based development. This is an evolving space already being flooded with a large list of vendors with key themes, trends, platform features, and insights on RAD suitability starting to emerge.

II. KEY LCNC TRENDS AND THEMES

As part of LCNC trends, the current global LCNC market and its outlook is assessed to validate if the hype truly holds true. Additionally, a select pool of vendors is narrowed down to evaluate them against each other.

A. Market Growth Indicator

Per the 2020 Grandview Research [5], LCNC market is expected to grow at a CAGR of 22.7% form 2020 to 2027 and cross \$21B in 2021. By the year 2027, this is predicted to be a \$86.9B industry with close to even split between On Premise and Cloud based LCNC platforms.

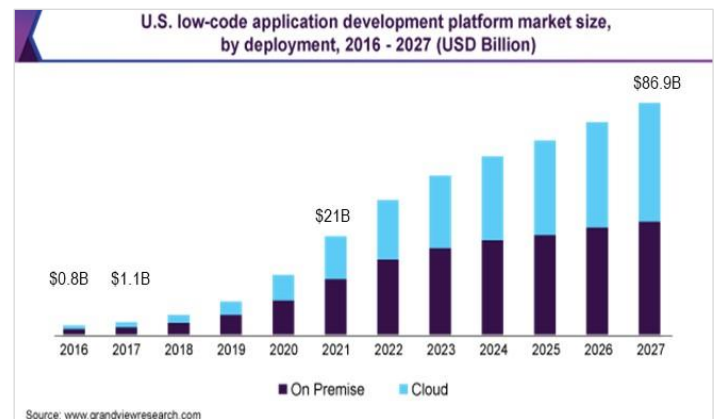


Fig. 1 Projected Low-Code Development Platform Market Growth.

B. Comparison of LCNC Growth with Other Leading Technology Trends

For the purposes of this analysis, LCNC growth is compared against AI, Blockchain, Edge Computing, and RPA. Also, to ensure research consistency, the analyses refer market reports from a common vendor. [5],[6],[7],[8],[9].

* Market Size for 2027

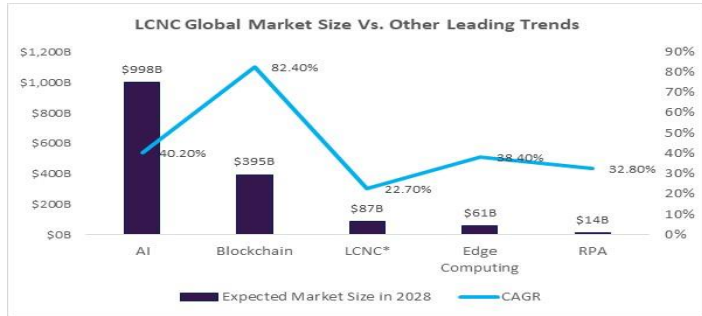


Fig. 2 LCNC Global Market Size Vs. Other Leading Trends.

While the growth for LCNC has been unprecedented, it fairs moderately when stacked against other leading technology trends. In fact, the CAGR for LCNC is the lowest at 22.7% when compared to others signifying interplay with other trends e.g., AI and RPA platforms potentially chipping away some of the LCNC market cap.

C. Leading LCNC Platforms Based on Analyst Reports

Over 300 vendors are estimated [10] to cater the LCNC market. While it is not possible to cover all of them, some of the vendors repeatedly rise above the others in the pack across the 3 analyst reports. The below table illustrates these select leading LCNC vendors [5], [11], [12].

LCNC Vendors	Forrester's Report	Gartner's Report	Grand View's Report
Appian	Strong Performer	Leader	Prominent Player
Mendix	Leader	Leader	Prominent Player
Microsoft Power Apps	Leader	Leader	Prominent Player
OutSystems	Leader	Leader	Prominent Player
Pegasystems	Strong Performer	Visionary	Prominent Player
Salesforce	Strong Performer	Leader	Prominent Player
ServiceNow	Leader	Leader	Prominent Player

Table. 1 Leading LCNC Platforms.

D. Funding & Market Capitalization of Leading LCNC Vendors

At least \$800M+ is raised by group of vendors listed below. [13], [14], [15], [16], [17]

LCNC Vendors	Funding Raised	Market Cap
Appian	\$48M	\$9.5B
Mendix	\$38M	\$0.7B
Microsoft Power Apps	N/A	N/A
OutSystems	\$572M	\$9.5B
Pegasystems	N/A	\$11.0B
Salesforce	\$65M	\$230.0B
ServiceNow	\$84M	\$110.9B
	\$807M	\$361B

Table. 2 Funding and Market Capitalization of Leading LCNC Platforms.

Market Cap is based on the stock price on July 7th, 2021 for publicly traded firms. Since Mendix and OutSystems are not traded, valuation is used for comparison purposes [18], [19]. The total valuation of this pool of vendors exceeds \$361B. This number will be significantly higher when factored for the 300 vendors estimated [10] to cater this segment and will significantly flood the market. Even with a medium to high CAGR of 22% (Fig 2), LCNC platforms will need to stay laser focused on their product and market execution strategy to avoid losing on growth and staying relevant.

E. Industry Demographics of the Leading LCNC Vendors

Conceptually, LCNC can be industry agnostic however some industries have a higher propensity for being able to leverage these platforms due to existing legacy technologies that need to be wrapped around LCNC for creating new application or their higher appetite for innovation. This combined with sales and marketing focus of LCNC vendors paint the picture for their industry alignment. The below table is indicative and based on the population of reviews provided for these vendors by their customers. [21], [22], [23], [24], [25], [26].

	Industry Demographics				
	Services	Financial Services	Manufacturing	Healthcare	Other
Appian	16%	40%	7%	6%	31%
Mendix	32%	17%	20%	2%	29%
Microsoft	20%	12%	20%	5%	43%
OutSystems	27%	21%	10%	7%	35%
Pegasystems	N/A	N/A	N/A	N/A	N/A
Salesforce	30%	15%	19%	8%	28%
ServiceNow	25%	17%	12%	12%	34%

Indicates vendor with highest demographic focus

Table. 3 Industry Demographics of Leading LCNC Platforms.

	Geographic Demographics			
	North America	Europe, Middle East, & Africa	Asia/Pacific	Latin America
Appian	49%	31%	16%	4%
Mendix	28%	63%	7%	2%
Microsoft	37%	28%	26%	9%
OutSystems	28%	50%	16%	6%
Pegasystems	N/A	N/A	N/A	N/A
Salesforce	52%	24%	16%	8%
ServiceNow	49%	18%	25%	8%

Indicates vendor with high demographic focus

Table. 4 Geographic Demographics of Leading LCNC Platforms.

Services, Finance, and Manufacturing are three primary sectors providing traction to LCNC based on Table 3. From a geographic standpoint and referring to Table 4, Appian, Salesforce, and ServiceNow command the North American Market and are USA headquartered. OutSystems originated in EMEA which led to their stronghold in this region. Microsoft on the other hand has more of a distributed hold across both the industry and geographic demographics. The above tables are indicative and based on the population of reviews provide for these vendors by their customers. [21], [22], [23], [24], [25], [26].

III. LCNC PLATFORM OVERVIEW

A. Key LCNC Platform Features

There are few common native core features that most LCNC platforms support. The maturity levels of these features do vary based on the platform selected. Below is the high-level overview of these:

- 1) **Developer studio or workbench** – An Integrated Development Environment (IDE) that allows developers to interact with the LCNC platform to build applications.
- 2) **UI components and widgets** – UI screen elements and widgets for visualization that can be dragged and dropped along with ability to modify HTML and CSS if needed.
- 3) **Data integration** – Tools for integrating, transposing, and orchestrating the exchange with internal and external data sets.
- 4) **Workflows and rules** – Configurable workflow and rules that allows for application to hand off with either other parts of the application or amongst application users.
- 5) **Process automation** – Bots and Robotic Process Automation capabilities for assisting with manual and repeatable processes
- 6) **Testing and deployment management** – Tools for application administration, unit, functional, and integration testing, and deployment.
- 7) **Application governance** – Super admin user tools for roles-based access management, security settings, privacy management, data oversight, performance monitoring, audit logging, and reporting.

B. LCNC Representative Technology Components and Stack

Features needed to enable the LCNC platform are supported by an array of technology stacks. These are often a combination of open source and licensed technologies which vary from vendor to vendor.[27], [28], [29].

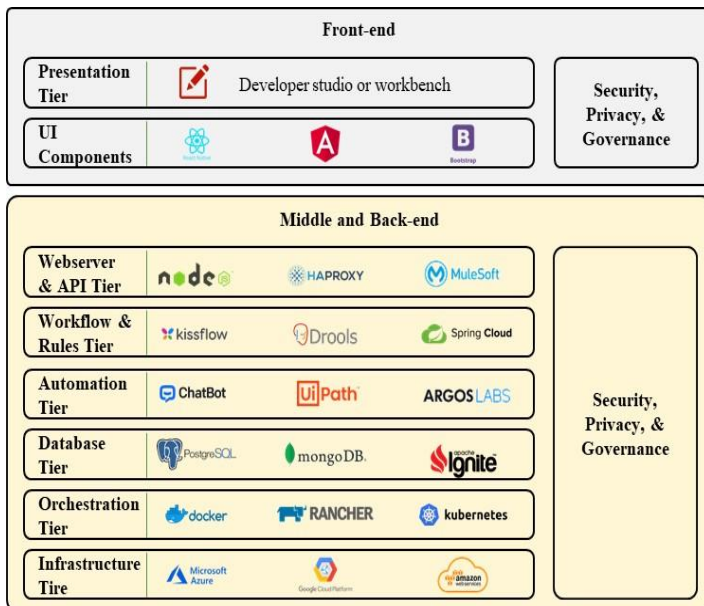


Fig. 3 LCNC Representative Technology Components and Stack.

IV. LCNC AND ITS SUITABILITY FOR RAPID APPLICATION DEVELOPMENT (RAD)

A. LCNC Synergies with RAD

The term Rapid Application Development (RAD) [2] was coined by James Martin in his book Rapid Application Development (RAD). This is an application development lifecycle designed to give much faster development and higher-quality results than those achieved with the traditional lifecycle. The advent of LCNC platforms enable this type of modern application development methodology due to complementary synergies mainly due to following reasons:

- 1) Learning curve to start building applications is compressed and typically in weeks.
- 2) LCNC platforms provide an integrated environment to the user that encompasses all the needed technology stacks, which the developer does not need to manage and maintain.
- 3) User story to application build and deployment can be done by a lean self-sufficient team with limited technical expertise vs. heavy reliance on IT.

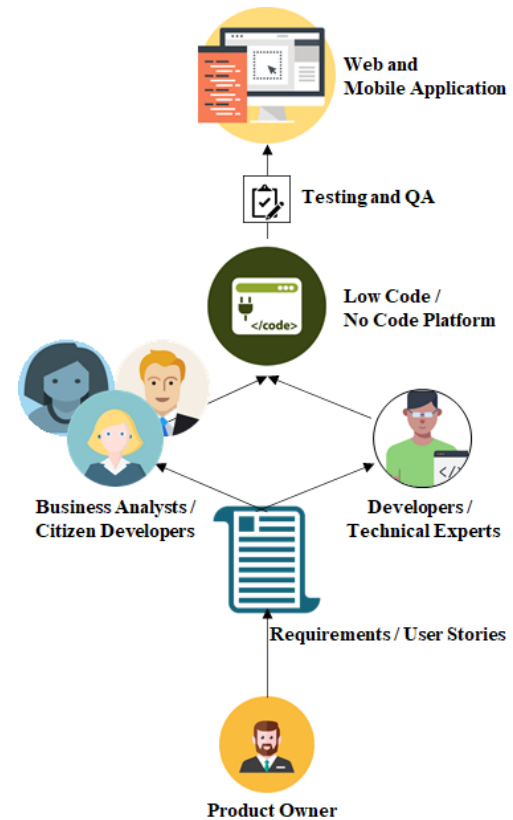


Fig. 4 Lean and Self-Sufficient LCNC Development Team.

- 4) Hybrid agile style iterations [30] to develop the application with certainty and specified timeline is possible due to reduced resource constrains as citizen developers shoulder the heavy lifting while doing so in a shorter build, test, and deployment cycle.

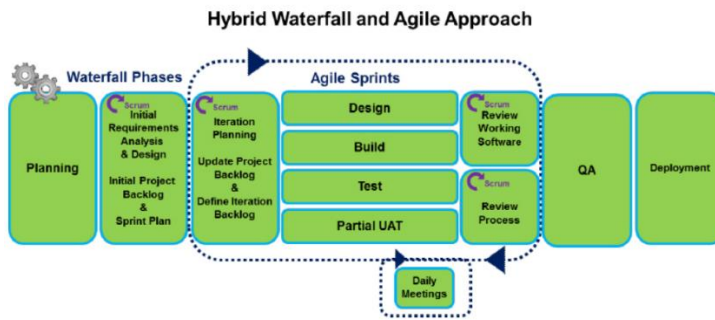


Fig. 5 Hybrid Agile Approach for LCNC Development.

B. LCNC Program Blind Spots to Consider While in RAD

While there is strong market demand for LCNC platforms and a great synergy for RAD, there are few blind spots that every LCNC program will need to navigate. These are:

- 1) Ensuring the platform fits the objectives and provides scale. Given the over 300 vendors [10] in this space, it is necessary that appropriate vendor selection is done so avoid future regrets.
- 2) Not compromising on the security of applications built using LCNC. This becomes increasingly critical during RAD as the focus is on building applications vs. making them secure and safe.

V. CONCLUSION

By 2024, 75% of large enterprises will be using at least four low-code development tools for both IT application development and citizen development initiatives [31]. This along with other trends discussed in this paper points to LCNC being more than a hype; it is here to stay and will be the new normal for application development. Also, business can successfully adopt these LCNC platforms for RAD with a hybrid Agile model proposed in this paper. In doing so, it is also necessary to understand the complex architecture that underline these platforms and plan for navigating some of the blind spots so the application design, delivery, and deployment is holistically successful.

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