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EXPLORING FACTORS AFFECTING IMPLEMENTING BLOCKCHAIN IN THE MIDDLE EAST: A TECHNOLOGY ACCEPTANCE MODEL PERSPECTIVE

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Abstract: Blockchain technology is emerging as a transforming agent across social, business, and technological environments globally, owing to its transparent, distributed, and safe design. However, its implementation faces challenges, including inadequate cross-border cooperation, poor regulatory frameworks, and a dearth of qualified professionals. This thesis investigates factors influencing blockchain adoption in three key Middle Eastern nations: Saudi Arabia, Jordan, and the United Arab Emirates (UAE). Employing a mixed-method approach—integrating quantitative and qualitative data using an extended Technology Acceptance Model (TAM) framework—the study examines user perceptions, software quality concerns, and contextual enablers. The core research evaluates the influence of Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Perceived Institutional Trust (PIT), and Perceived Privacy (PP) [5][6][7] on the decision to adopt blockchain technology. Findings emphasize the necessity of strong regulatory support, localized training, and focused awareness campaigns to foster sustainable blockchain adoption in the Middle East. The work acts as a model for regional application, advancing knowledge on how blockchain can propel digital transformation in the selected countries.

Keywords — Blockchain, Middle East, challenges, technology adoption barrier, IoT.

I. INTRODUCTION

A. Background and Context

Blockchain technology, initially unveiled over a decade ago with Bitcoin [1], has evolved beyond cryptocurrencies to influence sectors such as retail, healthcare, logistics, and financial services. [2][3] Its foundational characteristics include decentralization, great security, simple auditing, and smart automation. This shift decentralizes data storage, improving transparency and security through the immutable quality that guarantees data integrity. The COVID-19 pandemic further accelerated interest in blockchain [4], particularly for supply chain traceability and data integrity.

Knowledge of factors influencing technology acceptance is vital for promoting the general acceptance of technologies like blockchain. Examining key factors such as Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Perceived Institutional Trust (PIT), and Perceived Privacy (PP) [5][6][7] is essential for properly understanding blockchain adoption.

B. Regional Focus: The Middle East and MENA

The constraints faced by blockchain technology, such as inadequate regulatory frameworks and skill shortages, especially apply in the Middle East. Three major nations—Saudi Arabia, Jordan, and the UAE—were examined due to their strategic positioning combining trade, finance, and digital transformation. Saudi Arabia's Vision 2030 and the UAE Blockchain Strategy 2021 [8][9] exemplify national initiatives driving digital transformation. Dubai, for instance, seeks to use blockchain [10] to streamline various services, including bill payments and license renewals.

However, regional barriers persist, including the perceived complexity of blockchain, high implementation costs, skill gaps, and the need for stronger privacy protections [11][12]. Without addressing factors like PU, PEOU, trust, and privacy, organizations risk investing in technologies that fail to reach desired societal acceptance.

C. Research Objectives and Questions

This study aims to close a significant research gap by methodically analyzing the specific factors affecting blockchain acceptance in Middle Eastern countries.
The main objectives of the study are:

1. To collect data about the use of blockchain in the MENA region.
2. To examine the influence of the most effective factors (PU, PEOU, PIT, and PP) on the decision-making to adopt blockchain technology.

3. To enhance the application of the TAM model to examine the adoption of blockchain technology for Middle-Eastern organizations and firms.

4. To evaluate and validate the viability of the proposed model.

The primary research questions guiding this investigation include:

- **Rq1:** To what extent do Perceived Utility, Ease of Use, Institutional Trust, and Privacy influence the decision to adopt blockchain technology?

- **Rq3:** How to modify the extended TAM model for blockchain technology adoption for Middle Eastern organizations and firms?

II. Theoretical Framework and Key Factors

A. The Technology Acceptance Model (TAM)

The TAM is a widely cited framework used to understand and predict user acceptance of IT systems. It posits that a user's intention to use technology is primarily determined by two factors: **Perceived Usefulness (PU)** and **Perceived Ease of Use (PEOU)**.

- **Perceived Usefulness (PU):** The degree to which users believe blockchain will enhance organizational performance or output. For blockchain, this includes safe, open record-keeping, and transaction processing, improving supply chain transparency, and lowering fraud.

- **Perceived Ease of Use (PEOU):** Users' perception of the simplicity of blockchain technology implementation and operation. Improving simplicity directly affects the acceptance rate.

The traditional TAM often needs expansion to capture the complexities of newer technologies like blockchain. This study extended the model to include **Perceived Institutional Trust (PIT)** and **Perceived Privacy (PP)**, recognizing that these elements are critical, especially in the context of the Middle East.

Perceived Institutional Trust (PIT): User confidence in blockchain dependability. The distributed nature and tamper-proof records inherent in blockchain help build this confidence.

Perceived Privacy (PP): Addresses consumers' impressions of their data security within blockchain systems. Blockchain's encryption and immutability ensure users believe their data remains safe.

B. Factors Affecting Adoption in the Middle East

The literature review identified numerous challenges and factors influencing blockchain adoption, particularly relevant to the Middle East:

1. **Lack of Skills and Complexity:** Blockchain requires specialized technical competencies in cryptographic algorithms and smart contract development. The lack of skilled professionals hinders effective implementation and leads to increased hiring or training costs. The complexity also extends to integrating blockchain solutions with existing legacy IT systems.
2. **Cost:** Implementation and maintenance costs can be substantial, encompassing specially designed hardware, software, and skilled personnel. Transactional costs and high energy consumption (for Proof of Work systems) also contribute to overall expense, making adoption hard to justify for organizations with thin budgets.
3. **Regulation and Standardization:** Rigid or vague regulatory frameworks seriously impede adoption. Regulatory uncertainty regarding data protection (such as GDPR compliance) can clash with blockchain's immutability, adding complexity and cost. Furthermore, the lack of standardization across numerous blockchain platforms (e.g., Ethereum, Hyperledger) breeds confusion and limits interoperability, slowing down adoption [15] [16].
4. **Organizational Barriers:** These include internal factors like resistance and lack of management support, technological familiarity of the management team, and lack of technical knowledge. Inter-organizationally, barriers include cultural differences, privacy/information disclosure concerns, and perceived effort in communication [17] [18].

III. Methodology

The research adopted a mixed-method approach, combining quantitative and qualitative methodologies to thoroughly investigate factors influencing blockchain implementation in the Middle East.

A. Research Design and Model

The quantitative approach utilized a developed conceptual framework, an extended TAM model, which included: Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Attitude (ATT), Efficiency and Security (ES), Reduced Cost (RC), and the ultimate dependent variable, Behavioral Intention (BI) to adopt blockchain technology.

The study formulated nine hypotheses, exploring relationships such as:

- **H1:** Attitude has a positive influence on the behavioral intention to adopt blockchain technology.

- **H2:** Perceived Usefulness has a positive influence on Behavioral Intention to adopt blockchain technology.

- **H5:** Perceived ease of use has a positive influence on the perceived usefulness of the adoption of blockchain technology.
- **H9:** Efficiency and security have a positive influence on the PU to adopt blockchain technology.

B. Data Collection and Analysis

1. **Target Population and Sampling:** The study targeted IT professionals and managers in organizations across **Saudi Arabia, Jordan, and the UAE (Dubai)**, who were familiar with blockchain technology but had not yet applied it in their firms.
2. **Quantitative Data:** Collected using a closed-ended survey questionnaire (Likert scale). A sample size of 384 participants was calculated based on statistical methods. Data analysis was conducted using **Structural Equation Modeling (SEM)** via AMOS-SPSS.
3. **Qualitative Data:** Collected through semi-structured interviews with 10 participants (managers/team leaders) using purposive sampling to gain in-depth insights into perceptions, experiences, and challenges. Analysis involved thematic analysis (coding and pattern identification).

IV. Results and Discussion

A. Model Assessment (SEM)

The Structural Equation Modeling (SEM) analysis provided insights into the model fit.

- The **CMIN/DF** value was 2.881, suggesting a reasonably good fit (as it is below the generally acceptable threshold of 3).
- The **Comparative Fit Index (CFI)** was 0.902, indicating that the model fits the data relatively well (as it is above 0.90).
- The **RMSEA** value was 0.070, suggesting a reasonably good fit (as it is below the acceptable threshold of 0.08).

B. Path Analysis and Hypothesis Testing

The path analysis confirmed significant relationships between several constructs.

Relationship	**Estimate**	**Significance (P-value)**	**Result**
PU <--- Efficiency and Security	0.538	*** (< 0.05)	Significant Positive Impact
PU <--- Perceived Ease of Use	0.223	*** (< 0.05)	Significant Positive Impact
ATT <--- Perceived Ease of Use	0.397	*** (< 0.05)	Significant Positive Impact
ATT <--- Reduced Cost	0.408	*** (< 0.05)	Significant Positive Impact
BI <--- Attitude	0.511	*** (< 0.05)	Significant Positive Impact
BI <--- Perceived Usefulness	0.252	*** (< 0.05)	Significant Positive Impact

Key results supporting adoption include:

- **Efficiency and Security (ES) significantly impact Perceived Usefulness (PU):** An estimated coefficient of 0.538 suggests that enhancing the security and efficiency of blockchain technology significantly improves its perceived usefulness.
- **Perceived Ease of Use (PEOU) significantly impacts Perceived Usefulness (PU):** A coefficient of 0.223 confirms that PEOU positively influences PU. Simpler and easier-to-use technology contributes to the belief that the system is more useful.
- **Attitude (ATT) and Perceived Usefulness (PU) both significantly impact Behavioral Intention (BI):** These core TAM constructs remain strong predictors of the intention to adopt blockchain technology.

C. Discussion of Factors

The findings confirmed that factors beyond the original TAM constructs are highly effective in driving blockchain adoption in the MENA region:

1. **Security and Efficiency:** Blockchain's potential for security (decentralization, immutability, cryptographic tools) and efficiency (automation, streamlining operations) strongly influences perceived usefulness. Middle Eastern firms utilize blockchain to safeguard transactions and data confidentiality, mitigating cyber-attacks and reducing fraud.
2. **Perceived Ease of Use and Skills:** PEOU is critical for successful implementation. However, the lack of skilled professionals with the necessary technical know-how remains a significant barrier. Training and focused efforts on user interface design are necessary to improve PEOU given the technology's novelty and complexity.
3. **Cost Reduction:** Reduced cost significantly and positively influences the Attitude (ATT) toward adopting blockchain. Blockchain streamlines transactions, reducing dependency on intermediaries, leading to cost savings, which acts as a major driver for implementation.

4. **Challenges to Implementation:** Major challenges identified include scalability issues (leading to slow transaction times), regulatory uncertainty (lack of clear guidelines), lack of standardization, and resistance to change

V. Conclusion

Blockchain technology is rapidly expanding in the Middle East, particularly within GCC nations, driven by technological advancements and digital transformation strategies. This research utilized an extended TAM framework to systematically investigate the factors influencing blockchain adoption among organizations and firms in Saudi Arabia, Jordan, and the UAE.

The findings confirm that the core TAM constructs—Perceived Usefulness, Perceived Ease of Use, and Attitude—are significant predictors of the intention to adopt blockchain. Crucially, the extended factors of Efficiency and Security, and Reduced Cost, were found to have a strong positive influence on both Perceived Usefulness and Attitude.

To enhance adoption, it is essential to address barriers such as complexity, scalability, and the shortage of qualified personnel. Policymakers and organizations are advised to invest in localized training programs to bridge the skill gap, develop clear regulatory frameworks to reduce uncertainty, and promote standardization to enhance interoperability between platforms. By focusing on perceived benefits like increased security, transparency, and cost reduction, Middle Eastern firms can successfully leverage blockchain technology to enhance information security and achieve greater efficiency in their business operations.

VI. References

[1] S. Nakamoto, “Bitcoin: A peer-to-peer electronic cash system,” 2008. [Online]. Available: https://bitcoin.org/bitcoin.pdf
[2] M. Crosby, P. Pattanayak, S. Verma, and V. Kalyanaraman, “Blockchain technology: Beyond bitcoin,” Applied Innovation Review, no. 2, pp. 6–10, 2016.
[3] J. Yli-Huumo, D. Ko, S. Choi, S. Park, and K. Smolander, “Where is current research on blockchain technology? —A systematic review,” PLoS ONE, vol. 11, no. 10, p. e0163477, 2016.
[4] M. M. Queiroz and S. F. Wamba, “Blockchain adoption challenges in supply chain: An empirical investigation,” International Journal of Information Management, vol. 46, pp. 70–82, 2019.
[5] F. D. Davis, “Perceived usefulness, perceived ease of use, and user acceptance of information technology,” MIS Quarterly, vol. 13, no. 3, pp. 319–340, 1989.
[6] D. Gefen, E. Karahanna, and D. W. Straub, “Trust and TAM in online shopping: An integrated model,” MIS Quarterly, vol. 27, no. 1, pp. 51–90, 2003.
[7] V. Venkatesh and F. D. Davis, “A theoretical extension of the technology acceptance model: Four longitudinal field studies,” Management Science, vol. 46, no. 2, pp. 186–204, 2000.
[8] Government of Saudi Arabia, “Vision 2030,” 2016. [Online]. Available: https://vision2030.gov.sa
[9] UAE Government, “UAE Blockchain Strategy 2021,” 2018. [Online]. Available: https://government.ae
[10] Dubai Future Foundation, “Dubai blockchain strategy,” 2019. [Online]. Available: https://www.dubaifuture.ae
[11] A. AlHogail, “Improving IoT technology adoption through blockchain technology,” International Journal of Advanced Computer Science and Applications, vol. 9, no. 8, pp. 77–84, 2018.
[12] I. A. Omar, R. Jayaraman, M. S. Debe, K. Salah, and S. Ellahham, “Secure patient data management using blockchain,” Healthcare, vol. 9, no. 1, p. 23, 2021.
[13] S. Muneer, M. B. Alvi, M. Al Sakhnani, H. Raza, T. M. Ghazal and M. Ahmad, "Systematic Review: Predictive Models for the Winning Team of Super Leagues (SL)," *2023 International Conference on Business Analytics for Technology and Security (ICBATS)*, Dubai, United Arab Emirates, 2023, pp. 1-5, doi: 10.1109/ICBATS57792.2023.10111268.
[14] M. Alsakhnini, “The impact of COVID-19 on the information technology sector in Egypt and UAE (challenges and opportunities),” *Journal of Positive School Psychology*, vol. 6, no. 8, pp. 7611–7621, 2022.
[15] Al Moaiad, Y., D., Alkhateeb, M., & Alokla, M. (2024). Enhancing Cybersecurity Practices in Nigerian Government Institutions an Analysis and Framework. J. Electrical Systems, 20(3), 5964-5967.
[16] Al Moaiad, Y., D., Alkhateeb, M., & Alokla, M. (2024). Deep Analysis of Iris Print and Fingerprint for Detecting Drug Addicts. J. Electrical Systems, 20(3), 5639-5644.
[17] Al Moaiad, Y., Alobed, M., & Alsakhnini, M. (2024). Python Solutions to Address Natural Language Challenges. International Journal, 10(3), 3594-3603.
[17] Al Moaiad, Y., Alobed, M., Alsakhnini, M., & Momani, A. M. (2024). Challenges in natural Arabic language processing. Edelweiss Applied Science and Technology, 8(6), 4700-4705.
[18] Al Moaiad, Y., Alobed, M., Alsakhnini, M., & Momani, A. M. (2024). Challenges in natural Arabic language processing. Edelweiss Applied Science and Technology, 8(6), 4700-4705.