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The Impact of Artificial Intelligence Enhanced No-Code Software Development Platforms on Software Processes: A Literature Review

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ABSTRACT

This literature review examines the impact of artificial intelligence-based (AI-based) no-code software development platforms on software processes. The study primarily focuses on accelerating software development processes, reducing costs, and optimizing business operations. Existing studies in the literature demonstrate how these types of platforms facilitate complex application development even for non-technical users and enhance time-cost optimization. This review highlights how no-code platforms have become more effective and efficient with AI-supported tools, transforming the current software development ecosystem. The article discusses the potential benefits and challenges of AI-based no-code platforms, emphasizing their promising future in the software industry.

Keywords: *No-Code, Low-Code, AI, Web development, Software development cost*

Yapay Zeka Tabanlı No-Code Platformlarının Yazılım Geliştirme Süreçlerine Etkisi: Literatür Taraması

Öz

Bu literatür taraması, yapay zeka (artificial intelligence – AI) tabanlı kodsuz (no-code – NC) yazılım geliştirme platformlarının yazılım süreçlerine olan etkilerini inceler. Çalışma, özellikle yazılım geliştirme süreçlerinin hızlanması, maliyetlerin azaltılması ve iş süreçlerinin optimizasyonu üzerinde durmaktadır. Literatürde yer alan mevcut çalışmalar, bu tür platformların teknik olmayan kullanıcıların bile karmaşık uygulamalar geliştirmelerini nasıl kolaylaştırdığını ve zaman-maliyet optimizasyonunu nasıl daha iyi hale getirdiğini göstermektedir. Bu inceleme, NC platformlarının, AI destekli araçlarla nasıl daha etkin ve verimli hale geldiğini, bu entegrasyonların mevcut yazılım geliştirme ekosistemini nasıl dönüştürdüğünü ortaya koymaktadır. Makale, AI tabanlı NC platformların potansiyel faydalarını ve karşılaşılabilecek zorlukları tartışarak, bu teknolojilerin yazılım endüstrisindeki gelecek vaatlerini vurgulamaktadır.

Anahtar Kelimeler: *Kodsuz, Az kodlu, Yapay zeka, Web geliştirme, Yazılım geliştirme maliyeti*

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I. INTRODUCTION

The world of software development, as a constantly evolving and transforming ecosystem, has become an inevitable necessity in every sector of today's business world. Especially digital transformation processes are rapidly increasing the software needs of businesses. Proportional to this need, the software industry reached a size of 565 billion dollars in 2019 and continues to grow exponentially. The growth graph is shown in Figure 1 [1]. Factors such as the widespread adoption of cloud computing infrastructures and the ability to reach cross-border customers through marketplaces have also triggered this growth in recent years.

The rapid growth of the sector and its contribution to many areas led to a significant increase in software costs. Many expense items such as resource requirements, license fees, development, support, and maintenance costs of software have become a major financial burden, especially for small and medium-sized enterprises (SMEs). In this context, no-code (NC) and low-code (LC) platforms have emerged as a great advantage, especially for Small and Medium-sized Enterprises (SMEs). By allowing users to develop applications with minimal technical knowledge, they significantly reduce software costs.

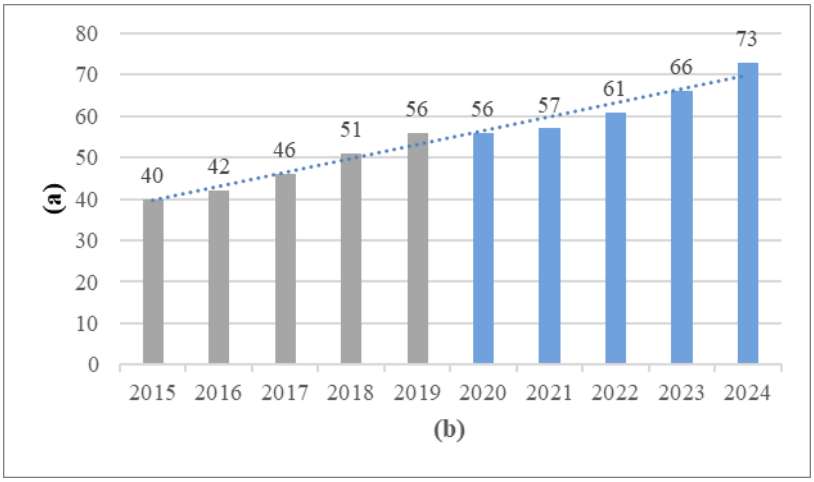

Figure 1. (a) *Market size in billion dollars and* ***(b)*** *Years for Software Industry Market Size, World Total, 2015-2024.*

According to Gartner's 2022 and 2023 reports, the usage rate of NC and LC platforms worldwide increased by 19.6% in 2022, and it is observed that the use of these platforms exceeded 20% by 2023. Moreover, according to Gartner's 2024 report, it is predicted that the low-code application development technologies market will reach 26.9 billion dollars [2].

The use of advanced technologies such as Artificial Intelligence (AI) and Natural Language Processing (NLP) in these platforms can further accelerate software development processes and significantly reduce costs. AI-based no-code/low-code (NCLC) platforms have the ability to understand commands given by users in natural language and generate code accordingly. In this study, the effects of NCLC platforms and AI support on software development processes, performance and cost benefits are examined in detail.

This paper makes several key contributions to the current literature. First, it provides a comparative analysis of AI-powered no-code/low-code platforms against traditional software development methods, focusing on their impact on efficiency, accessibility, and cost reduction. Second, it highlights the challenges of scalability, security, and sustainability in AI-enhanced platforms, offering guidance for businesses navigating digital transformation. Lastly, it identifies gaps in the existing research and suggests future directions for optimizing the integration of AI into no-code platforms, contributing to the ongoing development of this rapidly evolving field.

II. LITERATURE REVIEW

The literature review includes a comparative analysis of AI-based NCLC platforms with traditional software development methodologies and classical NC platforms. El Kamouchi et al (2023) conducted a systematic literature review on low-code/no-code development, providing an extensive analysis of its advantages and challenges in software processes [3]. This analysis reveals how AI support transforms software development processes and how these processes improve in terms of cost, time, and accessibility.

A. LARGE LANGUAGE MODELS (LLM)

Language models are used in natural language processing by predicting the probability distributions of word sequences. When a sequence of words of any length (m) is given to the language model, it assigns a probability to the entire sequence. Its representation is shown in formula (1) [4].

$$P(w_1, \dots, w_m) \tag{1}$$

NLP is used in many artificial intelligence applications such as machine translation and text-to-speech conversion. Language models can be both parametric and non-parametric. While practical language models use an artificial neural network with a predetermined number of parameters, non-parametric language models have an undetermined number of parameters [5]. LLM is used to increase language understanding and generation capabilities using developing deep learning techniques, large datasets, and powerful computing resources. The main feature of these models is that they use a large text dataset as training data. These datasets can include millions of text documents collected from the internet or books, which helps the model develop a deep understanding of language [6]. Since 2010, large language models such as GPT (Generative Pre-trained Transformer) and BERT (Bidirectional Encoder Representations from Transformers) have revolutionized the field of natural language processing. They greatly improved language understanding and generation capabilities. By the 2020s, models like GPT-3 and GPT-4 became popular with their ability to generate large-scale language and began to be used in many fields.

B. GENERATIVE AI (GENAI)

Generative AI refers to artificial intelligence language models that generate/create content. It has become possible to produce content in many areas such as text, image, and music using these models. It has achieved great success especially in natural language processing (NLP) and image processing fields [7]. Generative AI encompasses language models trained using very large data and can then create new data by analyzing this data. It fundamentally uses deep learning techniques. Using deep learning techniques along with artificial neural networks, very complex relationships are learned and patterns between data are discovered. This ability of artificial neural networks allows computers to understand what is in a photo or what happens in a story. Deep learning techniques come into play in this process. Deep learning helps computers find patterns between data. Thus, artificial intelligence models gain the ability to learn and produce new data [8]. These models generally consist of two points: encoder and decoder. The encoder has the task of examining and understanding the data and representing it in a special way. The decoder, on the other hand, can create new data from this representation information.

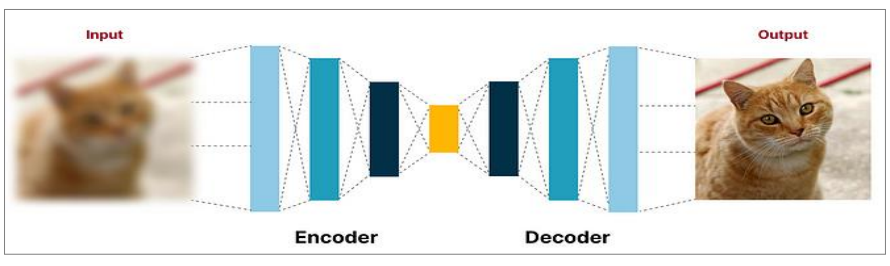

Figure 2. *Example of encoder and decoder of Generative AI language models*

As seen in Figure 2 [9], a cat photo and the information that this image belongs to a cat are given as input to the encoder. The encoder learns how the cat looks from this input. Later, it can create a new cat image (output) through the decoder with what it has learned. With this method, language model training is performed.

C. SOFTWARE CODE GENERATION WITH LLM

It was mentioned that LLM produces new data/outputs by feeding on millions of data. This data also includes software codes. The language model, which acquires technical knowledge from open-source codes on the internet and articles, documents, and books written in the field of software, can produce code from an input made in natural language. On this subject, OpenAI Company [10] took the first step with its artificial intelligence called ChatGPT [11], and then products such as GitHub Copilot and Microsoft Copilot were also introduced by other companies. In this area where interest is increasing, different artificial intelligence products are being released every day. These use large language models such as GPT-3 (Generative Pre-trained Transformer 3) and GPT-4 (Generative Pre-trained Transformer 4). OpenAI Company is an artificial intelligence research and development laboratory aimed at benefiting humanity. Founded in 2015, it is considered a rival to DeepMind [12]. OpenAI first developed the GPT-3 language model and gained great interest by releasing ChatGPT, an artificial intelligence chatbot using this model, on November 30, 2022 [13]. After this interest and success, Microsoft invested 1 billion USD in OpenAI. GPT-3 is a third-generation autoregressive language model that uses deep learning to produce human-like text. In simpler terms, it is a computational system designed to generate sequences of words, code, or other data starting from a source input called a prompt [14]. It can respond in the same language to prompts entered in many languages. Its only disadvantage is that since it has data up to September 2021, the answers it gives are also shaped accordingly. As a result of these developments, OpenAI released its new model GPT-4 on March 14, 2023 [15]. GPT-4, which has up-to-date information, can understand more complex inputs compared to GPT-3. Unlike GPT-3, which only responds to textual inputs in the same way; GPT-4 can process other data such as images and videos. Finally, on May 13, 2024, OpenAI released a more capable model with GPT-4o, combining artificial intelligence's image processing and audio data generation capabilities, allowing real-time video and voice conversations with artificial intelligence. The ChatGPT mobile application using the GPT-4o model can recognize any object shown on the camera during video calls and play long conversations or games. By integrating this model into smart glasses, there are many different usage possibilities such as being able to intervene urgently to an injured person. The model can understand the image received from the glasses and tell you what to do both verbally and through the image on the glasses. Since the data in the language models also includes software information, it is possible to use these abilities to produce software codes as well. Their ability to give software code in an explanatory way in response to a prompt made in natural language allowed language models to be used for different purposes.

D. AI APPLICATIONS SKILLED IN CODE GENERATION

It was mentioned that large language models can produce software code due to the data they contain. By using artificial intelligence applications supported by large language models, developer productivity and efficiency can be increased; code generation, debugging, refactoring, and creating test scenarios can be handled faster and more easily. In this regard, GitHub Copilot [16] and Microsoft Copilot [17] artificial intelligence stand out in corporate software development, while artificial intelligence products such as CodeQwen1.5 [18], Llama3 [19], and Claude 3 Opus [20] can be seen in individual uses. Although Microsoft Copilot and OpenAI ChatGPT artificial intelligence products are capable in many areas, products such as GitHub Copilot, CodeQwen1.5, and Claude 3 Opus can produce better results in code generation [21]. You can see the comparison of these and similar artificial intelligence applications that are widely used in terms of quality, speed, and cost in Figure 3, Figure 4, and Figure 5 below.

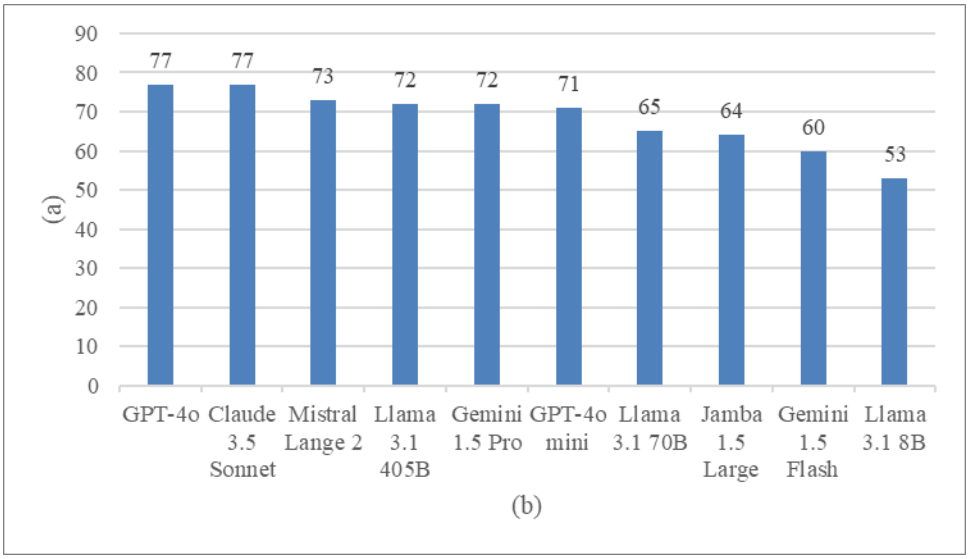

Figure 3. (a) *AI Quality Index values and* ***(b)*** *AI platforms*

Figure 3 shows the quality index of artificial intelligence models [22]. Here, higher values represent better performance. According to this index, GPT-4o and Claude 3.5 Sonnet receive the highest quality value with 77 points, while Mistral Lange 2, Llama 3.1 405B, and Gemini 1.5 Pro follow this order with close values.

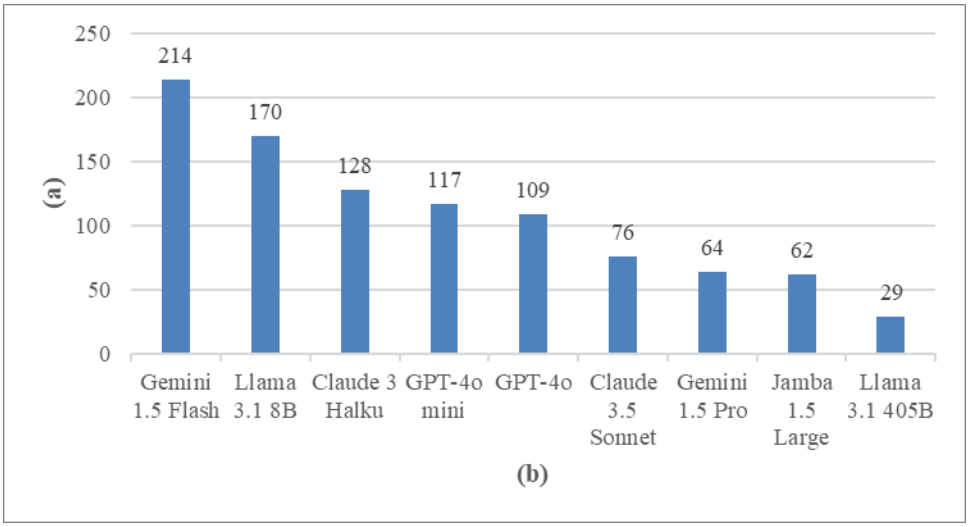

Figure 4. (a) *Output speed per second and* ***(b)*** *AI platforms*

Figure 4 [22] shows the number of output tokens produced per second per model. The higher this number, the faster the model works. Here, Gemini 1.5 Flash has the highest value with 214 tokens, 44 tokens ahead of its closest rival, the Llama 3.1 8B model.

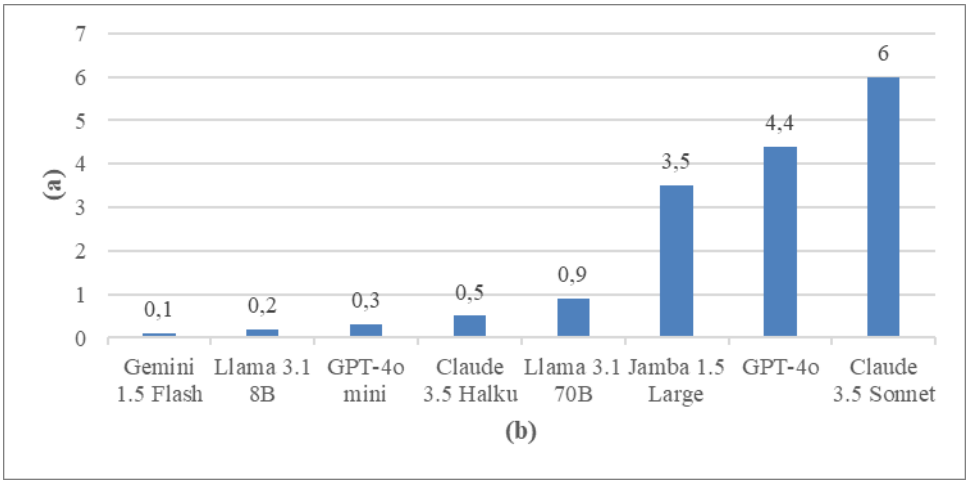

Figure 5. (a) *US dollars spent per 1 million tokens and* ***(b)*** *AI platforms*

Figure 5 [22] shows the cost of models in US dollars for every million tokens. Lower values in this graph indicate less cost. The Gemini 1.5 Flash model shows the best performance in terms of cost efficiency with 0.1 USD. These three graphs visually explain how artificial intelligence models are compared in different dimensions such as cost, speed, and quality. The graphs are prepared according to the latest analysis data as of August 2024. According to these values, it is not very accurate to say that this is the best artificial intelligence, but the best one can vary depending on what you will use artificial intelligence for and what your constraints will be.

E. NO-CODE AND LOW-CODE PLATFORMS (NCLC)

No-Code and Low-Code (NCLC) platforms allow users to develop applications with minimal technical knowledge. Using these platforms designed with drag-and-drop method, it is possible to develop applications or interfaces easily and practically without writing any code or with very little code addition. While providing a faster development process for those who know code, for those who do not know or know little, just learning to use the platform is enough to develop applications. On this subject, GitHub CEO Chris Wanstrath stated, "The future of coding is no coding at all." [23].

Many studies are being conducted in this field, both academically and experimentally. Moskal (2021) discusses the importance of NCLC technology in the digitalization process and how this technology can be used in businesses. Liu et al. (2024) detail the design and implementation of a universal NCLC web design tool, showing how such tools can increase efficiency in digital monitoring systems. Van Lunteren (2023) addresses the use of NCLC platforms to train and deploy customized object detection models [8], [9], [24].

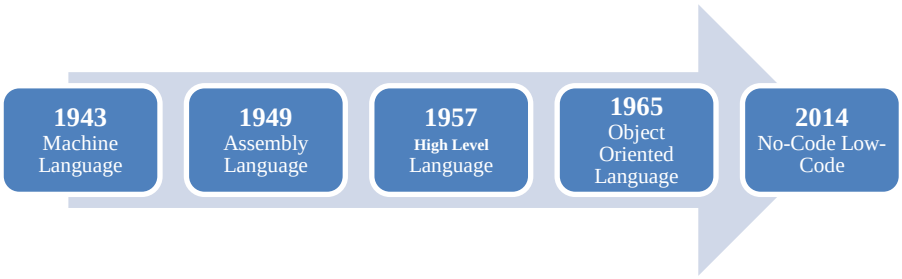

Figure 6. *Evolution of algorithms from machine code to NCLC structure*

The evolution from machine language to NCLC platforms is shown in Figure 6 [23]. There are many platforms or software products that provide NCLC development opportunities. The most popular ones for 2024 can be listed as; Mendix, Xano, Zoho Creator, Webflow, Google AppSheet, ServiceNow App

Engine, Zeroqode, Glide, Thunkable, Adalo, Blockly, and Logotec App Studio. Sample views from Blockly and Mendix interfaces can be seen in Figure 7 [25], Figure 8 [26], and Figure 9 [27], [28].

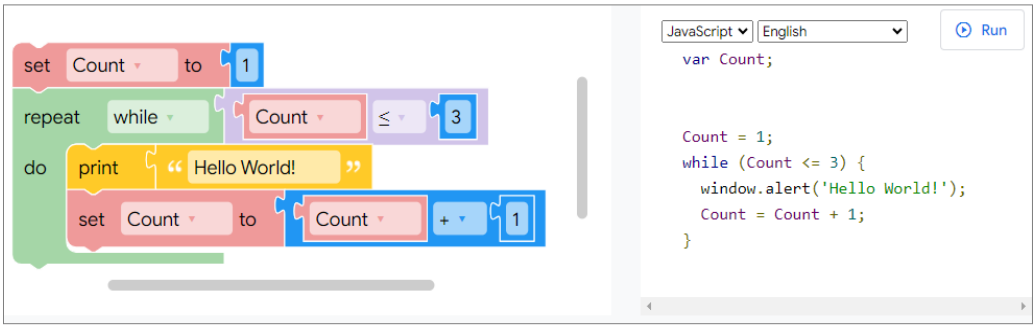

Figure 7. *Blockly Interface – Drag and drop elements to write code*

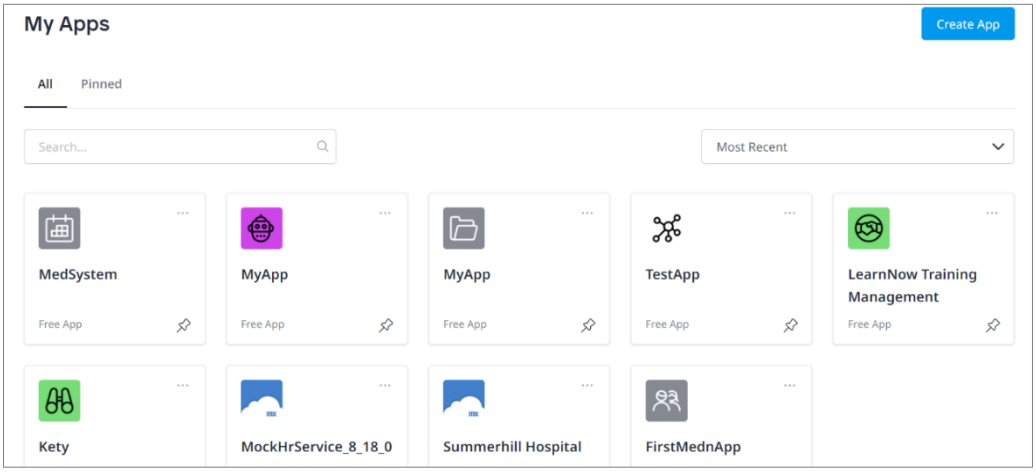

Figure 8. *Mendix Interface – My applications page*

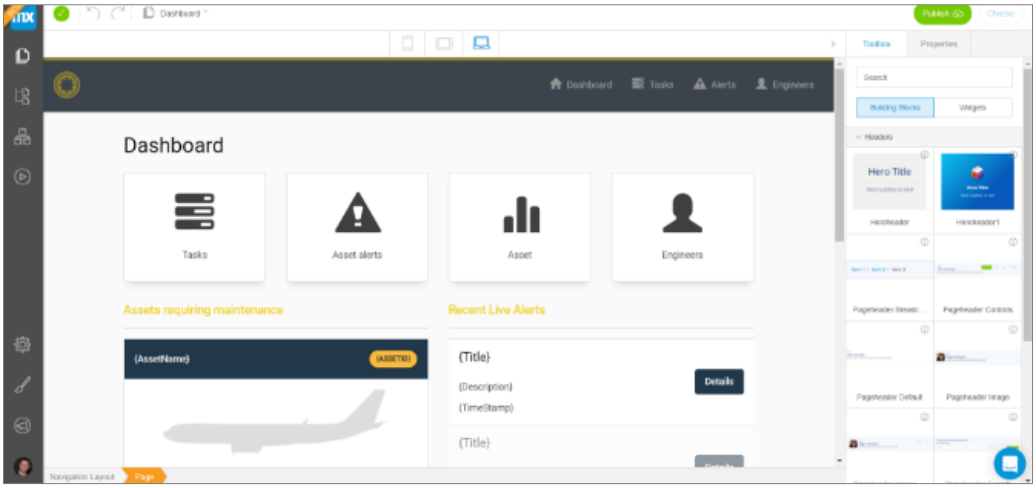

Figure 9. *Mendix Interface – Application development page*

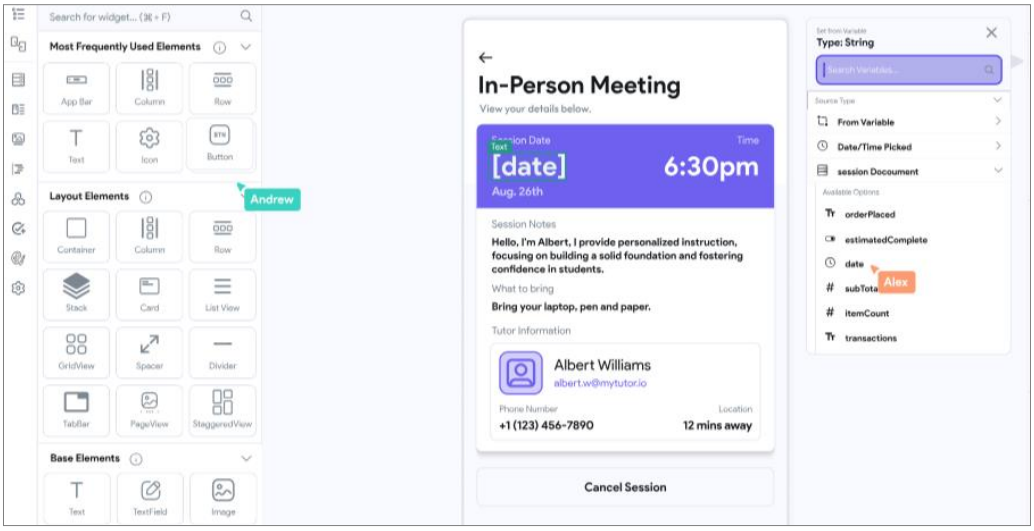

Figure 10. *FlutterFlow Interface – Mobile application development with drag and drop method*

A screenshot from the FlutterFlow platform for mobile application development can be seen in Figure 10 [29]. It is possible to publish the mobile application developed here for Android or iOS operating systems. Also, there is the opportunity to work together with other people who are allowed to work. The sole purpose of all these platforms is to enable companies of all sizes to easily create custom web and mobile applications. Apart from the drag-and-drop development opportunity, they have the chance to use applications that many companies need without the effort of development with the ready-made modules they contain.

F. AI-BASED NCLC PLATFORMS

Platforms that provide NCLC development opportunities were mentioned. Although these platforms have greatly simplified traditional software development processes, they have fallen behind advanced artificial intelligence and large language models. For this reason, AI-based NCLC platforms have started to be seen. Amazon CEO Andy Jassy, in a post he shared in August 2024, talks about the importance of AI-based code development. Andy mentions in his post that using Amazon Q, which they developed as a software development assistant, they converted an application to Java 17 in a few hours, but if they did it with the traditional software development method, it would be done with the daily effort of 50 developers. Accordingly, he emphasized that they saved as much as the daily work cost of 4500 developers per year with the AI-supported software development assistant [30]. While NCLC platforms are seen to benefit small and medium-sized enterprises, AI support is seen to provide high benefits in large-scale enterprises like in this example. Amazon Q does not currently offer a platform in NCLC structure. But it is possible to show Amazon SageMaker product similar to NCLC structure. As examples of other AI-based NCLC platforms, many platforms such as Buildfire AI, Akkio, DataRobot, Obviously AI, Google Teachable Machine, Lobe AI, Nanonets, Levity AI, Causaly AI, PredictNow AI, Invideo, AI Squared, E42, Flagright, and CallFluent AI can be listed [31].

BuildFire AI [32] is an AI-powered NCLC platform that allows everyone to develop mobile applications without coding knowledge. Thanks to AI support, the platform offers the opportunity to develop applications much faster compared to other NCLC-based platforms. The application needed is automatically created by AI with answers given to some questions about the business. It even uses the logo and colors on the company's website for the application to be in harmony with the company brand. Thus, instead of struggling for weeks just for design, it is possible to handle this in seconds with AI and

no-code structure. It offers the opportunity to publish the developed mobile application on iOS and Android operating systems.

Akkio [33] allows creating an AI-powered chatbot. While many tasks can be easily done using this chatbot, it is possible to customize the chatbot according to yourself using the NCLC structure. In addition, it can create some reports and graphs in seconds without writing code. For example, it can create detailed graphs with simple commands such as "create a graph about monthly sales".

DataRobot [34] uses generative AI and predictive workflows to improve business results. The platform is used in a wide range of industries including banking, fintech, healthcare, insurance, manufacturing and aviation. For example, it can be used with hospitals and health applications to predict which patients are more likely to be admitted. This way, doctors can proactively take steps to improve their health. An insurance company can use it to predict which products are most likely to be successful when cross-selling to specific customers. Warehouses can predict traffic to optimize resource planning. DataRobot simplifies many complex tasks without requiring code.

Google, which has many products in every field, did not hold back in this area either and offered Google Teachable Machine [35] solution. This platform uses Tensorflow, a machine learning library for model training and production. Using Teachable Machine, you can easily create datasets from images taken from the camera and file uploads. Then it offers the opportunity to produce and use models without any coding with this dataset. For example, it will create a dataset and model from a face scanned from the camera at different angles. There is the possibility to edit the codes of the model it creates with the LC method. It stands out as a facilitating platform for people working in machine learning fields.

Lobe AI [36], developed by Microsoft, is very similar to the Google Teachable Machine platform and can be considered as a competitor. As of August 2024, it only works using image classification; images are labeled to train the model, but it is known that object detection and data classification models will be available in the future. Also, Lobe AI has project templates that automatically select the best machine learning architecture for the project.

Amazon SageMaker [37], [38] is a cloud-based, AI-powered NCLC platform designed for enterprise companies. This platform provides data scientists, engineers, and developers with the ability to easily process data, create models, train models, and deploy [37]. While users without technical knowledge can work in machine learning fields with NC development capability, users with technical knowledge can make improvements or customizations by editing the codes created by the platform with the LC feature. The platform is similar to Google's Teachable Machine and Microsoft's LobeAI products in terms of service and usage. One of the biggest advantages of SageMaker is the ability to deploy your model that you developed on the platform. Thus, you can share this over the web or use it in your applications.

LevityAI [39] is an NC workflow automation platform that allows creating artificial intelligence and machine learning models using the uploaded dataset [40]. Users can create an AI-powered model with LevityAI to complete common tasks based on specific triggers. You can connect to systems already in use such as CRM databases, email providers, and management systems, and create workflows by creating AI blocks. Thus, it is possible to easily make an automation application for continuous tasks.

CausalyAI [41] is designed for biomedical scientific research and development. It is used to eliminate human bias during scientific research and studies. CausalyAI has all published biomedical literature and can produce answers to questions asked in this direction. These answers, which can be accessed by doing literature review for weeks, can be found in seconds with CausalyAI. It is possible to develop a wide

variety of useful applications by integrating this artificial intelligence into no-code/low-code development environments. For example, it can help identify biomarkers in drug development programs and regulate success rates. It can also verify and characterize biomarkers in these studies. This capability can be customized using the low-code method and can be integrated into existing applications or made to work together. As of August 2024, there is no NCLC platform within CausalyAI yet, but it can be added to existing NCLC platforms with API support.

AI Squared [42] uses both predictive and generative AI models to support web-based applications. The platform can be applied on the web application already in use. It allows quick editing and development of the existing web application using AI-powered LC method on AI Squared. In this respect, it is different from many other artificial intelligence platforms.

CallFluent AI [43] is a platform that can create an AI-powered voice call representative in 1 minute without writing code. These created representatives can make communication smoother and more efficient by managing tasks such as answering customer questions or scheduling appointments. The platform has a flexible structure, allowing businesses to make additional developments according to their own special needs. It can be used in many areas where time will be saved to automate daily tasks. All these possibilities are very important for reducing costs in businesses [44].

III. COMPARATIVE ANALYSIS

To fully understand the effects of AI-based NCLC platforms on software development processes, it is necessary to compare these platforms both with traditional NCLC platforms and among themselves. In this section, we will discuss the advantages offered by AI-based platforms compared to traditional platforms, the differences between different AI-based applications, and how these platforms are evaluated according to various usage areas.

AI-based NCLC platforms offer significant advantages compared to traditional platforms. While traditional platforms allow users to develop simple applications with limited technical knowledge, AI-based platforms make complex functions possible. For example, AI-powered platforms such as LobeAI and Amazon SageMaker make it possible to integrate and automate machine learning models, while traditional NCLC platforms generally do not offer such features. In addition, the user interface of AI-powered platforms is more intuitive and user-friendly; this accelerates the development process and reduces costs.

Table 1. *Comparison Table of AI-Powered and Traditional NCLC Platforms*

Feature	**AI-Powered NCLC Platforms**	**Traditional NCLC Platforms**
Ease of use	Easier to use with natural language commands.	Drag-and-drop interface, easy to use but has a learning process.
Customization ability	High – AI can understand complex and custom needs.	Fast – Requires manual component selection and configuration.
Development speed	Very Fast – AI quickly converts requests into code.	Moderate – May require some manual interventions.

Table 1 (cont). *Comparison Table of AI-Powered and Traditional NCLC Platforms*

Automation level	High – Routine tasks are performed automatically.	Medium – May require some manual interventions.
Code quality	Medium – AI applies best practices and current standards. But there is a possibility of writing erroneous code.	Variable – Depends on platform and user skills.
Learning curve	Low – Quick adaptation thanks to natural language use.	Medium – Need to learn platform features.
Cost	High initially, low in the long term.	Generally lower initial cost.
Scalability	High – AI easily provides integration to needs.	Medium – May require manual scaling.
Integration capabilities	Wide – AI provides easy integration with various systems.	Limited – Limited to predefined integrations.
Debugging and troubleshooting	Advanced – AI can detect and correct errors.	Manual – User needs to find and correct errors.
Data security	Medium – AI use may require additional security measures.	High -- Less complex, easier to provide security.
Updates and maintenance	Automatic – AI provides continuous learning and improvement.	Manual – Requires periodic updates and maintenance.

The comparison between AI-powered and traditional NCLC platforms extends beyond mere technological capabilities, encompassing a wide range of factors that significantly impact the software development lifecycle. These factors include ease of use, development speed, customization abilities, long-term cost implications, and scalability. Understanding these differences is crucial for organizations as they navigate the complex landscape of modern software development tools. While AI-powered platforms promise enhanced automation and potentially more sophisticated outputs, they also introduce new challenges in terms of data security and initial implementation costs. Traditional NCLC platforms, on the other hand, often offer simplicity and a lower barrier to entry, but may lack the advanced features necessary for more complex projects. The choice between these two types of platforms can have far-reaching implications for an organization's digital strategy, affecting not only the immediate development process but also long-term maintenance and scalability of applications. Moreover, the rapid pace of technological advancement in AI means that the capabilities gap between these platform types is likely to evolve, adding another layer of complexity to the decision-making process. As organizations strive to balance innovation with practicality, a thorough understanding of these platforms' strengths and limitations becomes indispensable. The following table provides a comprehensive overview of these differences, highlighting key aspects that organizations should consider when choosing between AI-powered and traditional NCLC platforms, and offering insights into how these choices may shape their software development capabilities in the years to come [45], [46].

Table 2. *Comparison Table of AI-Powered NCLC Platforms*

Platform	Main Focus	Key Feature	Target Audience	Usage Areas
Amazon Q	General AI assistant	Natural language processing, data analysis, code generation	Businesses, developers	Business intelligence, software development
BuildFire AI	Mobile app development	Automatic code generation, design suggestions	SMEs, entrepreneurs	Mobile app creation
Akkio	Predictive analytics	Automatic code generation, data visualization	Data analysts, businesses	Customer analysis, risk assessment
DataRobot	Enterprise AI platform	Automatic machine learning, model deployment	Large enterprises	Predictive modeling, data science
Obviously AI	Predictive analytics	Natural language queries, fast model creation	SMEs, data analysts	Sales prediction, customer segmentation
Google Teachable Machine	Image classification	Easy model training, web-based interface	Educators, students	Educational projects, simple AI applications
Lobe AI	Image classification	Drag-and-drop model training, easy export	Developers, designers	Visual recognition applications
Causaly AI	Biomedical research	Causal inference, literature analysis	Researchers, pharmaceutical companies	Drug discovery, disease research
AI Squared	AI integration	Adding AI to existing applications, model management	Developers, businesses	Application development, AI integration

The table above shows the fundamental differences between AI-powered NCLC platforms and traditional NCLC platforms. AI-powered platforms offer easier use, faster development process, and higher customization possibilities thanks to their natural language processing capabilities. Also, they can be more efficient in the long term with automatic debugging and continuous learning features. However, traditional NC platforms continue to be an attractive option especially for small-scale projects with lower initial costs and a simpler structure. Both approaches have their own advantages and usage areas. Businesses should choose the most suitable platform according to their own needs, technical capabilities, and budgets. In the future, with the development of artificial intelligence technologies, more advanced hybrid platforms that combine these two approaches can be expected to emerge [45], [46].

Platforms such as BuildFireAI, Akkio, and DataRobot offer different functionalities. These platforms are optimized for various usage scenarios. For example, BuildFire AI is designed specifically for mobile application development, while Akkio is optimized for data analytics and business intelligence

solutions. DataRobot, on the other hand, is strong in automatic machine learning modeling and has the capacity to process large datasets. Some feature comparisons by platforms are shown in Table 2.

These various AI-powered NC platforms demonstrate how technology can be integrated into different sectors and business processes. Each platform stands out with its unique strengths and areas of expertise. Users should choose the platform that best suits their specific needs, technical competencies, budgets, and long-term goals. For example, a corporate company may prefer Amazon Q for business intelligence and code generation, while an entrepreneur may use Buildfire AI to quickly develop mobile applications. On the other hand, a business that wants to add artificial intelligence capabilities to its existing applications may prefer AI Squared. When making a choice, factors such as the scalability of the platform, integration capabilities, user-friendliness, and support services offered should also be considered. Also, in this period when artificial intelligence technology is developing rapidly, it is an important criterion that the chosen platform is continuously updated and open to innovations. As a result, the most efficient artificial intelligence platform will be the one that can meet the user's current requirements as well as support future growth and change potential.

A. EVALUATION ACCORDING TO USAGE AREAS

A comprehensive analysis of how different AI-powered NCLC platforms are used in various sectors reveals the wide impact area of this technology. As seen in Table 2, these platforms offer solutions in a wide variety of fields. In the healthcare sector, AI-powered no-code platforms provide great benefits not only in patient data management and analysis but also in more advanced applications. For example, platforms like CausalyAI accelerate drug discovery and disease research by making causal inference and literature analysis in biomedical research. This contributes to the development of treatment methods by enabling more effective use of medical knowledge. In the finance sector, these platforms go beyond analyzing customer data and making predictions. While PredictNowAI offers time series analysis for stock market prediction and risk management, Flagright provides real-time risk monitoring and behavioral analysis in fraud detection and KYC (Know Your Customer) [47] processes. These tools help optimize investment strategies while increasing financial security [48].

In the business world, general AI assistants like Amazon Q are used in business intelligence and software development processes, increasing efficiency. Buildfire AI simplifies the mobile application development process especially for SMEs and entrepreneurs. E42, on the other hand, offers virtual AI agents and business process automation to optimize the internal operations of large enterprises. In the education sector, platforms like Google Teachable Machine provide educators and students with the opportunity to develop simple AI applications, making AI education more accessible [49]. This ensures that future generations are familiar with AI technologies, encouraging long-term technological innovation. In the field of marketing and content production, platforms like Invideo enable the rapid and effective creation of social media videos and advertisements with AI-powered video editing and template libraries. This allows small businesses and content producers to produce professional quality content. In the field of customer services, solutions like CallFluent AI increase the quality of customer interactions and support staff training by performing speech and emotion analysis. This improves customer satisfaction while also improving operational efficiency. Each sector and usage area has its own unique needs and requirements; this determines which platform is most suitable. For example, while platforms like Lobe AI or Google Teachable Machine for image classification may be ideal for a startup that wants to do rapid prototyping, more advanced analytical platforms like DataRobot or Akkio may be more suitable for a corporate company that needs to do comprehensive data analysis. This diversity shows how NCLC platforms can play a transformative role in different sectors and business processes. As technology evolves and these platforms become more sophisticated, it is expected that usage areas will expand further and boundaries between sectors will blur.

IV. DISCUSSION

The benefits provided by AI-based NCLC platforms to software development processes are quite extensive. However, it should not be forgotten that these technologies also have some challenges and limitations. In this section, we will examine in detail the advantages offered by AI-based NCLC platforms, potential challenges that may be encountered, and problems that may arise in the future.

AI-based NCLC platforms offer various advantages such as accelerating software development processes, reducing costs, and increasing flexibility. For example, while traditional software development processes can take weeks or even months, it is possible to develop complex applications within a few days thanks to these platforms. In addition, artificial intelligence algorithms can analyze large amounts of data to better understand users' needs and offer appropriate solutions. This provides a significant advantage in terms of both time and cost. Although AI-based NCLC platforms offer many advantages, there are also some challenges and limitations. First, these platforms may increase concerns about data privacy and security. The lack of transparency in artificial intelligence's decision-making processes can make it difficult for users to fully understand the results. Also, despite the complex structures of these platforms, there may be situations that require users to have technical knowledge. Such challenges may prevent the widespread adoption of AI-based platforms. With technological developments, potential problems that AI-based NCLC platforms may encounter will also emerge. For example, as artificial intelligence becomes increasingly complex, it will lead to questioning the ethical dimensions and usage limits of these technologies. Also, issues such as data integrity and security will become even more important during the development and management of these platforms. Developers and users will need to plan carefully for these issues.

A comprehensive analysis of the findings obtained from the literature review provides a deep understanding of the effects of these findings on software development processes. In this section, a general evaluation of the findings in the literature will be made, the theoretical and practical contributions of these findings will be discussed, and future research directions will be discussed. The literature review evaluated the effects of AI-based NCLC platforms on software development processes from various aspects. The current literature suggests that the use of these platforms significantly accelerates software development processes, reduces costs, and increases software quality. However, some studies also emphasize the technical limitations of these platforms and the difficulties in user adaptation. These findings indicate that these technologies are open to development and will be better in the future.

This review offers important contributions from both theoretical and practical perspectives. Theoretically, it provides a deeper understanding of the effects of AI-based NCLC platforms on software development processes. From a practical point of view, it offers suggestions on how these platforms can be used more effectively in software development processes. This article can be a useful resource for both academic researchers and software developers. Future research in this field should focus on further optimization of AI-based NCLC platforms and expansion of their usage areas. In particular, studies examining the applications and usage scenarios of these platforms in different industries should be conducted. It is also important to investigate the long-term effects of integrating artificial intelligence into these platforms. Such research can shape the future development of this technology.

V. CONCLUSION

In this section, the effects of AI-based NCLC platforms on software development processes will be evaluated in general, and suggestions will be presented for organizations that want to increase the use of these technologies. These suggestions aim to make the best use of the advantages offered by the platforms and overcome potential challenges.

The effects of AI-based NCLC platforms on software development processes have been extensively addressed in the literature, and it has been revealed that this technology offers multifaceted advantages. These platforms make significant contributions to accelerating development processes, reducing costs, and empowering non-technical users. While platforms such as Amazon Q and DataRobot offer groundbreaking solutions in corporate-level AI integration and data analytics, platforms such as Buildfire AI and Invideo are revolutionizing specific areas (mobile application development and video content production). Google Teachable Machine and Lobe AI democratize AI education, enabling a wider user base to benefit from these technologies. However, the challenges and limitations encountered during the use of these platforms should not be ignored. Data security and privacy are critical, especially in platforms like Flagright and PredictNow AI that process sensitive financial data. Also, the transparency and explainability of AI decisions is a significant concern, especially in systems like Causaly AI that perform complex analysis. This article provides a comprehensive framework for evaluating the current state and future potential of AI-based NCLC platforms. Given the rapid development of technology, trends and innovations in this field need to be constantly monitored.

For companies aiming to optimize the use of AI-based NCLC platforms in their software development processes, a comprehensive strategy is essential. This strategy should begin with a thorough evaluation to select the most suitable platform for their specific needs. For instance, while Amazon Q might be the go-to choice for general-purpose solutions, specialized platforms like Nanonets or Levity AI could be more appropriate for niche requirements. Once a platform is chosen, implementing robust security measures becomes paramount, particularly for those handling sensitive data like Flagright and E42. Regular security audits and state-of-the-art encryption methods should be standard practice.

The success of implementing these platforms heavily relies on proper training and skill development. Organizations should invest in comprehensive training programs for their employees, tailoring the content to the specific platforms in use. For example, users of Google Teachable Machine would benefit from foundational machine learning concept training. Alongside technical training, it's crucial to establish clear guidelines for ethical AI usage. This includes developing policies that ensure AI decision transparency and explicability, which is especially critical for platforms like PredictNow AI that deal with financial forecasting.

As organizations grow and evolve, so too should their technological infrastructure. Therefore, it's vital to select platforms that offer scalability to meet expanding needs. Platforms like AI Squared, which allow for seamless AI integration into existing systems, can be particularly valuable in this regard. To ensure ongoing effectiveness, continuous monitoring and optimization of these platforms is necessary. Analytical tools such as Akkio and Obviously AI can be instrumental in this ongoing assessment process. The integration of NCLC platforms often necessitates a reimagining of existing business processes. For instance, CallFluent AI could drive a complete overhaul of customer service processes. This technological shift should be accompanied by a cultural transformation within the organization, fostering an environment that embraces AI and NCLC platforms. User-friendly platforms like Lobe AI can be catalysts for this cultural shift.

Legal and regulatory compliance cannot be overlooked, especially when dealing with sensitive domains. Platforms like Causaly AI, which operate in the biomedical research space, must adhere strictly to relevant legal and regulatory frameworks. Finally, the journey towards effective NCLC platform utilization should not be a solitary one. Collaborating with other organizations and academic institutions to share best practices and develop joint solutions can accelerate progress and innovation in this rapidly evolving field. By adopting this holistic approach, organizations can harness the full potential of AI-based NCLC platforms, driving their digital transformation efforts and positioning themselves at the forefront of technological innovation. The key to success lies in staying agile, continuously adapting to new developments, and maintaining a strategic focus on leveraging these powerful tools to gain a competitive edge in the market.

In conclusion, AI-based NCLC platforms stand out as effective tools with the potential to make software development processes more accessible and optimize them. These technologies accelerate development

processes while reducing costs and allow users with limited technical expertise to create complex applications. However, the effective use of these platforms requires careful planning, continuous training, and adoption of ethical principles. Organizations should consider potential challenges while evaluating the opportunities offered by these technologies. When implemented with a strategic approach, AI-powered NCLC platforms have the potential to play an important role in businesses' digital transformation processes and lead future innovation initiatives. Continuous monitoring and adaptation to developments in this field will be critical for organizations to gain competitive advantage and be at the forefront of technological advancements.

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