The Impact of Low-Code and No-Code Development on IT Workforces and Software Engineering Practices in Indonesia

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Article Info

ABSTRACT

This study examines the impact of low-code and no-code (LCNC) development platforms on IT workforces and software engineering practices in Indonesia. Employing a quantitative approach with 50 respondents and data analysis using SPSS version 25, the research investigates the relationships between LCNC adoption and variables such as workforce productivity, skill adaptability, software quality, and development efficiency. The findings indicate that LCNC platforms significantly enhance workforce productivity and development efficiency, with moderate impacts on skill adaptability and mixed perceptions of software quality. These results suggest that LCNC platforms have the potential to revolutionize software development processes in Indonesia, provided that challenges related to skill adaptation and quality assurance are effectively addressed.

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1. INTRODUCTION

The rapid evolution of software development practices has been significantly influenced by the emergence of low-code and no-code (LCNC) platforms, which enable users, including those with minimal programming expertise, to design and deploy applications efficiently by utilizing graphical user interfaces and pre-configured templates. Reflecting a broader trend toward democratizing technology, these platforms allow businesses to adapt quickly to market demands while reducing dependency on specialized IT professionals. LCNC platforms empower "citizen developers" by lowering barriers to entry, facilitating rapid application delivery, and enhancing productivity and flexibility, thereby contributing to digital transformation and innovation across industries, including SMEs and enterprise teams focused on internal solutions [1]–[4]. However, they also present challenges, such as security concerns, data governance issues, and limitations in building complex applications, with risks like "shadow IT" compromising security and compliance, and a dependency on vendors potentially limiting customization [1]–[3]. Additionally, LCNC platforms are reshaping traditional software development roles by fostering collaboration between technical and non-technical users in hybrid teams, necessitating a balanced approach to leverage their benefits without compromising strategic IT control [2], [4].

In Indonesia, the adoption of low-code and no-code (LCNC) platforms has gained momentum, driven by the increasing demand for digital transformation and

operational efficiency across industries. With a growing digital economy and a substantial focus on bridging the gap between technical and non-technical teams, organizations are leveraging LCNC tools to accelerate development cycles, enhance collaboration, and lower costs. These platforms enable "citizen developers" to participate in application development, fostering innovation and democratizing software development processes [1], [2], [4]. However, their adoption also raises critical questions about security vulnerabilities, governance issues, and vendor lock-in, with risks such as "shadow IT" compromising IT oversight and interoperability concerns hindering scalability [1], [2], [5]. Moreover, the rise of LCNC platforms is reshaping traditional IT workforce roles, shifting focus towards strategic and oversight functions while necessitating a revaluation of skill sets and workflows [4]. These dynamics highlight both the potential and challenges of integrating LCNC platforms into Indonesia's rapidly transforming digital landscape.

In Indonesia, the adoption of low-code and no-code (LCNC) platforms has gained significant momentum, driven by the increasing demand for digital transformation and the need to improve operational efficiency across industries. These platforms enable both technical and non-technical users, including "citizen developers," to design and deploy applications efficiently, bridging skill gaps and democratizing software development [1], [2], [4]. By leveraging pre-built components and drag-and-drop interfaces, LCNC platforms accelerate development cycles, enhance collaboration, and reduce costs, making them particularly beneficial for small and medium-sized enterprises (SMEs). However, their adoption raises critical concerns about security vulnerabilities, governance issues, and the risk of "shadow IT" applications developed outside formal oversight, as well as challenges with vendor lock-in and interoperability between platforms [1], [2], [5]. Furthermore, the integration of LCNC platforms into traditional IT environments is reshaping

software engineering roles, shifting focus towards strategic oversight and necessitating a revaluation of skill sets and workflows to fully leverage their potential while mitigating associated risks [1], [4]. This study aims to analyses the impact of LCNC development platforms on IT workforces and software engineering practices in Indonesia.

2. LITERATURE REVIEW

2.1 Low-Code and No-Code Development: An Overview

Low-code/no-code (LCNC) platforms have revolutionized the software development landscape by enabling faster application delivery, reducing costs, and democratizing the development process. These platforms allow users with minimal technical expertise to create applications through visual interfaces and pre-built components, thereby expanding the pool of individuals who can engage in software development [1], [2]. Organizations adopting LCNC platforms report enhanced agility in meeting business needs and reduced strain on IT departments, as these tools facilitate rapid, cost-effective, and user-friendly application development [1], [3], [4]. The benefits include accelerated development cycles through drag-and-drop functionalities, the empowerment of "citizen developers" to foster innovation, and significant cost reduction by minimizing the need for extensive coding expertise [2]–[4]. However, challenges such as security vulnerabilities, data governance issues, limitations in scalability and integration, and risks of vendor dependency in no-code solutions highlight the need for careful consideration when integrating LCNC platforms into existing systems [1]–[3].

2.2 Impact on IT Workforce

The proliferation of Low-Code/No-Code (LCNC) tools is transforming IT workforce skills by democratizing software development and enabling broader employee participation. This shift reduces reliance on traditional coding, allowing business analysts and project managers to engage in development, enhancing collaboration

between technical and non-technical teams [1], [2]. LCNC platforms empower "citizen developers" to create applications with minimal coding, accelerating digital transformation and fostering innovation, especially in SMEs and internal enterprise teams [2]. However, challenges such as security vulnerabilities, scalability issues, and "shadow IT" risks arise when applications are developed outside governance structures [2]. Critics also warn of declining advanced programming expertise, complicating complex customizations and legacy integrations [1]. Reskilling IT professionals toward platform-specific skills and application maintenance is essential [4]. While LCNC platforms won't replace traditional programming entirely, they enhance innovation and inclusivity, requiring organizations to balance benefits with security and strategic IT control [2], [6].

2.3 Software Engineering Practices and Quality Concerns

Low-Code/No-Code (LCNC) platforms have revolutionized software development by enabling rapid application creation with minimal coding, democratizing technology access, and accelerating delivery, particularly for SMEs and non-technical users [1], [2]. These platforms simplify development with user-friendly interfaces and pre-built components, fostering innovation and enhancing business agility. However, their simplification can result in oversimplified architectures, reduced scalability, and limited performance control, making them less suitable for complex applications [1], [2]. Security and data governance challenges arise from a lack of formal oversight, while reliance on vendor-specific ecosystems creates lock-in issues, complicating migration and integration efforts [5]. To balance LCNC efficiencies with robust development practices, organizations should adopt traditional software engineering principles, including testing, documentation, and version control, while leveraging hybrid teams that integrate technical and non-technical users to bridge gaps [2], [4].

2.4 Adoption of LCNC Platforms in Indonesia

Indonesia's digital economy is experiencing rapid growth, with Low-Code/No-Code (LCNC) platforms playing a crucial role in enabling SMEs and start-up to achieve efficient digital transformation. These platforms empower businesses to develop scalable software solutions without requiring extensive IT expertise, thus enhancing operational efficiency and reducing time-to-market [7], [8]. However, challenges such as limited customization capabilities and a shortage of local talent skilled in LCNC platforms hinder their effectiveness and broader adoption [9], [10]. Addressing these issues requires tailored strategies, including government support to improve digital literacy and skills through targeted training and resources [9], [11]. Collaborative efforts between public and private sectors, involving training programs and financial incentives, are also vital to accelerating technology adoption and supporting digital transformation initiatives [8], [11].

2.5 Research Gaps and Contributions

While existing literature extensively discusses the benefits and limitations of Low-Code/No-Code (LCNC) platforms, research on their specific impact on IT workforces and software engineering practices in Indonesia remains limited. Most studies emphasize global trends, often neglecting Indonesia's unique socio-economic and technological context. This study aims to bridge these gaps by examining the implications of LCNC adoption on workforce productivity, skill adaptability, and software quality within Indonesia. Through a combination of prior research insights and quantitative data, this study seeks to provide a comprehensive understanding of how LCNC platforms can be optimized to meet the evolving needs of Indonesian organizations.

3. METHODS

3.1 Research Design

The study is designed as a cross-sectional quantitative analysis, aimed at examining the relationships between LCNC platform adoption and key variables such as

workforce productivity, skill adaptability, and software quality. A structured questionnaire with a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) was used to gather data on participants' perceptions and experiences.

3.2 Population and Sample

The target population for this study includes IT professionals, software engineers, and business users engaged in adopting and utilizing Low-Code/No-Code (LCNC) platforms in Indonesia. A purposive sampling technique was applied to select respondents with direct experience using LCNC tools, ensuring the data's relevance and reliability. The study involved a sample size of 50 respondents, which, although modest, offers a focused dataset for analyzing the initial impacts of LCNC platforms in the Indonesian context. Participants were drawn from diverse industries, such as technology start-up, financial services, and manufacturing, to capture a wide range of perspectives.

3.3 Data Collection

Data for this study were collected through an online survey distributed via email and professional networks. The survey consisted of two sections: demographic information covering age, gender, professional role, and industry sector, and core variables assessing the impact of LCNC platforms on workforce productivity, skill requirements, software quality, and development efficiency. Each statement was rated on a 5-point Likert scale to quantify respondent agreement. Prior to full distribution, the survey was piloted with 10 participants to ensure clarity and reliability. Key variables examined included workforce productivity (time savings, task completion rates, and collaboration ease), skill adaptability (reskilling opportunities, ease of learning LCNC tools, and changes in technical skill requirements), software quality (application reliability, scalability, and adherence to engineering standards), and development efficiency (speed of application delivery and resource utilization).

3.4 Data Analysis

Data analysis was conducted using SPSS version 25, with descriptive statistics summarizing respondent demographics and key variables, while inferential statistical tests, including Pearson correlation and multiple regression analysis, were performed to examine relationships between LCNC platform adoption and the studied variables. To ensure data quality, reliability testing using Cronbach's alpha assessed the internal consistency of questionnaire items, and exploratory factor analysis (EFA) verified the construct validity of the variables. A significance level of $p < 0.05$ was applied to identify statistically meaningful relationships.

4. RESULTS AND DISCUSSION

4.1 Descriptive Statistics

The demographic profile of the respondents showed diverse industry representation, with participants primarily from technology start-up (40%), financial services (30%), and manufacturing (20%). Most respondents were software developers (60%), followed by IT managers (25%) and business users (15%), reflecting a balanced mix of technical and business-oriented perspectives.

On a 5-point Likert scale, the average ratings for key variables were as follows: Workforce Productivity scored 4.2, indicating strong agreement on the enhancement of task efficiency and collaboration through LCNC platforms. Skill Adaptability had a mean score of 3.8, reflecting moderate agreement on the role of LCNC tools in fostering skill diversification and ease of learning. Software Quality received a score of 3.5, showing mixed perceptions about the reliability and scalability of LCNC-developed applications. Development Efficiency scored the highest at 4.4, emphasizing the platforms' significant contribution to accelerating application delivery.

4.2 Inferential Statistics

The relationships between LCNC platform adoption and key variables were analyzed using Pearson correlation and multiple regression. The correlation analysis

revealed that LCNC adoption positively correlates with workforce productivity (r = 0.681, p < 0.01) and development efficiency (r = 0.726, p < 0.01). Moderate correlations were also observed between LCNC adoption and skill adaptability (r = 0.542, p < 0.05) as well as software quality (r = 0.493, p < 0.05), indicating varying levels of influence on these factors.

Regression analysis further highlighted the impact of LCNC adoption. For workforce productivity, the regression model explained 62% of the variance (R² = 0.623, p < 0.01), with LCNC adoption emerging as the strongest predictor (β = 0.585, p < 0.01). Similarly, for development efficiency, the model accounted for 68% of the variance (R² = 0.681, p < 0.01), where LCNC adoption was again a significant contributor (β = 0.657, p < 0.01). These findings underscore the substantial role of LCNC platforms in enhancing productivity and efficiency in software development.

4.3 Discussion

The findings reveal several critical insights into the impact of LCNC platforms. Enhanced workforce productivity, as evidenced by the strong positive correlation with LCNC adoption, highlights these platforms' ability to streamline development processes and foster collaboration between technical and non-technical teams. This aligns with prior studies, such as Gartner (2022), which emphasized LCNC tools' role in reducing development bottlenecks. Additionally, the moderate relationship between LCNC adoption and skill adaptability suggests that while these platforms lower the entry barriers for software development, they necessitate ongoing reskilling efforts for IT professionals. Organizations must prioritize training programs to ensure their workforce can fully utilize LCNC tools while maintaining essential technical expertise.

Mixed perceptions of software quality point to concerns about scalability, robustness, and vendor lock-in despite the tools' ability to accelerate delivery. These concerns resonate with Roshandel et al. (2021), who stressed the need to balance speed and quality in LCNC development. Conversely, the high mean score for development efficiency and its strong correlation with LCNC adoption underscore the platforms' ability to expedite application creation. This supports findings by Mendix (2021), which demonstrated that LCNC platforms significantly reduce time-to-market, particularly for simple and medium-complexity applications. These insights highlight the importance of strategic adoption to maximize LCNC platforms' benefits while addressing their limitations.

Implications for Practice

The findings suggest that Indonesian organizations can gain substantial benefits from LCNC platforms by fostering cross-functional collaboration to drive innovation, developing structured training programs to bridge skill gaps, and implementing robust quality control measures to uphold software standards. However, businesses must exercise caution against over-reliance on LCNC tools, especially for projects that demand advanced customizations or long-term scalability.

5. CONCLUSION

This study highlights the transformative impact of LCNC platforms on IT workforces and software engineering practices in Indonesia. Key findings reveal that LCNC platforms significantly improve workforce productivity and development efficiency, offering organizations a faster and more collaborative approach to application development. However, moderate skill adaptability and mixed perceptions of software quality underline the need for targeted training programs and robust quality assurance measures.

For Indonesian organizations, adopting LCNC platforms presents a promising avenue for addressing the growing demand for agile software solutions. Nevertheless, a balanced strategy that combines LCNC adoption with continuous skill development and a focus on software standards is critical to ensuring sustainable

success. Future research should explore larger sample sizes and diverse industry settings to provide a more comprehensive understanding of LCNC adoption's long-term implications.

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