AI adoption in recruitment and selection: exploring different factors of TOE model in Pakistan

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ABSTRACT

In today's business environment, the role of adoption of AI is very important. Although the pace of this adoption is low in emerging markets and Pakistan in particular, however, it is increasing significantly in the developed markets. In the coming years it would be indispensable for organizations to opt for AI adoption in different task management. There is little evidence of AI adoption in recruitment and selection. The objective of this study is to explore the different factors impacting AI adoption in recruitment and selection process. The different factors that fall under the broader category of technological, organizational, environmental of TOE model in recruitment and selection process are investigated through interviews. The sample of this study is senior management from different organizations where AI adoption is used, or they have intention to use. This study has found and validated some existing factors and some new factors are identified. Management also has shown some concern about adoption of AI. The results of this study can be valuable for the organizations to develop their AI adoption practices in this competing environment to have viable and distinguishable edge[1].

Keywords: *TOE*; *technological; organizational; environmental; potential employee pressure; AI adoption; qualitative; interviews*

INTRODUCTION

HRM encompasses all the tasks related to overseeing work and personnel within organizations (Boxall & Purcell, 2011). This management of human resources also encompasses the recruitment and selection process. The fulfillment of the necessity for acquiring and developing new skills necessitates the implementation of a recruitment and selection process. The recruitment and selection process should uphold transparency and impartiality, making the utilization of AI for such purposes one of the most effective methods (Andersson, et al., 2016). The Artificial Intelligence (AI) technology in various domains is constantly evolving with new capabilities, and it is also transforming the landscape of human resource management (Bersin, 2018).

The TOE model, initially introduced by Tornatzky and Fleischer in 1990, was further expanded upon by Malik, Chadhar, et al. in 2021. They proposed a tripartite classification comprising technological, organizational, and environmental factors for the adoption of new technology. The technological context pertains to the attributes of a particular technological innovation, including factors like efficiency, complexity, and compatibility. The organizational context encompasses the unique HR characteristics of

[1] The initial version of this paper was presented in in International, Applied Social Sciences (C-IASOS-2023) Congress. Held November 13-15, 2023 at in Valletta, MALTA

an organization, the innovativeness of its management, and its infrastructure's adaptability. The environmental context relates to external factors such as the market, competition, regulatory bodies, and government laws.

Within the framework of the Technology, Organization, and Environment (TOE) model, Pan, Froese, Liu, Hu, and Ye (2022) conducted an empirical examination of a model that explored the factors and limiting factors associated with the adoption of AI in the recruitment and selection process. Their findings indicated that several elements, including relative advantage, complexity, firm size, technological competence, industry, and regulatory considerations within the TOE model contexts, had direct impacts on the adoption of AI. Additionally, they observed that transaction costs partially influenced and moderated these relationships.

In different studies various factors under TOE model has been discussed regarding adoption of technology usage under various sectors. Like, (Hassan, Ngah, & Tio, 2023) study ‘about the intention of logistics, (Bhatt, & Shah, 2023) study ‘about the level of awareness regarding AI and its applications in HR practices, (Agarwal, Kapoor, & Walia, 2023) mentioned ten barriers, while (Neumann, Guirguis, & Steiner, 2023) have discussed environmental factors tend to wield less overall influence across the board. In the study of (Sjöberg, & Schill, 2023), the main facilitative factor for readiness emerged as effective communication, while the primary inhibiting factor was the disquiet associated with technological innovations like AI. (Rawashdeh, Bakhit, & Abaalkhail, 2023) investigated the technological factors that impact the acceptance of artificial intelligence (AI) technology.

This study investigates into the research framework concerning the implementation of AI in recruitment and selection process in Pakistan. In light of these identified research deficiencies, this research endeavor aims to tackle the subsequent research inquiries:

What factors influence the adoption of AI in recruitment and selection process in Pakistan?

Is there new factor under TOE model that can effect adoption of AI in recruitment and selection?

How can we expand upon the current theoretical framework to enhance the successful adoption, utilization, and value generation from recruitment and selection process?

LITERATURE REVIEW

Utilizing the Technology, Organization, and Environmental framework, the study of (Hassan, Ngah, & Tio, 2023) has identified factors that influence the intention of logistics providers in Malaysia to adopt cold transport solutions. They collected to use of self-administered questionnaires distributed to respondents who were selected using the purposive sampling technique from 184 valid responses. Under SEM analysis, the results revealed that factors such as relative advantage, top management support, and organizational readiness, were substantiated in their connection to the intention to embrace cold transportation services, while the role of a sole mediator, it was observed that all mediation hypotheses pertaining to top management support and organizational readiness were corroborated.

In the study of (Bhatt, & Shah, 2023), the preliminary findings from the data collected from 228 participants suggested that the model could be a valuable foundation for future research, provided that confirmatory factor analysis and validity and reliability tests to be conducted. Their study indicated that employees have a level of awareness regarding AI and its applications in HR practices. Furthermore, the majority of respondents expressed a preference for incorporating AI

into their company's HR practices, but they also exhibit some reservations regarding certain aspects of AI.

A qualitative research approach was used, involving semi-structured interviews with middle level managers possessing expertise and experience in the field, as part of the empirical investigation was made in the study of (Sjöberg, & Schill, 2023). The main facilitative factor for readiness emerged as effective communication, while the primary inhibiting factor was the disquiet associated with technological innovations like AI. The influencing determinants of a successful adoption were identified as the availability of surplus resources and a skilled workforce, along with the prerequisite condition of addressing AI readiness before implementation. Conversely, a significant barrier in the adoption process was identified as a shortage of qualified labor in the market, specifically individuals possessing the requisite knowledge and experience.

(Rawashdeh, Bakhit, & Abaalkhail, 2023) investigated the technological factors that impact the acceptance of artificial intelligence (AI) technology. Furthermore, they explored the mediating role of accounting automation in the adoption of AI using smart PLS. They claimed that their study enhanced the TOE model by integrating accounting automation as an mediating variable within the TOE framework.

(Agarwal, Kapoor, & Walia, 2023) mentioned ten barriers. Utilizing expert perspectives on these identified barriers, interpretive structural modeling (ISM) was applied to gain insights into how these 10 challenges interact and contribute to the ineffective or non-implementation of HR blockchain. They highlighted significant obstacles, such as a shortage of expertise, concerns about data privacy, technical challenges, implementation complexity, and a dearth of practical use cases.

(Horani, Khatibi, AL-Soud, Tham, & Al-Adwan, 2023) in their conducted a comprehensive systematic literature review employing the PRISMA technique to explore the impact of organizational, technological, and environmental factors on the adoption of Business Analytics. By rigorously analyzing relevant research findings, they provided a synthesized overview and identified crucial components that influence the adoption process. From an initial pool of 614 articles published from 2012 to 2022, a meticulous selection process yielded 29 final articles for inclusion in their study. They identified the factors influencing the adoption of new technologies under technological factors data quality, cost-effectiveness, technology competence, security and privacy, IT infrastructure, compatibility, observability, relative advantage, trialability, and complexity. These factors collectively shape the decision-making process when it comes to adopting innovative technologies in various fields. Each of these factors plays an important role and holds significance in determining the successful implementation and integration of new technological solutions. In the same way they also identified Top Management Support, Firm Size, Organizational Readiness, Organizational Data, Environment, Project Champion, Organizational Structure, Rational decision-making culture, Organization Strategy factors under organizational factors and they also come with Competitive Pressure, Government Regulation, External Support, Trading Partner Readiness, Industry Type, and Relationship Assets factors for environmental factors of TOE model.

The research of (Chen, Zhou, & Yang, 2023) revealed that the presence of skilled professionals and managerial support can exert a significant influence on adoption intentions,

empowering professionals to effectively engage with HR analytics. Additionally, they envisaged that early adopters' illustrative instances and analytical models enable managers to navigate intricate processes and facilitate strategic human resource management (SHRM) decision-making.

By employing the Technology-Organization-Environment (TOE) framework, (Neumann, Guirguis, & Steiner, 2023) bridged this void through a comparative case study involving eight Swiss public organizations. Their discoveries indicated that the significance of technological and organizational elements fluctuates in accordance with an organization's position in the adoption continuum. Meanwhile, environmental factors tend to wield less overall influence across the board.

The study of (Sharma, Gupta, Sehrawat, Jain, & Dhir, 2023) identified and established causality between different determinants of Big Data Adoption (BDA) and firms' performance in the tourism and hospitality sector, employing the Technology, Organization & Environment (TOE) framework. They used 17 different determinants of adoption. They collected data from 28 industry experts through semi-structured interviews and multi-criteria decision-making (MCDM) techniques. Among the determinants, "Big data quality" emerged as the most impactful, while "trading partner pressure" was found to be the least influential determinant.

(Samy, Aziz, Tarek, & Ismail, 2023) investigated the impact of deploying the TOE model within three distinct contexts: technology (comprising competitive advantage, complexity, compatibility, security, and trust), organization (encompassing senior management, readiness, technology, maturity, and performance), and environment (including competition, telecommunications infrastructure, internet service provider, business partner support, and business partner pressure). In their study, this examination centers on its influence on the process of informed decision-making, with HRIS acting as a mediator. The study was focused on the higher education sector, specifically within the Arab Academy for Science and Technology and Maritime Transport (AASTMT).

In the study of (Maroufkhani, Iranmanesh, & Ghobakhloo, 2023) it was suggested that top management support plays a mediating role between technological and organizational factors and the adoption of Big Data Analytics (BDA). Additionally, their study examined how environmental factors moderate the relationship between relative advantage, compatibility, competitiveness, organizational readiness, and BDA adoption. The results of their study affirmed the interconnectedness among the Technology-Organization-Environment (TOE) factors. Compatibility, competitiveness, and organizational readiness were found to influence BDA adoption through the mediating influence of top management support. Moreover, the study highlighted that environmental factors have a moderating effect on the relationships between compatibility, organizational readiness, and top management support.

In the study of (Hmoud, Al-Adwan, Horani, Yaseen, & Al Zoubi, 2023) the primary factors of TOE model that helpful for the adoption of Business Intelligence within the Higher Education Institutions were explored. The sample was collected from 387 managers of Higher Education Institutions in Jordon and quantitative data was analyzed through PLS-SEM. The results indicated that organizational readiness, top management support, relative advantages, information culture, compatibility, perceived Complexity, vendor selection and information quality, are significant

determining factor of Business Intelligence within the Higher Education Institutions but competitive pressure, was statistically insignificant. Moreover, the results revealed that information culture develops as the strongest predictor, while Complexity applies a significantly negative effect and acts as hurdle in adoption of Business Intelligence within the Higher Education Institutions.

According to, (Phuoc, 2022), different factors that effect the adoption of AI applications at organization level in Vietnam were investigated. The study identified ten key factors of TOE model that can influence adoption of AI applications. The sample was collected from 193 senior managers that are direct responsible for information systems in both public and private sectors, and further used SEM to analyze the data. Their findings revealed that managerial capability, technical compatibility, technical complexity, relative advantage, technical capability, organizational readiness, government involvement, vendor partnership, and market uncertainty, are all significantly related to AI application adoption. Notably, the results of the study identified that there is no significant relationship between organization size and adoption of AI applications.

The study of (Horani, Al-Adwan, Yaseen, Hmoud, Al-Rahmi, & Alkhalifah, 2023), pursued to explore the main technological and socio-environmental factors that impact the inclination regarding AI technologies, within organizational level. The sample of 512 collected through survey from IS/IT senior managers of both private and public organizations that are located in Jordan, and empirically tested under conceptual model of the technology-organization-environment (TOE), rooted in the innovation diffusion theory (DOI). Results of their study revealed that several factors like top management support, relative advantage, vendor support, compatibility, cost-effectiveness, competitive pressure, AI strategic alignment and availability of resources, exert a positive influence toward intention to adopt AI-based technologies. On the other-hand their analysis highlighted insignificant results of market uncertainty on adoption of AI-based technologies. It was also observed that complexity and government regulations impact negatively towards intentions of adoption.

According to the study of (Dastjerdi, Keramati, & Keramati, 2023), CRMS (Customer Relationship Management system) was introduced which represented an innovative technology that is designed to support the relationship between hospitals with their patients. The utilization of AI integrated CRMS has brought about a substantial change in how organizations analyze massive quantities of customer-related data. This integration empowered hospitals to process the data accurately and instantly about patients, facilitating and automated decision making. Further, in their study endeavored to broadly consider both human and organizational factors to enhance the understanding of CRMS adoption in hospitals settings. According to (Dastjerdi, Keramati, & Keramati, 2023) their study will be the first effort in the analysis and cauterization of factors that are contributing to adoption of CRMS in healthcare through an integrated framework having Human, Technology, Organization, Environment, and Cost (HTOEC) dimensions.

Scholars have examined the adoption, utilization, and management of AI adoption through various theoretical lenses. Notably, technology adoption theories at the individual level include the Technology Acceptance Model (TAM) (Davis, 1985) and the Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003). For analyzing innovation adoption within

organizations, prominent models include the Diffusion of Innovations (DOI) theory (Rogers, 1995) and the Technology-Organization-Environment (TOE) framework (Tornatzky and Fleischer, 1990). Additionally, strategic management theoretical frameworks like the Resource-Based View (RBV) (Wernerfelt, 1984; Barney, 2001) are also widely recognized in this context.

In this study, we have employed the TOE framework as the foundation for constructing a conceptual model for the adoption of AI Technology. Our choice of the TOE framework is supported by its widespread acceptance as a well-regarded theoretical perspective in the field of technology management, as demonstrated in the study by Hsu et al. (2014). The following main factors were defined from different research.

The technological context pertains to the attributes of a particular technological innovation, including factors like efficiency, innovation, complexity, compatibility, Technological infrastructure and resources, Technological standards and protocols, Technological interdependence with other firms, Intellectual property considerations and technological knowledge and capabilities.

The organizational context encompasses the unique HR characteristics of an organization, the innovativeness of its management, and its infrastructure's adaptability. It includes; Organizational structure, Organizational culture, Leadership and management support, Employee skills and attitudes, Communication, Resource availability and allocation, Employee training and development, Decision-making processes and structures, Organizational agility, and flexibility and information flows.

The environmental context relates to external factors such as the market, competition, regulatory bodies, supplier relationships, Government incentives and subsidies, socioeconomic factors, market demand & customer expectations, Global economic conditions and trade policies, and government laws.

METHODOLOGY

The qualitative research is used in this study to validate the existing factors of TOE model in context of AI adoption in recruitment and selection. For this purpose, semi-structured interviews from senior managers in the sample organizations were conducted to extract the themes by using thematic content analysis. In information studies research, thematic content analysis has been used for finding determinants technology adoption (Lai, Sun, and Ren, 2018). From the results of the thematic content, transcripts were subsequently integrated with the underlying theoretical framework. This study has incorporated direct quotations from the participants, which serve as a crucial element in enriching and providing depth to the study's findings. The research design of this study is displayed in Figure 1.

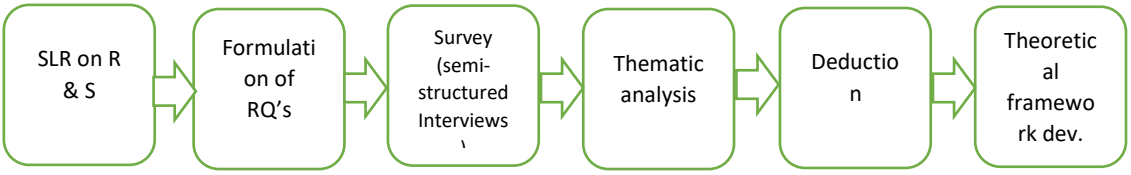

Fig.1 Research Process for Adoption of AI in recruitment & Selection Process

The sample of 7 HR professionals was selected through a non-probabilistic sampling. However, before conducting the interviews, these semi-structured interview script underwent pre-testing by two senior experts, and it was subsequently refined after incorporating their feedback. The unit of analysis is organizations. The sample respondents were from multiple industries such as banking, Takful, education, telecommunication, e-commerce, and IT services providers.

In exploratory research on AI adoption, choosing samples from various industries proves valuable in crafting a theoretical perspective on AI adoption that can be applied more generally. (Verma and Bhattacharyya 2017). The semi structured interviews consist of different questions from these selected HR professionals to explore the factor of AI adoption in recruitment and selection process. Here, in this study handwritten notes, were taken as respondents did not provide the consent for video or audio recordings. These hand-written martial were converted into English transcripts for analysis.

The study follows by familiarizing with the data, generating initial codes, discovering, and reviewing themes together, categorization and naming of themes. After validation process of codes, the last set of codes was subsequently grouped according to their content and context. These codes were further classified into categories into broader categories of TOE such as s, technological aspects, organizational elements, and environmental factors. To provide explanations for the themes and patterns discovered during the primary data analysis (semi structured interview), we applied the theoretical framework derived from the literature review.

ANALYSIS AND RESULTS

For data analysis, excel and TagCorowd software's were used. First, data reduction was taking place that is followed by thematic content analysis. In Figure 1, a straightforward depiction of the process-level comprehension of implementing a AI adoption in recruitment and selection process within organizations. Organizations need to establish a comprehensive grasp of the factors that impact each facet of the AI adoption process in order to effectively cultivate AI capabilities and attain a strategic advantage. Management's unambiguous vision for adopting AI in recruitment and selection is crucial for aligning the AI strategy with these goals.

Fig.2 AI adoption in recruitment and selection Process

The interview transcripts undertook a thorough analysis, with a detailed process of line-by-line coding applied to the gathered data, considering both content and context. The codes were categorized into technological, organizational, and environmental factors affecting recruitment and selection. The insights derived from the primary data analysis led to development of the theoretical framework established in the literature review, allowing for deductive explanations of the identified themes and patterns. The organizations must develop a clear understanding of the factors influencing each component of the AI adoption.

Figure 3. Word Cloud Visualization derived from interviewee's opinion.

The management's clear vision concerning AI adoption plays a pivotal role in aligning the AI strategy with the organization's business requirements. Furthermore, ensuring that IT assets are compatible with AI solutions is essential for the technical implementation of AI. Employee competencies in both AI adoption and domain-specific skills are crucial for fostering better coordination between the AI adoption and the business unit, ultimately leading to increased value generation from AI adoption practices. Environmental factors, including competitive AI practices within the industry, drive organizations to either introduce new AI adoption methods or improve existing ones in recruitment and selection processes. Organizations are also motivated to enhance their capabilities in response to applicant pressure.

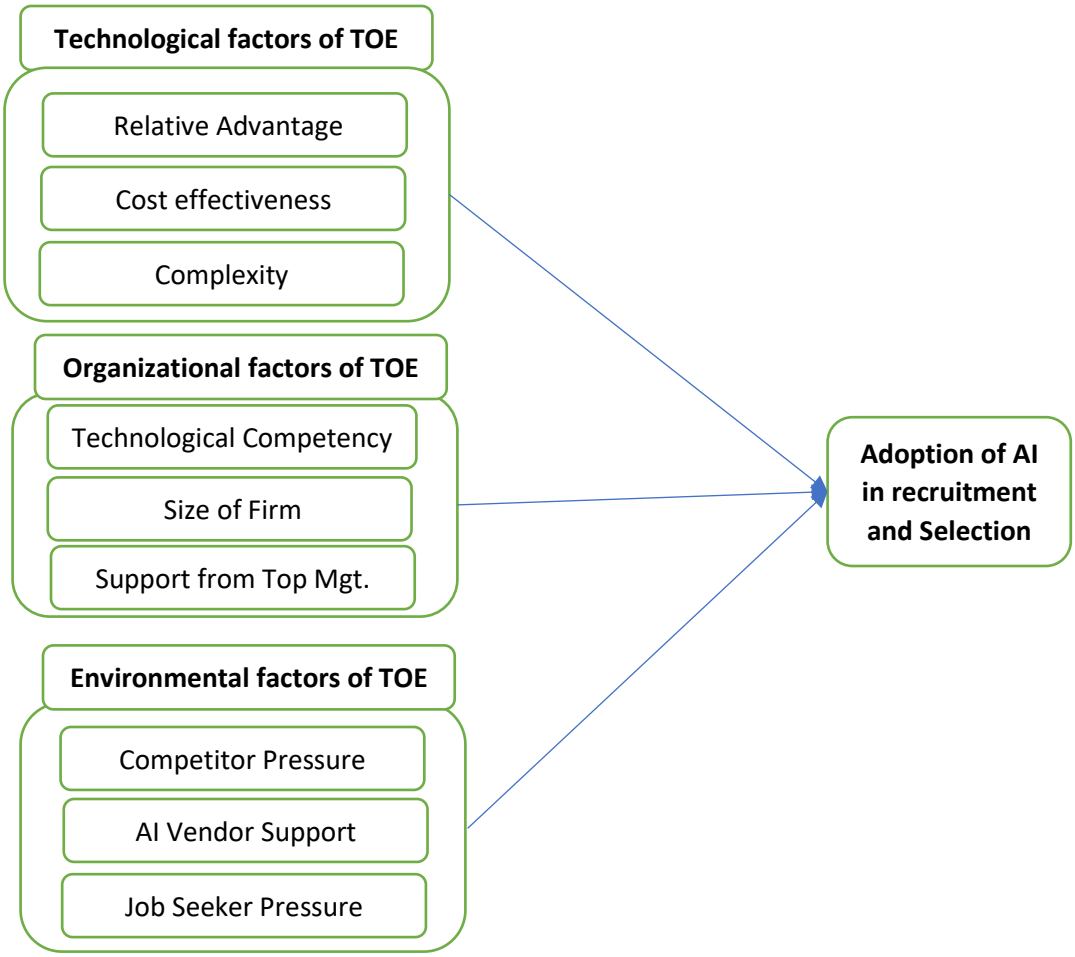

Figure 4. Theoretical diagram; factors under TOE model effecting AI Adoption

This study has identified 9 major determinants of AI adoption, which have been categorized into three broader areas following the TOE (Technological, Organizational, and Environmental) model, displayed in figure 3. Fig 4 provides a comprehensive list of these key factors derived from the study. Eight factors were existing factors that were validated during the research process. These were Technological (relative advantage, cost effectiveness, complexity), Organizational (technological competency, size of firm, top management support), and Environmental (AI vendor support, competitor pressure). While new factor Job Seeker Pressure or Potential candidate Pressure or potential employee pressure emerges as new factor under environment. Further, lack of clarification towards identification of factors toward adoption of AI and fronting difficulties in advancing towards more recent and advanced aspects of AI adoption were also the main concern.

CONCLUSION

The following problems were identified regarding adoption of AI in recruitment and selection process under the umbrella of TOE model: (1) lack of clarification towards identification of factors toward adoption of AI (2) Fronting difficulties in advancing towards more recent and advanced aspects of AI adoption.

Technological (relative advantage, cost effectiveness, complexity), Organizational (technological competency, size of firm, top management support), and Environmental (AI vendor support, competitor pressure) factors under TOE model were validated that can affect AI adoption in recruitment and selection process. While new factor Job Seeker Pressure or Potential candidate Pressure or potential employee pressure emerges as new factor under environment through interviews.

The study identifies potential employee pressure as a new factor that can impact AI adoption in recruitment and selection process for organizations in Pakistan due to high unemployment rate. As organizations have to dealt with thousands of CV's for small number of jobs, so this factor influence to management to use adoption of AI in recruitment and selection process. It is suggested that this new factor can be analyzed empirically. Drawing upon the examination of interviews from the experts and a review of extensive and relevant literature, a theoretical framework for the adoption of AI in recruitment and selection process has been introduced. It can be tested empirically for organizations in Pakistan and rest of the developing countries where unemployment rate is high, and organizations have to dealt with thousands of CV's for small number of jobs. The findings from this study aim to link any existing disproportions between the theoretical model and its practical applications within the industry.

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