

Empowering Innovation: How Low-Code and No-Code are Changing the Tech Landscape

Sneha Singha
Assistant Professor
(Department of Computer Science Engineering)
MIT Art, Design and Technology University
Pune, India
singhasneha@gmail.com

Ruchita Sharma
Assistant Professor
(Department of Computer Science Engineering)
MIT Art, Design and Technology University
Pune, India
11ruchitasharma@gmail.com

Abstract— In the midst of the huge growth of the large number of companies spending millions in the digital evolution for business stability, especially after the crucial time of COVID-19 crisis, Low Code-No Code (LCNC) platforms gain an unexpectedly huge momentum to reduce the extensive development cycles in order to build new applications that would help meet business requirements. The modernization and digitization of technology is rapidly growing at a remarkable rate, however, there lies a vast gap between the requirement and recruitment of skilled professionals. The scarcity of proficient developers poses a significant obstacle to the rapid pace of application development projected in the coming years. Estimates from the Institutional Development Cell suggest that over the next few years, the industry could witness the creation of more than 500 million apps, further exacerbating the demand-supply gap in skilled talent.

In application development, technology is the new paradigm which reduces or eradicates the necessity for coding. This survey paper analyses the current state of LCNC and its upcoming potential in multiple industries primarily in technology, healthcare, academia and manufacturing. It presents the popular existing LCNC platforms and emerging concepts capable of automating businesses, providing seamless customer experiences, and better workflow integration, among others. Studies indicate that the demand for app development services is poised to surge significantly faster than the IT industry's capacity to meet it. Consequently, there's a looming risk of IT projects facing prolonged delays or even being shelved due to resource constraints.

Keywords— LCNC, Technology, IT Sector, Industry, Education, Academia, Business, App Development, Coding

I. INTRODUCTION

It is estimated that over 500 million applications have already been developed and deployed throughout the world due to the surge in software applications. However, the introduction of Low code/No-code development platforms has provided an amicable solution to business requirements at a much reduced cost contrary to the traditional development techniques and comparatively, is faster as well. [5] Using predefined modules and a simple, drag-and-drop interface to create the process models and app framework facilitates the deployment of the application, making it easier to use, faster, and extensible. New platforms were necessary to improve the

use of these applications, which led to the development of Low-code and No-code development platforms.

[4] According to Forrester, 'Low-code' refers to an environment that emphasizes simplified growth and ease of use. Low-code development is a software development platform which requires minimal amount of coding expertise. It makes use of Graphical User Interface (GUI) where the feature of drag and drop operation is used. As a result of low-code development, business applications are able to be enhanced faster by reducing the coding time. The main benefit of No-Code development is its ability to reduce deployment and maintenance costs.

In addition, No-code Development is a platform for developing applications without coding. In order to build the applications, users do not need any coding experience. The language is closely related to visual programming languages and allows both programmers and non-programmers to create software applications.

Due to the speed and agility it provides for businesses, No-code development is in high demand. It has become one of the most advanced platforms to develop applications by overcoming the traditional limitations.

Below we will provide an insight in the impact of LCNC in various fields, primarily technology, healthcare, academia and manufacturing. The formatter will need to create these components, incorporating the applicable criteria that follow.

II. LITERATURE SURVEY

No code and low code are terms used to describe software development approaches that don't require coding skills. Their purpose is to enable citizens, business analysts, and other non-technical users to develop applications without learning traditional programming skills. The following is a literature review on low code and no code.

The book "No Code: How to Build a Product without Writing Code" by Ryan Hoover is a comprehensive guide to creating products without writing code. The book covers no code's benefits and limitations, how to choose the right tool for your project, and what best practices to follow when building a successful product.

The report "Low-Code Development: The Future of Enterprise Software?" by Forrester Research provides an in-

depth analysis of the low code development market, including its growth potential, key vendors, and adoption trends. A low code approach is also discussed, as well as its benefits and challenges. Several recommendations are provided for companies considering a low code approach.

The Gartner report "The Rise of No-Code/Low-Code Development Platforms" summarizes the market for no code/low code development and its potential impact on enterprise application development. A vendor landscape analysis is also included, as well as recommendations for organizations looking to adopt such platforms..

According to Harvard Business Review, "No-Code Movement: Future of Enterprise Software?" explores what the No-Code Movement might mean for traditional software development in the future. There is a discussion of the benefits and challenges of no code, as well as examples of companies that have adopted it successfully.

TechTarget's article "Low-Code/No-Code Platforms: A Primer" provides a comprehensive overview of these platforms, their key features, benefits, and limitations. In addition, the article discusses the future of these platforms as well as a list of popular vendors.

The article "Low Code vs No Code: What's the Difference and When to Use each" by Medium provides a clear explanation of the differences between low code and no code, as well as their target users and capabilities. Several examples of no-code and low-code platforms are included as well.

[2] There are many benefits offered by LCNC that could be helpful in finding solutions to issues in all fields of study. In their areas of expertise, researchers from all regions carry out significant evaluation. A variety of AI-based totally algorithms frequently need to be used in scientific studies in order to conduct critical evaluation. The LCNC platforms enable scientists and researchers across disciplines to easily test AI-based algorithms on their data to uncover crucial insight. The researchers and scientists no longer want to be programmers or statisticians in order to use AI-based entirely algorithms. Citizen developers can perform complex AI-based analysis including regression, CNN, clustering, decomposition analysis by using the drag-and-drop capabilities of LCNC systems.

As a result of the literature survey, it appears that low-code and no-code are fast-growing areas in software development, which has a significant potential to transform the way applications are developed and deployed. Nonetheless, these approaches have challenges and limitations, so organizations should carefully evaluate their needs and goals before adopting them.

III. LCNC ON DIFFERENT SECTORS

A. Technology Industry

[3] The need for digital transformation on the part of businesses gives Low/No-Code development a chance to demonstrate its value. The requirements for business applications will become more specific and complex as digital transformation progresses. Although LNC has advantages that enable businesses to swiftly respond to industry trends, LNC platforms lack flexibility and customizability. Data breaches and the difficulty in accessing the source code raise security concerns, but LNC provides secure building blocks that can be used to create secure applications. Maintaining LNC

applications should be simple despite the fact that there is little to no code to maintain, and vendor lock-in occurs when platforms are no longer supported by providers. Contradictions like these suggest that LNC might be advantageous and that there is room for advancement in LNC technology. We discovered that AI and ML are essential for enhancing current LNC technology after conducting an analysis of the market's leading LNC platforms. Additionally, it is a key for converting Low-Code to No-Code. Chris Wanstrath suggested that in the future, people could focus on high-level software prototyping and design rather than writing lines of code and squandering a lot of time on implementation details. When robust coding AI and ML technologies collaborate with Low/NoCode technology, such a future will occur. Children, students, professional developers, and non-IT employees are among the many potential users of LNC platforms. The community ought to be extensive as well, given that it has such a diverse user base. The community of users guarantees that it will always be improved to meet the needs of users. Although Low/No-Code Development only became popular a few years ago, the adoption rate is rapidly rising, pointing to a bright future. For papers with more than six authors: Add author names horizontally, moving to a third row if needed for more than 8 authors.

To overcome the drawbacks and difficulties associated with the current LNC technology, researchers all over the world should conduct additional evaluations and research. LNC platform providers can work with businesses to improve their platforms. A better user experience is not only for providers but also for organizations.

B. Education Industry

[1] As a result of COVID-19, the education sector has been affected dramatically all over the world. Educational institutions have been forced to quicken their digital transformation as a result of the necessity to use technologies to deliver online learning.

Yet, the abrupt closure of educational institutions and the absence of planning for such a situation created previously unheard-of difficulties for educational systems in managing the transformation of digital learning. Furthermore, practical solutions were harmed by the time-consuming process of designing software applications. Citizen Development (CD), a company that uses low-code/no-code (LCNC) platforms, gives users who know little to nothing about coding languages simple, quick tools for creating software applications.

Low code and no code platforms are also having a significant impact on the education industry, by enabling educators and students to quickly and easily create and deploy digital learning tools, applications, and systems without requiring extensive programming knowledge. Here are some of the key impacts:

Increased Access to Technology: Low code and no code platforms can help to bridge the digital divide by providing educators and students with the tools they need to create and access technology-based learning resources. This can help to make education more accessible and inclusive for students who may not have access to traditional technology resources.

Increased Collaboration: Low code and no code platforms can enable educators and students to collaborate more effectively on digital projects, by providing a common

platform for sharing information and working on projects in real-time.

Customization: Low code and no code platforms can help educators to customize their digital learning tools and resources to better meet the needs of their students. This can lead to more engaging and effective learning experiences for students. [8] No-code platforms can be utilized more widely to assist students in practicing Agile without the added pressure and time commitment of learning a traditional programming language.

Improved Efficiency: Low code and no code platforms can help educators to create digital learning tools and resources more quickly and efficiently than traditional programming methods. This can save educators time and resources, while also enabling them to create a wider variety of learning resources.

Innovation: Low code and no code platforms can help to promote innovation in the education industry by enabling educators and students to create new digital learning tools and resources that would not have been possible with traditional programming methods.

Low code and no code platforms are having a transformative impact on the education industry by making technology more accessible, collaborative, and efficient for educators and students alike.

C. Manufacturing Industry

Low-code and no-code platforms have the potential to change the way manufacturers work, allowing them to quickly build and deploy applications and systems with minimal coding and programming knowledge. This can bring many benefits to manufacturers, including:

Increased Efficiency: [9] Low-code and no-code platforms allow manufacturers to automate processes and workflows that would otherwise require significant manual effort. This increases efficiency and reduces errors and costs.

Improved collaboration: Low-code and no-code platforms can help manufacturers collaborate more efficiently by providing a common platform to share information and collaborate on projects.

Faster time to market: By reducing the time and effort required to develop and deploy applications and systems, low-code and no-code platforms can help manufacturers bring their products to market faster.

Increased agility: Low-code and no-code platforms can make it easier for manufacturers to adapt to changing market conditions and customer demands, allowing them to rapidly develop and deploy new applications and systems.

Reduce IT Costs: Low-code and no-code platforms can help manufacturers reduce IT costs by allowing them to develop and deploy applications and systems without deep coding and programming knowledge.

[7] The rapid changes in the market requirements necessitate rapid and flexible responses from companies and organizations, Low-code and no-code platforms have the potential to have a significant impact on manufacturing by providing more efficient, collaborative, and agile ways to develop and deploy applications and systems.

D. Service Sector

Low-code and no-code platforms are having a major impact on service industries including healthcare, finance, retail, hospitality, and more. Here are some key impacts:

Improved customer experience: Low-code and no-code platforms enable service providers to quickly develop and deploy new applications and systems that improve the customer experience. This can include chatbots, self-service portals, and other tools to provide customers with faster, more personalized service.

Improved Efficiency: Low-code and no-code platforms can help service providers automate manual processes and workflows, increasing efficiency, reducing errors, and reducing costs.

Customization: Low-code and no-code platforms can help service providers build custom applications and systems to better meet customer needs. This can lead to more personalized and efficient service offerings.

Faster Time to Market: Low-code and no-code platforms can enable service providers to quickly develop and deploy new applications and systems, which can speed time to market to market new products and services.

Innovation: Low-code and no-code platforms can make it easier for service providers to experiment with new ideas and concepts, leading to more innovation and creative problem solving.

Low-code and no-code platforms are helping to transform the service industry by enabling service providers to build new applications and systems faster and more efficiently while improving the customer experience and by stimulating innovation.

IV. FUTURE SCOPE

Because it can cut down on the time and money especially required for software development, low-code or no-code app development is a desirable option for businesses looking to meet modern demands with automation and accelerate digital transformation. However, low-code and no-code platforms will not be able to replace expert coders and traditional developers because they are typically limited to templates that lack flexibility and scalability. On some low-code development platforms, professional coding is also required to finish or customize an application. It would be interesting to conduct additional research on the viability of low-code in other industries and the higher education sector. Additionally, little research has been done on the long-term advantages of low-code implementation. As a result, we recommend that more research be conducted on the benefits realization management of low-code solutions. Our analysis of the impact of low/no-code development (LCNC) in all fields indicates that LCNC will play a significant role in digital transformation and bring about a turnaround in the software development industry, improving the customer experience and by stimulating innovation.

V. CONCLUSION

An overview of how Low Code No Code has begun a new era is provided in this survey paper. Businesses looking to speed up digital transformation and meet modern demands with automation should consider low-code or no-code app

development because it can cut costs and time typically required for software development. Additionally, it is possible that developing a low-code solution in a short amount of time would eliminate the majority of the manual processing steps, thereby reducing processing time while still maintaining a satisfactory overview.

According to our findings, low-code development platforms can make it possible for non-professional developers to contribute to the development of applications, thereby expanding the pool of people who can aid in the digital transformation. However, we contend that the majority of low-code development procedures continue to require IT specialists to manage the underlying IT infrastructure. We believe that higher education institutions can save money and time by working together on low-code projects. However, there may be barriers to this collaboration due to differences in work processes and information systems.

REFERENCES

- [1] Farhad Khosrojerdi, Hamed Motaghi, and Mohar Yusof, The Application of No-Code/Low-Code Platforms in the Sector of Education, *International Journal of Management, Accounting, Governance and Education*, Volume 1, Issue 2, 2021.
- [2] Fahim Sufi, Algorithms in Low-Code-No-Code for research Applications: A Practical Review, Monash University, School of Public Health and Preventive Medicine, Melbourne, VIC 3004, Australia, MDPI, Volume 16 Issue 2 10.3390/a16020108.
- [3] Zhaohang Yan, The Impacts of Low/No-Code Development on Digital Transformation and Software Development, University of Toronto, Canada, Volume 10 Issue 1 10.3390/app10010012, Dec 2021.
- [4] Shubham Ramesh Hedau, Prof. Omprakash Mandge (Jun 2021). Low Code & No Code Software Development of the future, *International Research Journal of Modernization in Engineering Technology and Science*, Volume: 03/Issue: 06/June-2021.
- [5] Shreyas Shridhar, Siddharth Bose (Dec 2021). Analysis of Low Code-No Code Development Platforms in comparison with Traditional Development Methodologies ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429 Volume 9 Issue XII Dec 2021.
- [6] Timothy C. Lethbridge, Low-Code Is Often High-Code, So We Must Design Low-Code Platforms to Enable Proper Software Engineering, *Leveraging Applications of Formal Methods, Verification and Validation*, 2021, Volume 13036, ISBN: 978-3-030-89158-9.
- [7] Hana A. Alsaadi, Dhefah T. Radain, Maysoon M. Alzahrani, Wahj F. Alshammari, Dimah Alahmadi, Bahjat Fakieh, Factors that affect the utilization of low-code development platforms: survey study, *Romanian Journal of Information Technology and Automatic Control*, Vol. 31, No. 3, 123-140, 2021
- [8] Mary Lebens, Roger Finnegan, Using a Low Code Development Environment to Teach the Agile Methodology, Volume 419, ISBN: 978-3-030-78097-5, Jun 2021.
- [9] Robert Waszkowski, Low-code platform for automating business processes in manufacturing, 2019.