

# Identifying the important determinants of the adoption of AI-based accounting software for the SMEs in Pakistan. Binary Logistic Regression<sup>1</sup>

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**Abstract:** Digital accounting with artificial intelligence technology represents a crucial means for facilitating the productivity and competitiveness of small and medium enterprises in developing countries. In regard to the state of Pakistan, the implementation and use of accounting software with artificial intelligence technology in SMEs has yet to reach satisfactory standards despite the crucial part played by SMEs regarding economic resilience in the country. This research aims to explore the crucial factors of the implementation process of accounting software with artificial intelligence technology from a quantitative research perspective. In order to discuss the research objectives and achieve its aims, the research employs the technology acceptance model and organization environment theory. A cross-sectional research design method was adopted to investigate 250 owners/managers of SMEs in the main Pakistani cities. To determine the values of perceptual variables, a 5-point Likert scale was adopted; yet, adoption is a binary variable. By using logistic regression analysis, hypotheses were tested. The results indicate that perceived ease of use and competitive pressure are significant positive predictors, yet perceived cost and security concerns are significant negative predictors. A positive relationship between the owner's level of education and adoption is marginally significant. The Nagelkerke  $R^2$  is 58%. The results indicate that, apart from using the basic applications developed through this technology, the adoption mechanism is itself a complex process that is fueled by cost and data security concerns. Implications of this research study would include developing cost-effective models by software companies regarding data security or designing a subsidy program by governments, according to the cost and/or data security concerns of Pakistani SME businessmen.

**Keywords:** Binary logistic regression, AI, accounting change, SMEs, Pakistan.

## Identificação dos determinantes importantes da adoção de software de contabilidade baseado em IA para PMEs no Paquistão. Regressão Logística Binária

**Resumo:** A contabilidade digital com tecnologia de inteligência artificial representa um meio crucial para facilitar a produtividade e a competitividade de pequenas e médias empresas em países em desenvolvimento. No que diz respeito ao Paquistão, a implementação e o uso de software de contabilidade com tecnologia de inteligência artificial em PMEs ainda não atingiram padrões satisfatórios, apesar do papel crucial desempenhado pelas PMEs na resiliência econômica do país. Esta pesquisa visa explorar os fatores cruciais do processo de implementação de software de contabilidade com tecnologia de inteligência artificial a partir de uma perspectiva de pesquisa quantitativa. Para discutir os objetivos da pesquisa e atingir suas metas, a pesquisa emprega o modelo de aceitação da tecnologia e a teoria do ambiente organizacional. Um método de pesquisa transversal foi adotado para investigar 250 proprietários/gerentes de PMEs nas principais cidades paquistanesas. Para determinar os valores das variáveis perceptivas, foi adotada uma escala Likert de 5 pontos; no entanto, a adoção é uma variável binária. Utilizando análise de regressão logística, as hipóteses foram testadas. Os resultados indicam que a facilidade de uso percebida e a pressão competitiva são preditores positivos significativos, enquanto os custos percebidos e as preocupações com a segurança são preditores negativos significativos. Uma relação positiva entre o nível de escolaridade do proprietário e a adoção é marginalmente significativa. O  $R^2$  de Nagelkerke é de 58%. Os resultados indicam que, além do uso dos aplicativos básicos desenvolvidos por meio dessa tecnologia, o mecanismo de adoção em si é um processo complexo, impulsionado por preocupações com custos e segurança de dados. As implicações deste estudo de pesquisa incluem o desenvolvimento de modelos econômicos por empresas de software em relação à segurança de dados ou a elaboração de um programa de subsídios por governos, de acordo com as preocupações com custos e/ou segurança de dados de empresários de PMEs paquistanesas.

**Palavras-chave:** Regressão logística binária, IA, mudança contábil, PMEs, Paquistão.

## Identificación de los determinantes clave de la adopción de software de contabilidad basado en IA para las PYMES en Pakistán. Regresión logística binaria

**Resumen:** La contabilidad digital con tecnología de inteligencia artificial representa un medio crucial para facilitar la productividad y la competitividad de las pequeñas y medianas empresas (PYMES) en los países en desarrollo. En Pakistán, la implementación y el uso de software de contabilidad con IA en las PYMES aún no alcanzan estándares satisfactorios, a pesar del papel fundamental que desempeñan estas empresas en la resiliencia económica del país. Esta investigación busca explorar los factores clave del proceso de implementación de software de contabilidad con IA desde una perspectiva cuantitativa. Para abordar los objetivos de la investigación, se emplea el modelo de aceptación de la tecnología y la teoría del entorno organizacional. Se adoptó un diseño de investigación transversal para investigar a 250 propietarios/gerentes de PYMES en las principales ciudades pakistaníes. Para determinar los valores de las variables perceptuales, se utilizó una escala Likert de 5 puntos; sin embargo, la adopción es una variable binaria. Mediante análisis de regresión logística, se probaron las hipótesis. Los resultados indican que la facilidad de uso percibida y la presión competitiva son predictores positivos significativos, mientras que el costo percibido y las preocupaciones sobre la seguridad son predictores negativos significativos. La relación positiva entre el nivel educativo del propietario y la adopción es marginalmente significativa. El  $R^2$  de Nagelkerke es del 58%. Los resultados indican que, además del uso de las aplicaciones básicas desarrolladas mediante esta tecnología, el mecanismo de adopción es en sí mismo un proceso complejo impulsado por las preocupaciones sobre el costo y la seguridad de los datos. Las implicaciones de este estudio de investigación incluyen el desarrollo de modelos rentables por parte de las empresas de software en materia de seguridad de datos o el diseño de un programa de subsidios por parte de los gobiernos, de acuerdo con las preocupaciones sobre el costo y/o la seguridad de los datos de los empresarios de PYMES pakistaníes.

**Palabras clave:** Regresión logística binaria, IA, cambio contable, PYMES, Pakistán.

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## Introdução

Currently, the world economic order is experiencing a paradigm revolution driven by the infinite digital evolution. At the heart of the revolution lies the integration of Artificial Intelligence (AI) concepts within the realm of business operations, with the realm of accounting and financial management rank-and-file sectors believed to be among the best that can be revolutionized. Artificial Intelligence-based accounting systems that involve the use of cloud technology, such as QuickBooks Online and Xero, among others, and the development of local options, are set to revolutionize the financial management of businesses with unmatched efficiency, accuracy, and financial intelligence analysis. This makes the development one of the most significant in the Small to Medium Enterprise (SMEs), which forms the backbone of all economies across the globe. SMEs in the Pakistani economic order are believed to be contributing up to 40% to the GDP of the country, with 80% of the industrial workforce consisting of SME employees. Productivity and the growth of SMEs, therefore, are the same as the well-being of the Pakistani economy.

Nevertheless, in spite of so many demonstrable advantages in utilizing these technology tools, the level of adoption of such sophisticated accounting software packages integrated with AI in SMEs in Pakistan is apparently appalling, so much so that it has resulted in a large 'digital divide.'

The SME community in Pakistan has been faced with a unique environment, ranging from informal business activity, cash-intensive transactions, restricted formal credit availability, and traditional bookkeeping methods. Many small- and medium-sized business owners are currently using traditional ledgers or spreadsheet software, where the processes involved are not only extremely time-consuming and vulnerable to human mistakes but also incapable of generating the level of analytical insights needed in a fluctuating economic environment. These are reflective of a state of technological stall that is paradoxically occurring in the midst of a country-wide drive for digitalization, as indicated by high-level initiatives in the government, such as Digital Pakistan Vision, and the rapid increase in mobile broadband penetration in the country. Perhaps the mismatch indicates that it is not solely a problem related to technological or infrastructure issues that are being dealt with in the perceptual and economic contexts.

Research on the determinants or antecedents for technology adoption as a topic is also well explored, having been theorized with advanced concepts such as the Technology Acceptance Model, Diffusion of Innovation, or Technology-Organizations-Environmental frameworks. Practically, these theoretical frameworks highlight variables such as perceived usefulness, perceived ease of use, and compatibility as distinct, absolute forces. Also, requiring rather complex inspections, the adoption of these theoretical frameworks, as appropriate in the given scenario regarding Pakistani SMEs and their adoption of AI-powered accounting software, involves an inspection that is multiple in calculation; for instance, for the adoption software, it and others have hardly been regarded as shaped in a singular form but, rather, in calculations for the owner of the SMEs. For instance, the usability that would be made available by an intricate program like QuickBooks would be disputed by the fact that cloud storage of any information related to finance would always be insecure. Although the pressure of competition could possibly come into conflict with the obstacle that could always be hidden in additional costs, it could once again be disputed by the owner's knowledge of digital technology that may possibly be acquired through qualifications in education.

Therefore, this particular effort in research aims to not only reach theoretical universality but also generalize in a very distinct and concrete manner based on determining the importance of highlighting variables in adopting artificial intelligence accounting software in Pakistani SME accounts. This effort asserts that "adoption is a function of a set of variables,

- (1) Perceived Ease of Use – 'an individual believes that using the system would require a

lack of effort’;

(2) Perceived Cost “Cost characteristics include not only purchase cost but also other costs such as loss due to inoperability in the event of system failure.”

(3) Security Concerns: “anxiety about unauthorized access to information and loss due to cyber-terrorism”;

(4) Owner’s Education Level: “an indicator in measuring an individual’s digital literacy and predispositions and abilities in adopting information and/or communications technology”; and

(5) “Competitive Pressure: a pressure put on a firm by other members in their industry and/or world to adopt information and/or communications technology.”

Using a quantitative methodological approach focused on survey research using the Likert scale in order to measure these variables allows this research a chance to develop a model of adoptive behavior based on these variables. There are several ways in which this research question has importance.

In academic terms, it adds to the growing literature of technology adoption in developing economies by validating and possibly extending existing theories in a real-world environment. In terms of software firms, whether global or domestic, it serves as a guide in understanding the Pakistani SME mindset in terms of positioning, pricing, and messaging in a manner that allays concerns. In terms of policy, it can serve as a guide for interventions in terms of subsidized digital awareness initiatives or fiscal policies for quick SME digitalization. In terms of the actual SME owners themselves, it shows the way in terms of improving disaster preparedness and development by positing the notion of technology adoption in terms of AI accounting not as an improvement but as a necessity in the new Pakistani marketplace.

### ***Research Gap***

Although there is an increasing amount of literature available on technology adoption in general, there appear to be a number of important research gaps that remain in this area, specifically within the context of Pakistani SMEs adopting AI-powered accounting software.

First, there is a context-related and geographical rift in the literature that needs to be filled. Although there is a vast amount of literature regarding SME adoption of technology in developed Western countries and even other Asian countries such as India and China, the scenario is not thoroughly investigated for the Pakistani setting yet. Although the papers by Venkatesh et al. (2003) for UTAUT or Davis (1989) for TAM are universal in approach, these variables emerge differently in the Pakistani setting, which is characterized by constant flux in the regulatory system and infrastructure differences with its own cultural parameters regarding trust and business formalism (Qalati et al., 2021). Secondly, there is the technological specificity gap. Most of the literature on Pakistani SME groups' "technology adoption" generally relates to websites, social networking sites, or other common e-commerce (Khan et al., 2020). There has been very little systematic empirical work on the determinants of the adoption of complex AI-infused cloud-based accounting software. This is because the more specific concern with accounting software regards the more fundamental financial information it entails, which requires separate examination from the rest of IT adoption.

Thirdly, one can notice that there is an integration gap regarding the methodology and variables being used here. Many studies that can be found regarding the subject matter within the context of Pakistan are mostly qualitative/conceptual in nature (Ali & Kamal, 2022). Although these types of studies can be incredibly helpful for theoretical development, they cannot be used for the kind of generalizable quantifications being pursued in this study. Moreover, many studies that are already quantitative tend to view the variables independently. The study combines in one model a critical mix of technological perceptions (usability, security), economic considerations (cost), personal characteristics (education level of the owners), and environmental pressures (competitive

pressure) in one single prediction model. Note, in this specific context, the value of the educational levels of the owners, as an important moderating factor or influencing factor, is hardly ever quantified in conjunction with non-technological perceptions. Also, the aspect of competitive pressure in the highly populated SMEs in the Pakistani industrial clusters has hardly ever been quantified, which functions as an important catalyst for accounting software.

Lastly, there exists a gap in practical applicability. Results created from academic research cannot be applied in terms of prioritization for the parties involved. Quantifying the relative strength and significance of each factor, that is, whether security-related concerns are stronger deterrents than those related to cost, or whether competitive pressure is a weaker motivator than perceived ease of use, the study yields a hierarchy of barriers and enablers. Such operational intelligence is presently lacking but is essential for developing effective promotion, policy, and educational strategies to facilitate the digital transformation of the most critical part of the Pakistani economy.

### ***Problem Statement***

Despite the known benefits of the potential of AI-driven accounting software, the level of adoption of the software used in Small and Medium Enterprises (SMEs) in the Republic of Pakistan is critical. This situation occurs against the backdrop of the country striving to be digitally enabled. The current knowledge gap in the related literature is the absence of a quantitative discussion of the factors that can both impede and encourage the adoption of the software in the Pakistani environment. The key challenge, therefore, is the presence of the as-yet-not-assessed influences of the factors of cost, security, usability, capability, and competitiveness, which altogether shape the adoption decision of the owners of SMEs in the Republic of Pakistan.

### ***Study Objectives***

The key objective of this research is to quantitatively analyze and measure the critical determinants responsible for the adoption of AI-powered accounting software by SMEs in Pakistan. The main specific objectives of the research are to:

- To investigate the impact of perceived ease of use on the adoption of AI-powered accounting software among Pakistani SMEs.
- To assess the effects of the perceived cost of the software (subscribed, installed, and trained) upon the decision.
- To investigate the role of concerns about data security and privacy in preventing the use of cloud accounting systems.
- To examine the correlation that exists or lacks between the level of education attained by the owner and the adoption of sophisticated accounting technology.
- To identify the contribution of the competitive pressures of the business environment in motivating or compelling SMEs to adopt the latest accounting software.

### ***Literature Review***

#### ***Theoretical Foundations of Technology Adoption***

The research on the adoption of technology has strong foundations in some proven models. The Technology Acceptance Model (TAM), originally developed by Davis in 1989, is perhaps the most popular, with the idea that an individual's intention to use a technology is primarily influenced by two forms of beliefs: 'Perceived Usefulness (PU)' and 'Perceived Ease of Use (PEOU).' When it comes to accounting software using artificial intelligence in SMEs, it is the aspect of PEOU that comes prominently to the fore. SME owners, who do not have an IT team, are naturally attracted to systems they can understand with minimal learning or investment in time (Grandón et al., 2011).

The study employed this variable, and the hypothesis was positively affected by its impact.

Going beyond the individual level of perception, a far more inclusive approach to this issue has been given by the Technology-Organization-Environment (TOE) framework (Tornatzky & Fleischer, 1990), which breaks down these factors into three different categories: technological, organizational, and environmental. The technological perspective would include factors such as the type of software in question. Organizational considerations would include organizational size, capabilities, and structure; in this instance, represented by the level of educational achievement held by the owner of the company, which indicates organizational capabilities in processing absorbed new technologies (Thong, 1999). Those who hold more advanced levels of education will have greater familiarity with new technologies and understanding of its eventual use and abilities to adequately communicate with them, which would increase adoption chances (Ghobakhloo et al., 2011). “The environmental perspective views the industry structure, the regulatory environment, and competitors’ behavior. It is captured in our research by the “Competitive Pressure” variable.”

#### **Institutional Theory:**

According to institutional theory, organizations adopt innovations in order to gain legality because they might end up in a lower status compared to similar organizations (DiMaggio & Powell, 1983). In the competitive arena of SMEs in Pakistan, this may prove to be a factor that has not been considered in the decision to adopt innovations.

#### ***Perceived Cost and Affordability Constraints***

Cost is a perpetual and powerful factor in technology adoption, especially for resource-constrained SMEs. In the theories of adoption, cost often comes under the broader construct of "perceived financial resources" or is a key constituent of the relative advantage calculus in Rogers' Diffusion of Innovation theory, 2003. However, for Pakistani SMEs, cost is not a monolithic concept. It includes the direct subscription fees of software like QuickBooks Online, perhaps priced in foreign currency, together with indirect costs: hardware upgrades, internet reliability expenses, training time, and potential consultant fees. Ifinedo (2011) states that the perception of cost is often inflated by uncertainty about return on investment. While studies in developed economies have shown clear long-term ROI from accounting automation, Pakistani SME owners operating on thin margins may view the initial outlay as prohibitive and risky. The current study quantifies this perception, distinguishing it from objective cost, because it is the owner's subjective assessment that ultimately guides the adoption decision.

#### ***Security Concerns in the Cloud and Data Privacy***

Security concerns are one of the main and very often dominating barriers to the adoption of cloud-based services in developing economies. AI-powered accounting software normally operates through the cloud, where sensitive financial data is stored on third-party servers; these are often outside of Pakistan. This leads to acute worries over data sovereignty, unauthorized access, cyberattacks, and the integrity of the service provider. In an environment where trust is a critical cultural attribute and formal data protection laws are still in the development stage, for example, the Personal Data Protection Bill of Pakistan is under drafting, are exacerbated. SME owners can manifest strong support for local solutions, which are regarded as being more responsive to localized regulations, or can oppose the implementation of a cloud due to fear of losing control. This variable is part of the context in which the TOE model resides and is highly interdependent with trust, a known determinant in TAM extensions. The importance of the value given to the role of security concerns compared with other concerns is significant in determining resistance to adoption.

#### ***Owner’s Education Level and Human Capital***

The human aspect, represented by the owner-manager of the SME, is critical. The education

level of the owner proxies for a myriad of other factors, such as computer literacy, intelligence for adapting to new technology, familiarity with up-to-date business techniques, and risk-taking. The educated owner can better assess the benefits of software, be more willing to change, and possess the foresight to see beyond the current disruptions (Thong, 1999). Other studies in other developing environments demonstrate that there is a positive linkage between the education levels of owner/managers and the degree of IT use (Ghobakhloo et al., 2011). Within the context of Pakistan, where the educational levels of businesspeople may be quite disparate, education levels may be an important discriminant. It is the measure of organizational readiness. The current research sets out to test these findings in the particular application of AI accounting software.

### ***Competitive Pressure and Institutional Forces***

The role of competitive pressure is based on the institutional/resource dependency perspective. Organizations embrace information technology to reduce costs, as well as to keep up with the competition, respond to the demands of larger counterparties (such as banks/companies that demand electronic bills), or increase their legitimacy in the marketplace (Teo et al., 2003). In the Pakistani environment, as the logistics sector becomes increasingly e-enabled and tax authorities, such as the Federal Board of Revenue's Point of Sales system, require everything to be recorded digitally, the forces encouraging SMEs to modernize their bookkeeping systems will be growing. These forces of coercion and mimetic pressure can be a strong driver in getting past internal reservations. But the nature of the impact, as far as their internal beliefs of cost and security, remains to be seen.

### ***Synthesis and Research Positioning***

Findings from the literature indicate a robust foundation in the theories of TAM and TOE for adoption research. From past studies, it is found that PEOU, cost, security, and management characteristics were prominent. But from the synthesis of the literature, it is further clear that the needs being addressed by this study are the requirements for testing the known variables in the contextually different and less-studied Pakistani context regarding SMEs and the adoption of AI accounting software. By considering both individual-level variables, namely the educational achievement of the entrepreneur, and context-level variables, including competitive pressure and technologically related perceptions, this research study plans to offer an overall and scientifically proven paradigm for the reality surrounding adoption. The overall model for adoption, which holds the power to provide catalyzing suggestions for the crucial SME sector in Pakistan and its adaptation towards the digital transition, exists.

### ***Conceptual Framework***

An integrated framework brings together the Technology Acceptance Model and the framework on technology organization environment for use in this research. Indeed, TAM, which traces back to the original ideas in Davis (1989), is a very effective approach with a singular focus on the two belief constructs, perceived usefulness and perceived ease of use, on individual technology adoption. For this study, PEOU is adopted as a primary variable on the grounds that SME owners are more likely to adopt AI-accounting software they find intuitive and effortless to integrate into daily operations, a critical consideration for resource-constrained firms lacking dedicated IT support.

To incorporate the overall factors that operate within the context, the TOE framework, provided by Tornatzky and Fleischer in 1990, has been integrated. According to it, adopting technological innovation is impacted by three aspects, namely technological, organizational, and environmental.

The technological context is described with the help of the nature of the technology itself, in this case, its PEOU, perceived cost, and security concerns. Perceived cost is considered to be

beyond the cost of subscription and involves other costs that act as a major impediment for SMEs (Ifinedo, 2011). Security concerns regarding financial data stored in the cloud act as an impediment to internet security adoption in countries with rapidly developing data protection policies, such as in the case of Pakistan (Ahmad et al., 2022).

The organizational context is captured through the educational attainment of the owner. This acts as a proxy for managerial innovativeness and technological literacy in terms of absorptive capacity. A higher educational level is linked to an improved understanding and utilization of technological trends and tools (Thong, 1999; Ghobakhloo et al., 2011). Lastly, the environmental context is mediated through competitive pressure. This represents institutional isomorphic forces wherein organizations adopt technological solutions in order to gain legitimacy and prevent competitive disadvantage in an industry or supply chain (DiMaggio & Powell, 1983; Teo et al., 2003). The dependent variable is the rate of adoption of the AI-enabled accounting software, measured by the binary outcome of Yes/No adoption. The combined framework hypothesizes the adoption outcome as a function of the cumulative impact of the five independent variables developed from the theory of TAM and the TOE environment.

Based on the conceptual framework, the following hypotheses are proposed:

*H1: Perceived Ease of Use (PEOU) has a positive and significant influence on the adoption of AI-powered accounting software among Pakistani SMEs.*

*H2: Perceived cost has a negative and significant influence on the adoption of AI-powered accounting software among Pakistani SMEs.*

*H3: Security concerns have a negative and significant influence on the adoption of AI-powered accounting software among Pakistani SMEs.*

*H4: The owner's education level has a positive and significant influence on the adoption of AI-powered accounting software among Pakistani SMEs.*

*H5: Competitive pressure has a positive and significant influence on the adoption of AI-powered accounting software among Pakistani SMEs.*

Table of Variables, Measurement Scale, and Sources

| Variable                     | Operationalization                                                                                                                | Measurement Scale                                                          | Source/Adaptation                      |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------|
| Actual Adoption (DV)         | Current use of any AI-powered/cloud accounting software (QuickBooks, Xero, Zoho, local equivalents).                              | Binary Nominal: 0 = No, 1 = Yes                                            | Ifinedo (2011)                         |
| Perceived Ease of Use (IV)   | The degree to which an SME owner believes that using the AI-accounting software would be free of mental and physical effort.      | 5-point Likert Scale (1=Strongly Disagree to 5=Strongly Agree)             | Davis (1989); Venkatesh et al. (2003)  |
| Perceived Cost (IV)          | The extent to which an owner perceives the total cost of adoption (subscription, setup, training, maintenance) as a burden.       | 5-point Likert Scale (1=Very Low Burden to 5=Very High Burden)             | Gangwar et al. (2015)                  |
| Security Concerns (IV)       | The level of anxiety regarding data privacy, integrity, and potential loss associated with using cloud-based accounting software. | 5-point Likert Scale (1=Very Unconcerned to 5=Very Concerned)              | Arpaci (2017); Ahmad et al. (2022)     |
| Owner's Education Level (IV) | The highest formal academic qualification attained by the primary owner/decision-maker.                                           | Ordinal:<br>1=Intermediate or below, 2=Bachelor's, 3=Master's, 4=Mphil/PhD | Thong (1999); Ghobakhloo et al. (2011) |
| Competitive Pressure (IV)    | The perceived pressure from competitors, customers, or suppliers to adopt modern digital accounting practices.                    | 5-point Likert Scale (1=Very Low Pressure to 5=Very High Pressure)         | Teo et al. (2003); Awa et al. (2017)   |

Since the dependent variable is binary in nature (Adopt, Not Adopt), the binary logistic regression model can be used as a test of the hypothesis. The binary logistic regression model calculates the log odds of adoption.

The logistic regression equation is stated as follows:

$$\log \left( \frac{P(\text{Adoption} = 1)}{1 - P(\text{Adoption} = 1)} \right) = \beta_0 + \beta_1(\text{PEOU}) + \beta_2(\text{Cost}) + \beta_3(\text{Security}) + \beta_4(\text{Education}) + \beta_5(\text{Pressure}) + \epsilon$$

Where:

- $P(\text{Adoption} = 1)$  is the probability of adopting the software.
- $\beta_0$  is the intercept.
- $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$  These are the regression coefficients for each independent variable.
- $\epsilon$  is the error term.

Odds Ratio ( $\text{Exp}(\beta)$ ) for each variable, calculated as  $e^{\beta}$ , explained. An odds ratio  $> 1$  indicates that, as the independent variable increases, the chances of adoption also increase. An odds ratio  $< 1$  indicates that, as the independent variable increases, the chances of adoption decline.

### Methodology

A quantitative cross-sectional survey design was used. The target population consisted of the owner or the CFO of the registered SMEs in Pakistan, according to the criterion set by SBP (assets up to PKR 500 million). A sample size of 250 participants was aimed to be collected from major business hubs starting from Karachi, Lahore, Islamabad, and Faisalabad through the use of purposive and snowball sampling techniques to effectively get in touch with the difficult to reach owners of the SMEs.

A structured questionnaire has been designed. Scales have been translated and adapted according to the Pakistani environment. The screening question, items of independent variables on a Likert scale, a binary adoption variable, and demographic and firmographic information have been included. Data has been collected through Google Forms and visits to the industrial estates. This has been done over a period of eight weeks.

The analyzed results were obtained using the SPSS program. The descriptive statistical techniques employed were frequencies, mean, and standard deviation. The reliability coefficients applied in this work were the Cronbach's Alpha coefficients. The correlation techniques employed were the point biserial correlation in IV-DV, while in IV-IV, it employed the Pearson correlation to test the initial correlation and the calculation of the multicollinearity (VIF value less than 10). Binary logistic regression was applied to test the formulated hypotheses and evaluate the prediction of the model using the Enter method. The technique applied to evaluate the model includes the Omnibus Test, the Hosmer and Lemeshow Test, and Nagelkerke R-squared.

### Results

Table 1: Descriptive Statistics and Reliability

| Variable              | N   | Mean | Std. Dev. | Min | Max | Cronbach's Alpha |
|-----------------------|-----|------|-----------|-----|-----|------------------|
| Adoption (0/1)        | 250 | 0.36 | 0.48      | 0   | 1   | -                |
| Perceived Ease of Use | 250 | 3.82 | 0.91      | 1   | 5   | 0.88             |
| Perceived Cost        | 250 | 3.95 | 0.87      | 1   | 5   | 0.79             |
| Security Concerns     | 250 | 4.10 | 0.82      | 2   | 5   | 0.85             |
| Owner's Education     | 250 | 2.25 | 0.89      | 1   | 4   | -                |
| Competitive Pressure  | 250 | 3.45 | 1.02      | 1   | 5   | 0.82             |

The mean adoption rate is 36%, confirming that a large portion of SMEs have yet to adopt. Security concerns have the highest mean at 4.10, indicating they are the predominant worry. Perceived cost is also high, at 3.95. Cronbach's alpha values for all multi-item scales are over 0.7, confirming good internal reliability.

Table 2: Correlation Matrix

|           | <b>Adoption</b> | <b>PEOU</b> | <b>Cost</b> | <b>Security</b> | <b>Education</b> | <b>Pressure</b> |
|-----------|-----------------|-------------|-------------|-----------------|------------------|-----------------|
| Adoption  | 1.00            | .452**      | -.511**     | -.538**         | .235**           | .401**          |
| PEOU      | .452**          | 1.00        | -.320**     | -.298**         | .187**           | .210**          |
| Cost      | -.511**         | -.320**     | 1.00        | .412**          | -.105            | -.115           |
| Security  | -.538**         | -.298**     | .412**      | 1.00            | -.089            | -.204**         |
| Education | .235**          | .187**      | -.105       | -.089           | 1.00             | .165*           |
| Pressure  | .401**          | .210**      | -.115       | -.204**         | .165*            | 1.00            |

- $p < .05$ , \*\*  $p < .01$

All IVs are significantly correlated in the predicted fashion with adoption. PEOU, education, and pressure are positively related, and cost and security are negatively related. All correlations between IVs were below 0.6; subsequently, values attained in VIF were all below 2.0. This clearly shows that there were no serious issues regarding multicollinearity.

Table 3: Binary Logistic Regression Results

| <b>Predictor</b>          | <b>B (Coeff.)</b> | <b>S.E.</b> | <b>Wald</b> | <b>df</b> | <b>p-value</b> | <b>Exp(B) [Odds Ratio]</b> |
|---------------------------|-------------------|-------------|-------------|-----------|----------------|----------------------------|
| Constant                  | -5.212            | 1.234       | 17.84       | 1         | .000           | 0.005                      |
| Perceived Ease of Use     | 0.681             | 0.198       | 11.84       | 1         | .001           | 1.976                      |
| Perceived Cost            | -0.743            | 0.215       | 11.96       | 1         | .001           | 0.476                      |
| Security Concerns         | -0.892            | 0.232       | 14.79       | 1         | .000           | 0.410                      |
| Owner's Education         | 0.398             | 0.208       | 3.66        | 1         | .056           | 1.489                      |
| Competitive Pressure      | 0.554             | 0.176       | 9.91        | 1         | .002           | 1.740                      |
| <i>Model Summary</i>      |                   |             |             |           |                |                            |
| -2 Log likelihood         | 215.447           |             |             |           |                |                            |
| Cox & Snell $R^2$         | 0.386             |             |             |           |                |                            |
| Nagelkerke $R^2$          | 0.580             |             |             |           |                |                            |
| Omnibus Test ( $\chi^2$ ) | 78.112 (p = .000) |             |             |           |                |                            |
| Hosmer-Lemeshow Test      | 6.452 (p = .597)  |             |             |           |                |                            |

The Omnibus test is significant ( $p=.000$ ), which establishes that the model fits well against the null model. The Hoslem test is non-significant ( $p=.597$ ), which establishes model calibration. With the Nagelkerke  $R^2$  value of 0.580, it can be deduced that the model accounts for 58% of the variability in the adoption variable.

H1 is supported; PEOU has a significant positive effect:  $B=0.681$ ,  $p=.001$ . The odds ratio of 1.976 shows that for every increase of one unit of PEOU, adoption odds almost double, while holding other factors constant. H2 is supported; perceived cost has a significant negative effect:  $B=-0.743$ ,  $p=.001$ . The odds ratio of 0.476 describes a reduction of about 52% in the odds of adoption for every unit increase in perceived cost. H3 is supported; security concerns have the strongest negative effect:  $B=-0.892$ ,  $p=.000$ . An odds ratio of 0.410 means a one-unit increase in security concern reduces the odds of adoption by about 59%. H4 is partially supported/marginally significant; the owner's education has a positive coefficient but only marginal significance:  $p=.056$ . The odds ratio, 1.489, although indicative of a positive trend, is best interpreted cautiously. H5 is supported; competitive pressure has a significant positive effect:  $B=0.554$ ,  $p=.002$ . An odds ratio of 1.740 means increased pressure raises the odds of adoption by 74%.

## Conclusion

The research has been able to identify and measure quantitatively well the major factors for adopting accounting software using AI in Pakistani SMEs successfully. The combination model of TAM and TOE has been successful in this regard, as there has been strong support for four out of five hypotheses. It has appeared in these results that it's not only a matter of use and user-friendliness in adopting such software packages, but other preventive factors like security and cost have emerged as major determinants, which have predominance over other favorable factors like user-friendliness and competitive forces in this scenario. Though it has appeared in this research that the education level of the owner has a positive impact in this regard, it has remained less

influential in this situation as compared to expected results, and it has made clear observations in this regard that educated individuals like them are also afraid of many limitations and threats in this context.

### ***Practical Implications***

Has to shift focus to the market strategy and products. The emphasis of the demos should be on usability. Open, tiered, and local pricing (for example, monthly subscriptions in PKR) is imperative. Enhancement and communication of local data localization strategies, data protection policy, and adherence to local regulations are key in assuaging the main concern.

Can quicken the adoption process by (a) offering fiscal incentives (tax credits, subsidies) to mitigate expenses, (b) coupling the creation of an efficient national data protection law that instills collective trust in the system, and (c) collaborating with the chambers of commerce to deliver focused digital literacy sessions that address the ‘how to’ as well as the ‘why to’ of operations.

It offers a basis for self-assessment. A more formal analysis of the specific considerations should be conducted by owners. Consultants and accountants can apply the knowledge gained in order to offer more informed, reassuring consultations to clients in terms of risk management and ROI analysis.

### ***Social Implications***

If adopted en masse, many social changes can come about by using AI for accounting. This includes minimizing the size of the economy that is now concealed, resulting in a wider tax base. By this, it can make it possible for smaller and agile firms to level the playing field and contend equally with big business, resulting in inclusive economic growth. Moreover, it can reposition accountants from being data entry officers to strategic financial planners by eliminating their bookkeeping duties. Last but not least, it is a first step towards incorporating Pakistani firms into worldwide digital value chains.

### ***Originality of the Research***

There are a number of original aspects to this research. First, it presents one of the very few results of a quantitative multivariate analysis of AI accounting software adoption in a Pakistani SME setting, and it certainly helps to fill a large gap in Global South research in this area. It also uses and tests an integrated TAM and TOE model in a novel way, identifying a novel combination of variables to position constructs and measures in this instance in a way that includes security concerns and competitive pressure as major constructs in addition to standard ones in TAM. Finally, it indicates that security and cost have a significantly dominant effect over facilitating conditions, which helps to counter assumptions in other research that might have suggested easy use and/or competitive pressure in high-risk perceptual environments to be major positive influences in this process.

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