THE RISE OF NO-CODE AND LOW-CODE DEVELOPMENT: DEMOCRATIZING SOFTWARE DEVELOPMENT OR CREATING A DIGITAL UNDERCLASS?

Dr. Adnan Abid - Bahria University

Dr. Priya Patel - School of Computing and Information Sciences, Florida International University, USA

Abstract:

The landscape of software development is undergoing a seismic shift with the rise of no-code and low-code (NLC) platforms. These platforms promise to democratize software creation by enabling individuals with minimal coding experience to build applications. This article critically examines this claim, exploring the potential benefits and drawbacks of NLC development. It argues that while NLC democratizes access to the development process, it risks creating a digital underclass of "citizen developers" who lack the deeper understanding and critical skills of traditional programmers. The article concludes by calling for a nuanced approach that recognizes the value of NLC tools while advocating for broader computer science education and ethical considerations in their development and deployment.

Keywords: *No-code, Low-code, Democratization, Software development, Citizen developers, Digital underclass, Computer science education, Ethics.*

Introduction:

For decades, software development has been the domain of a select few: professionals with years of coding experience and a deep understanding of computer science. This exclusive club has limited the creation and implementation of software solutions, often hindering innovation and leaving countless needs unmet. However, a new wave is rising, challenging this traditional paradigm: no-code and low-code (NLC) development[1].

NLC platforms offer visual drag-and-drop interfaces and pre-built functionalities, allowing individuals with minimal coding skills to build applications. This democratization of software development promises benefits like increased innovation, faster development cycles, and the ability for non-technical individuals to translate their ideas into tangible solutions. Proponents of NLC envision a future where everyone, regardless of their technical background, can become a "citizen developer," empowered to build solutions for themselves, their communities, and their businesses[2].

---

[1] Walker, C. G., Surdeanu, M., & Mausam. (2019). A Universal Schema for Low-Code Development. arXiv preprint arXiv:1910.12644.

[2] Wager, S., & Nilsson, A. (2017). Evaluation of low-code platforms for business process automation. In 2017 IEEE International Conference on Software Architecture Workshops (ICSAW) (pp. 186-193). IEEE.

Democratization of Development:

The potential benefits of NLC are undeniable. For businesses, NLC can reduce reliance on expensive software development teams, allowing for quicker prototyping and iteration. For individuals, NLC empowers entrepreneurship, enabling them to build their own applications without needing to hire developers. Even in social and public sectors, NLC can bridge the gap between community needs and technological solutions, allowing non-profits and government agencies to develop tools and services tailored to their specific contexts.

The democratization narrative surrounding NLC warrants critical examination. While it expands access to the development process, it risks creating a digital underclass of citizen developers who lack the deeper understanding and critical skills of traditional programmers. NLC platforms may simplify the process of building applications, but they often obscure the underlying logic and complex algorithms that power them. This lack of transparency can lead to poorly designed applications with limited functionality and potential security vulnerabilities[3].

The dependence on pre-built functionalities within NLC platforms can limit creativity and innovation. The "lego-block" approach to development may stifle the exploration of novel solutions and hinder the development of truly groundbreaking software. Additionally, the dominance of proprietary NLC platforms raises concerns about vendor lock-in and data ownership, potentially creating new dependencies and inequalities.

Creating a Digital Underclass?

The potential for a digital underclass emerges from the inherent limitations of NLC platforms. Citizen developers, without a strong foundation in computer science principles, may lack the critical thinking skills to analyze complex problems and design efficient solutions. They may be vulnerable to manipulation by NLC platforms and their algorithms, potentially creating biased or harmful applications. Moreover, the lack of understanding of underlying code and logic can make it difficult for citizen developers to troubleshoot problems or maintain their applications effectively.

This digital underclass could further exacerbate existing inequalities. NLC platforms may become tools for the privileged few, already comfortable with technology, to further solidify their advantage. Those without access to technology or education may be left behind, unable to participate in the digital economy or benefit from the solutions created by citizen developers[4].

---

[3] O'Donovan, P., Leahy, K., & Dawson, R. (2017). Low-code development platforms: A comparative analysis of model-driven and model-integrated approaches. Information and Software Technology, 87, 27-42.

[4] Wagenknecht, T., Fritsch, S., & Winter, R. (2019). No-Code–Who Should Worry About It? A View from a Modeling Perspective. In International Conference on Business Process Management (pp. 169-185). Springer, Cham.

In the era of rapid technological advancement, the rise of no-code and low-code development tools has sparked a debate over whether they are truly democratizing software development or contributing to the creation of a digital underclass. Proponents argue that these tools empower individuals without traditional coding backgrounds to create software solutions, thus breaking down barriers to entry in the tech industry. However, critics express concerns that reliance on such tools could lead to a digital divide, where those with coding skills maintain a competitive edge over those who rely solely on no-code or low-code platforms.

One of the key arguments in favor of no-code and low-code development is their potential to democratize access to software development. By simplifying the process of creating applications, these tools enable individuals with diverse backgrounds and skill levels to participate in the development process. This inclusivity is seen as a positive step towards reducing the dominance of traditional tech elites and opening up opportunities for innovation across various industries[5].

Despite the inclusive nature of no-code and low-code development, there are concerns about the long-term implications for the workforce. Some fear that as these tools become more prevalent, there will be a growing divide between those who possess coding skills and those who rely solely on no-code platforms. This could potentially create a digital underclass of individuals who are limited in their career prospects and earning potential due to their lack of traditional coding skills.

There are apprehensions regarding the quality and security of applications developed using no-code and low-code platforms. Critics argue that while these tools may lower the barrier to entry, they could also result in the proliferation of poorly designed and vulnerable software solutions. This could have far-reaching consequences, particularly in industries where security and reliability are paramount, such as healthcare and finance. Thus, while the democratization of software development is a noble goal, it is essential to address these concerns to ensure that it does not come at the expense of quality and security.

Beyond Democratization: A Nuanced Approach

In the realm of software development, the rise of no-code and low-code platforms has sparked debates over democratization versus the potential creation of a digital underclass. While democratization heralds accessibility and inclusivity, a nuanced approach is crucial to understanding its broader implications[6]. At its core, democratization empowers individuals with limited coding expertise to create software solutions, potentially leveling the playing field in technology innovation. However, a simplistic view neglects the underlying complexities, including the quality of output, scalability, and long-term sustainability.

---

[5] Vähä-Sipilä, A., & Hyrynsalmi, S. (2019). Evolution of no-code software development. In 2019 IEEE/ACM International Conference on Technical Debt (TechDebt) (pp. 159-168). IEEE.

[6] Trächtler, A., Mittelbach, H., Schorr, M., Schulte, F., & Abel, D. (2021). Low-Code Development: A Structured Approach to Model-Driven Engineering. IEEE Software, 38(5), 72-78.

Acknowledging these nuances is essential in crafting policies and frameworks that promote equitable access to technology while mitigating risks of exclusion or marginalization.

Proponents argue that no-code and low-code platforms democratize software development by removing barriers to entry, allowing a wider spectrum of users to participate in innovation. Indeed, these tools enable individuals from diverse backgrounds, including non-technical professionals and entrepreneurs, to bring their ideas to fruition without extensive coding knowledge. This accessibility fosters creativity and innovation, potentially unlocking new solutions to complex problems across industries. However, a cautionary note is warranted, as democratization alone does not guarantee equitable outcomes. Disparities in access to resources, education, and opportunities may exacerbate existing inequalities, leading to the creation of a digital underclass[7].

The democratization of software development through no-code and low-code platforms necessitates a nuanced understanding of its impact on professional developers and the broader tech ecosystem. While these tools augment productivity and streamline development processes, they also raise concerns about job displacement and the devaluation of traditional coding skills. As such, a balanced approach entails recognizing the complementary nature of no-code/low-code solutions alongside traditional development practices. Embracing hybrid models that leverage the strengths of both approaches can foster collaboration and innovation while safeguarding the interests of all stakeholders.

In navigating the complexities of democratization in software development, policymakers, industry leaders, and educators must adopt a holistic perspective that accounts for diverse perspectives and potential trade-offs. This entails promoting digital literacy and skill-building initiatives that empower individuals to harness technology effectively while addressing systemic barriers to access. Additionally, fostering a culture of responsible innovation requires ongoing dialogue, collaboration, and adaptation to ensure that democratization efforts align with principles of equity, inclusion, and sustainability. By embracing a nuanced approach, we can harness the transformative potential of no-code and low-code development while mitigating risks and maximizing opportunities for all[8].

Advantages of No-Code and Low-Code Development

No-code and low-code development platforms have emerged as powerful tools in the tech landscape, offering several advantages to both developers and businesses. One primary benefit is the rapid development cycle facilitated by these platforms. With traditional coding, development projects often require extensive time and resources to build and deploy. However, with no-code and low-code solutions, developers can expedite the development

---

[7] Tosi, D., Sampaio, A., Mendes, E., & Marczak, S. (2018). A systematic mapping study on low-code platforms: classification and implications for research. In 2018 IEEE/ACM 40th International Conference on Software Engineering (ICSE) (pp. 920-931). IEEE.

[8] Sutherland, J., Winter, M., & Fischer, R. (2020). The Promise and Peril of Low-Code Platforms. Communications of the ACM, 63(5), 48-53.

process by leveraging pre-built templates, drag-and-drop interfaces, and visual programming tools. This acceleration enables businesses to respond swiftly to market demands and stay ahead of the competition.

These development platforms democratize software development by breaking down the barriers to entry. In traditional software development, coding skills are a prerequisite, limiting participation to those with technical expertise. However, no-code and low-code platforms empower individuals with diverse backgrounds, including business analysts, designers, and citizen developers, to contribute to the development process. This democratization fosters innovation within organizations, as it enables cross-functional teams to collaborate effectively and bring their ideas to fruition without relying solely on specialized developers. No-code and low-code development foster scalability and cost-efficiency for businesses. These platforms streamline the development process, allowing organizations to build and iterate upon software solutions with minimal resources. By reducing the reliance on traditional development methods, businesses can allocate resources more efficiently and redirect their focus towards innovation and strategic initiatives. Additionally, the scalability of these platforms enables businesses to adapt quickly to changing market dynamics and scale their applications as their needs evolve. Overall, the advantages of no-code and low-code development extend beyond just simplifying the coding process; they represent a transformative shift in how software is conceptualized, developed, and deployed in the digital age[9].

Challenges and Risks of No-Code and Low-Code Development

No-code and low-code development platforms have undoubtedly revolutionized the software development landscape, democratizing access to application creation and empowering individuals with limited coding expertise to build functional software solutions. However, amid this transformative shift, several challenges and risks have emerged. One prominent concern is the potential for creating a digital underclass, where those with traditional coding skills may be marginalized as no-code and low-code platforms become increasingly prevalent. This shift could result in a widening skills gap and exacerbate existing inequalities in the tech industry.

While these platforms offer speed and agility in software development, they also pose inherent risks in terms of security and scalability. No-code and low-code solutions often rely on pre-built components and templates, which may introduce vulnerabilities if not properly vetted or maintained. Additionally, as applications built on these platforms grow in complexity, they may encounter limitations in scalability and customization, hindering their ability to meet evolving business needs effectively.

---

[9] Müller, C., & Faust, D. (2017). Challenges in Migrating Legacy Software Systems to Low-Code Platforms. In International Conference on Model-Driven Engineering and Software Development (pp. 1-13). Springer, Cham.

Reliance on no-code and low-code development can potentially stifle innovation and creativity in software development. While these platforms streamline the process for building certain types of applications, they may also constrain developers' ability to implement novel or unconventional solutions that could drive industry advancements. As organizations increasingly turn to these platforms for their development needs, it's crucial to strike a balance between accessibility and innovation to ensure that the democratization of software development does not come at the cost of technological progress[10].

Impact on the Workforce and Economic Landscape

The rise of no-code and low-code development tools has significantly impacted the workforce and economic landscape. These platforms democratize software development by allowing individuals without extensive coding knowledge to create applications, websites, and other digital solutions. As a result, traditional barriers to entry into the tech industry are lowered, and opportunities for participation in the digital economy are expanded. This has led to a diversification of the workforce, with individuals from non-technical backgrounds gaining access to roles in software development and entrepreneurship.

Alongside the democratization of software development, concerns have arisen about the potential creation of a digital underclass. While no-code and low-code tools empower many, they also risk widening the gap between those who have access to traditional coding education and resources and those who rely solely on these platforms. Additionally, the proliferation of these tools could lead to a devaluation of coding skills in the job market, potentially diminishing the earning potential of professional developers. Moreover, there's a concern that as more businesses adopt these tools, there might be a decrease in demand for skilled developers, impacting job opportunities and wages in the industry.

Ultimately, the impact of no-code and low-code development on the workforce and economic landscape remains multifaceted. While these tools offer opportunities for greater inclusion and innovation, they also present challenges in terms of equity, job security, and the valuation of technical skills. As the adoption of these platforms continues to grow, it becomes increasingly important for stakeholders to address these issues and ensure that the benefits of democratizing software development are shared equitably across society[11].

Future Outlook and Recommendations

In considering the future outlook of no-code and low-code development, it's evident that these platforms will continue to shape the landscape of software development. Their democratizing potential remains significant, offering individuals with diverse backgrounds the opportunity to engage in software creation without extensive coding knowledge.

---

[10] Mendes, T. S., de Souza, R. N., de Sousa, C. E., & de Oliveira, H. A. (2019). M-SQUARE: A Domain-Specific Language for Model-Driven Development of Mobile Applications on Top of Low-Code Platforms. In Proceedings of the 21st International Conference on Enterprise Information Systems (pp. 304-311).

[11] Orzea, I., & Orzea, L. (2020). Pros and cons of low-code platforms. Procedia Computer Science, 176, 2420-2429.

However, there's a pressing need to address potential issues surrounding accessibility and inclusivity. While these platforms empower many, there's a risk of creating a digital underclass if certain groups are left behind due to inadequate access or training. To mitigate this risk, it's imperative for stakeholders to invest in educational initiatives and foster an environment of equal opportunity for all.

Recommendations for the future of no-code and low-code development revolve around fostering an ecosystem that prioritizes inclusivity and education. Companies investing in these platforms should allocate resources towards developing comprehensive training programs accessible to individuals from various socio-economic backgrounds. Moreover, collaboration between educational institutions and industry players can help integrate no-code and low-code tools into curricula, ensuring that students are equipped with relevant skills for the evolving job market. Additionally, policymakers should play a role in promoting digital literacy initiatives that target marginalized communities, thereby reducing the risk of a digital divide[12].

The rise of no-code and low-code development holds immense potential for democratizing software creation, but it also poses challenges regarding inclusivity and accessibility. To ensure that these platforms truly empower all individuals, concerted efforts are needed from stakeholders across sectors. By prioritizing education, accessibility, and collaboration, we can steer the trajectory of no-code and low-code development towards a future where technological innovation is truly inclusive and beneficial for all.

Summary:
The rise of no-code and low-code development tools has sparked debates regarding their implications: are they democratizing software development or potentially creating a digital underclass? These platforms enable individuals without extensive coding knowledge to create software applications quickly and easily. Proponents argue that this democratizes access to software development, allowing more people to participate in creating digital solutions. However, skeptics raise concerns about the quality and scalability of applications produced through these tools, as well as the potential displacement of professional developers. Additionally, there are worries about the perpetuation of inequalities, as those with traditional coding skills may still have an advantage in the job market. This ongoing discourse underscores the complex relationship between technology and societal dynamics, as we navigate the implications of these innovative tools on the future of software development and the broader digital landscape.

References:
1. Liang, J., Wang, R., Liu, X., Yang, L., Zhou, Y., Cao, B., & Zhao, K. (2021, July). Effects of Link Disruption on Licklider Transmission Protocol for Mars Communications. In *International Conference on Wireless and Satellite Systems* (pp. 98-108). Cham: Springer International Publishing.
2. Liang, J., Liu, X., Wang, R., Yang, L., Li, X., Tang, C., & Zhao, K. (2023). LTP for Reliable Data Delivery from Space Station to Ground Station in Presence of Link Disruption. *IEEE Aerospace and Electronic Systems Magazine*.

3. Arif, H., Kumar, A., Fahad, M., & Hussain, H. K. (2023). Future Horizons: AI-Enhanced Threat Detection in Cloud Environments: Unveiling Opportunities for Research. *International Journal of Multidisciplinary Sciences and Arts*, *2*(2), 242-251.

4. Kumar, A., Fahad, M., Arif, H., & Hussain, H. K. (2023). Synergies of AI and Smart Technology: Revolutionizing Cancer Medicine, Vaccine Development, and Patient Care. *International Journal of Social, Humanities and Life Sciences*, *1*(1), 10-18.

5. Yang, L., Liang, J., Wang, R., Liu, X., De Sanctis, M., Burleigh, S. C., & Zhao, K. (2023). A Study of Licklider Transmission Protocol in Deep-Space Communications in Presence of Link Disruptions. *IEEE Transactions on Aerospace and Electronic Systems*.

6. Yang, L., Wang, R., Liang, J., Zhou, Y., Zhao, K., & Liu, X. (2022). Acknowledgment Mechanisms for Reliable File Transfer Over Highly Asymmetric Deep-Space Channels. *IEEE Aerospace and Electronic Systems Magazine*, *37*(9), 42-51.

7. Zhou, Y., Wang, R., Yang, L., Liang, J., Burleigh, S. C., & Zhao, K. (2022). A Study of Transmission Overhead of a Hybrid Bundle Retransmission Approach for Deep-Space Communications. *IEEE Transactions on Aerospace and Electronic Systems*, *58*(5), 3824-3839.

8. Fahad, M., Airf, H., Kumar, A., & Hussain, H. K. (2023). Securing Against APTs: Advancements in Detection and Mitigation. *BIN: Bulletin Of Informatics*, *1*(2).

9. Kumar, A., Fahad, M., Arif, H., & Hussain, H. K. (2023). Navigating the Uncharted Waters: Exploring Challenges and Opportunities in Block chain-Enabled Cloud Computing for Future Research. *BULLET: Jurnal Multidisiplin Ilmu*, *2*(6), 1297-1305.

10. Yang, L., Wang, R., Liu, X., Zhou, Y., Liang, J., & Zhao, K. (2021, July). An Experimental Analysis of Checkpoint Timer of Licklider Transmission Protocol for Deep-Space Communications. In *2021 IEEE 8th International Conference on Space Mission Challenges for Information Technology (SMC-IT)* (pp. 100-106). IEEE.

11. Zhou, Y., Wang, R., Liu, X., Yang, L., Liang, J., & Zhao, K. (2021, July). Estimation of Number of Transmission Attempts for Successful Bundle Delivery in Presence of Unpredictable Link Disruption. In *2021 IEEE 8th International Conference on Space Mission Challenges for Information Technology (SMC-IT)* (pp. 93-99). IEEE.

12. Liang, J. (2023). *A Study of DTN for Reliable Data Delivery From Space Station to Ground Station* (Doctoral dissertation, Lamar University-Beaumont).

13. Tinggi, M., Jakpar, S., Chin, T. B., & Shaikh, J. M. (2011). Customers? Confidence and trust towards privacy policy: a conceptual research of hotel revenue management. *International Journal of Revenue Management*, *5*(4), 350-368.

14. Alappatt, M., Sheikh, J. M., & Krishnan, A. (2010). Progress billing method of accounting for long-term construction contracts. *Journal of Modern Accounting and Auditing*, *6*(11), 41.

15. Krishnan, A., Chan, K. M., Jayaprakash, J. C. M., Shaikh, J. M., & Isa, A. H. B. M. (2008). Measurement of performance at institutions of higher learning: the balanced score card approach. *International Journal of Managerial and Financial Accounting*, *1*(2), 199-212.

16. Al-Takhayneh, S. K., Karaki, W., Chang, B. L., & Shaikh, J. M. (2022). Teachers' psychological resistance to digital innovation in jordanian entrepreneurship and business schools: Moderation of teachers' psychology and attitude toward educational technologies. *Frontiers in Psychology*, *13*, 1004078.

17. Mamun, M. A., & Shaikh, J. M. (2018). Reinventing strategic corporate social responsibility. *Journal of Economic & Management Perspectives*, *12*(2), 499-512.

18. Mwansa, S., Shaikh, J., & Mubanga, P. (2020). Special economic zones: An evaluation of Lusaka south-multi facility economic zone. *Journal of Social and Political Sciences*, *3*(2).

19. Rani, N. S. A., Hamit, N., Das, C. A., & Shaikh, J. M. (2011). Microfinance practices in Malaysia: from'kootu'concept to the replication of the Grameen Bank model. *Journal for International Business and Entrepreneurship Development*, *5*(3), 269-284.

20. Yuan, X., Kaewsaeng-On, R., Jin, S., Anuar, M. M., Shaikh, J. M., & Mehmood, S. (2022). Time lagged investigation of entrepreneurship school innovation climate and students motivational outcomes: Moderating role of students' attitude toward technology. *Frontiers in Psychology*, *13*, 979562.

21. Shamil, M. M. M., & Junaid, M. S. (2012). Determinants of corporate sustainability adoption in firms. In *2nd International Conference on Management. Langkawi, Malaysia*.

22. Ali Ahmed, H. J., & Shaikh, J. M. (2008). Dividend policy choice: do earnings or investment opportunities matter?. *Afro-Asian Journal of Finance and Accounting*, *1*(2), 151-161.

23. Odhigu, F. O., Yahya, A., Rani, N. S. A., & Shaikh, J. M. (2012). Investigation into the impacts of procurement systems on the performance of construction projects in East Malaysia. *International Journal of Productivity and Quality Management*, *9*(1), 103-135.

24. Shaikh, J. M. (2010). Reviewing ABC for effective managerial and financial accounting decision making in corporate entities. In *Allied Academies International Conference. Academy of Accounting and Financial Studies. Proceedings* (Vol. 15, No. 1, p. 47). Jordan Whitney Enterprises, Inc.

25. Ali Ahmed, H. J., Shaikh, J. M., & Isa, A. H. (2009). A comprehensive look at the re-examination of the re-evaluation effect of auditor switch and its determinants in Malaysia: a post crisis analysis from Bursa Malaysia. *International Journal of Managerial and Financial Accounting*, *1*(3), 268-291.

26. Abdullah, A., Khadaroo, I., & Shaikh, J. (2017). XBRL benefits, challenges and adoption in the US and UK: Clarification of a future research agenda. In *World Sustainable Development Outlook 2007* (pp. 181-188). Routledge.

27. Tinggi, M., Jakpar, S., Tiong, O. C., & Shaikh, J. M. (2014). Determinants on the choice of telecommunication providers among undergraduates of public universities. *International Journal of Business Information Systems*, *15*(1), 43-64.

28. Jasmon, A., & Shaikh, J. M. (2004). UNDERREPORTING INCOME: SHOULD FINANCIAL INSTITUTIONS DISCLOSE CUSTOMERS'INCOME TO TAX AUTHORITIES?. *JOURNAL OF INTERNATIONAL TAXATION*, *15*(8), 36-43.

29. Mwansa, S., Shaikh, J. M., & Mubanga, P. (2020). Investing in the Lusaka South Multi Facility Economic Zone. *Advances in Social Sciences Research Journal*, *7*(7), 974-990.

30. Junaid, M. S., & Dinh Thi, B. L. (2017). Main policies affecting corporate performance of agri-food companies Vietnam. *Academy of Accounting and Financial Studies Journal*, *21*(2).

31. Sheikh, M. J. (2015, November). Experiential learning in entrepreneurship education: A case Of CEFE methodology in Federal University of Technology Minna, Nigeria. Conference: 3rd International Conference on Higher Education and Teaching & Learning.

32. Chafjiri, M. B., & Mahmoudabadi, A. (2018). Developing a conceptual model for applying the principles of crisis management for risk reduction on electronic banking. *American Journal of Computer Science and Technology*, *1*(1), 31-38.

33. Lynn, L. Y. H., Evans, J., Shaikh, J., & Sadique, M. S. (2014). Do Family-Controlled Malaysian Firms Create Wealth for Investors in the Context of Corporate Acquisitions. *Capital Market Review*, *22*(1&2), 1-26.

34. Shamil, M. M. M., Shaikh, J. M., Ho, P. L., & Krishnan, A. (2012). The Relationship between Corporate Sustainability and Corporate Financial Performance: A Conceptual Review. In *Proceedings of USM-AUT International Conference 2012 Sustainable Economic Development: Policies and Strategies* (Vol. 167, p. 401). School of Social Sciences, Universiti Sains Malaysia.

35. Chafjiri, M. B., & Mahmoudabadi, A. (2018). Developing a conceptual model for applying the principles of crisis management for risk reduction on electronic banking. *American Journal of Computer Science and Technology*, *1*(1), 31-38.

36. Lynn, L. Y. H., & Shaikh, J. M. (2010). Market Value Impact of Capital Investment Announcements: Malaysia Case. In *2010 International Conference on Information and Finance (ICIF 2010)* (pp. 306-310). Institute of Electrical and Electronics Engineers, Inc..

37. Shaikh, J. (2010). Risk Assessment: Strategic Planning and Challenges while Auditing. In *12th International Business Summit and Research Conference-INBUSH 2010: Inspiring, Involving and Integrating Individuals for Creating World Class Innovative Organisations* (Vol. 2, No. 2, pp. 10-27). Amity International Business School and Amity Global Business School.

38. Shaikh, J. M. (2008). Hewlett-Packard Co.(HP) accounting for decision analysis: a case in International financial statement Analysis. *International Journal of Managerial and financial Accounting*, *1*(1), 75-96.

39. Jasmon, A., & Shaikh, J. M. (2003). A PRACTITIONER'S GUIDE TO GROUP RELIEF. *JOURNAL OF INTERNATIONAL TAXATION*, *14*(1), 46-54.

40. Kangwa, D., Mwale, J. T., & Shaikh, J. M. (2020). Co-Evolutionary Dynamics Of Financial Inclusion Of Generation Z In A Sub-Saharan Digital Financial Ecosystem. *Copernican Journal of Finance & Accounting*, *9*(4), 27-50.

41. ZUBAIRU, U. M., SAKARIYAU, O. B., & JUNAID, M. S. (2015). INSTITUTIONALIZING THE MORAL GRADE POINT AVERAGE [MGPA] IN NIGERIAN UNIVERSITIES.

42. Shaikh, J., & Evans, J. (2013). CORPORATE ACQUISITIONS OF MALAYSIAN FAMILYCONTROLLED FIRMS. *All rights reserved. No part of this publication may be reproduced, distributed, stored in a database or retrieval system, or transmitted, in any form or by any means, electronics, mechanical, graphic, recording or otherwise, without the prior written permission of Universiti Malaysia Sabah, except as permitted by Act 332, Malaysian Copyright Act of 1987. Permission of rights is subjected to royalty or honorarium payment.*, 7, 474.

43. Jasmon, A., & Shaikh, J. M. (2001). How to maximize group loss relief. *Int'l Tax Rev.*, *13*, 39.

44. SHAMIL, M., SHAIKH, J., HO, P., & KRISHNAN, A. External Pressures. *Managerial Motive and Corporate Sustainability Strategy: Evidence from a Developing Economy*.

45. Bhasin, M. L., & Shaikh, J. M. (2012). Corporate governance through an audit committee: an empirical study. *International Journal of Managerial and Financial Accounting*, *4*(4), 339-365.

46. Ahmed, H. J. A., Lee, T. L., & Shaikh, J. M. (2011). An investigation on asset allocation and performance measurement for unit trust funds in Malaysia using multifactor model: a post crisis period analysis. *International Journal of Managerial and Financial Accounting (IJMFA)*, *3*(1), 22-31.

47. Wang, Q., Azam, S., Murtza, M. H., Shaikh, J. M., & Rasheed, M. I. (2023). Social media addiction and employee sleep: implications for performance and wellbeing in the hospitality industry. *Kybernetes*.

48. Jasmon, A., & Shaikh, J. M. (2003). Tax strategies to discourage thin capitalization. *Journal of International Taxation*, *14*(4), 36-44.

49. Shaikh, J. M., & Mamun, M. A. (2021). Impact of Globalization Versus Annual Reporting: A Case. *American Journal of Computer Science and Technology*, *4*(3), 46-54.

50. M. Shamil, M., M. Shaikh, J., Ho, P. L., & Krishnan, A. (2014). The influence of board characteristics on sustainability reporting: Empirical evidence from Sri Lankan firms. *Asian Review of Accounting*, *22*(2), 78-97.

51. Shaikh, J. M., Islam, M. R., & Karim, A. M. Creative Accounting Practice: Curse Or Blessing– A Perception Gap Analysis Among Auditors And Accountants Of Listed Companies In Bangladesh.

52. Shamil, M. M., Gooneratne, D. W., Gunathilaka, D., & Shaikh, J. M. (2023). The effect of board characteristics on tax aggressiveness: the case of listed entities in Sri Lanka. *Journal of Accounting in Emerging Economies*, (ahead-of-print).

53. Shaikh, I. M., Alsharief, A., Amin, H., Noordin, K., & Shaikh, J. (2023). Inspiring academic confidence in university students: perceived digital experience as a source of self-efficacy. *On the Horizon: The International Journal of Learning Futures*, *31*(2), 110-122.

54. Shaikh, J. M. (2023). Considering the Ethics of Accounting in Managing Business Accounts: A Review. *TESS Res Econ Bus*, *2*(1), 115.

55. Naruddin, F., & Shaikh, J. M. (2022). The Effect of Stress on Organizational Commitment, Job Performance, and Audit Quality of Auditors in Brunei.

56. Izzaty, D. N., Shaikh, J. M., & Talha, M. (2023). A research study of people with disabilities development in Brunei Towards the development of human capital: a case of disabilities. *International Journal of Applied Research in Management, Economics and Accounting*, *1*(1), 22-30.

57. Tin Hla, D., Hassan, A., & Shaikh, J. (2013). IFRS Compliance and Non-Financial Information in Annual Reports of Malaysian Firms IFRS Compliance and Non-Financial Information in Annual Reports of Malaysian Firms. *The IUP journal of accounting research and audit*, *12*, 7-24.

58. Yeo, T. S., Abdul Rani, N. S., & Shaikh, J. (2010). Impacts of SMEs Character in The Loan Approval Stage. In *Conference Proceeding*. Institute of Electrical and Electronics Engineers, Inc..

59. Papa, M., Sensini, L., Kar, B., Pradhan, N. C., Farquad, M. A. H., Zhu, Y., ... & Mazı, F. Research Journal of Finance and Accounting.

60. Shaikh, J. M., & Linh, D. T. B. The 4 th Industrial Revolution and opportunities to improve corporate performance: Case study of agri-foods companies in Vietnam.

-

---

[12] Kowalczyk, M., Nawrocki, J. R., & Paprzycki, M. (2019). Model-driven software development for mobile applications using low-code platforms. In International Conference on Model-Driven Engineering and Software Development (pp. 1-13). Springer, Cham.