Adoption of Big Data and AI in UAE SMEs in Unpredictable Environment

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Abstract— **Digital technologies like "big data" and "artificial intelligence" have become firmly embedded in corporate operations over the past several years, and they are even starting to play a bigger role in specialized industries like retail, distribution and manufacturing. Despite government and relevant agency understanding, evaluation, support, and training regarding Industrial Revolution 4.0, the use of these technologies is only gradually being adopted in the UAE's SME sector. This exploratory research paper identifies five major business challenges faced by these SMEs and suggests potential solutions by investigating an opportunity for cross-fertilization between Big Data, Artificial Intelligence and Advanced analytics. There have been very limited studies done in past to understand the adoption of these technologies with respect to UAE SMEs sector. An in-depth literature review has been conducted and the technology adoption models such as UTAUT and TOE framework is implemented plus extended, with the goal of conceptualizing a model that incorporates the discovered components. The study's findings may be used as a guide for identifying and forecasting the acceptance of Big Data as well as Artificial Intelligence amongst SMEs in U.A.E**

Keywords— ***SME, Big Data, Artificial Intelligence, Digital Transformation, Technology Adoption Model***

Technology Adotion: quast Technology Adoption im Sinne einer Transformation

I. Introduction

As a result of the COVID-19 pandemic, which has affected both public health and the global economy, people all over the world have learned to live in a challenging environment that can be described as a "new normal age". Along with having a negative impact on public health, COVID-19 has also disrupted regular business operations and presented obstacles to businesses, particularly SMEs. Big Data and artificial intelligence are two examples of technology that can assist SMEs deal with the repercussions of an economic crisis and contribute to the long-term success of their businesses.

The UAE government has been paying particular attention to SMEs businesses because of its significance to the economic development of any country in the world. Therefore, the question of what difficulties SME merchants are currently experiencing or might experience in any economic crisis and how to handle these difficulties in order to adapt to the new normal age arises [1]. There has not been much study done in the past that specifically focuses on the business difficulties and potential solutions for the UAE SME industry using big data and artificial intelligence technologies. A research gap is thus identified by the current study expressing acknowledged information on how SMEs might use digital technology to turn the problem into an opportunity. Goog approach.... and Mindset

Companies have a wealth of opportunities to add value to their businesses utilizing data and analytics in the era of digital business. In the modern company plan for seamless operations, especially amid any crisis, Big Data and AI are the two key disrupting technologies of Industry 4.0. Big Data plays a big role in many enterprises. It is defined as information that is large in volume, diversity, and velocity. Data volume is expanding quickly. It has proven beneficial in modern times when it improves judgment, which is aided using analytical methods and some AI components. Artificial intelligence (AI) enables the automation of a variety of business processes across industries and can go beyond the decision-making limitations of human data collecting and processing [2]. The fusion of these innovations aims to increase customer engagement, speed up innovation, boost competition, increase profit margins, and boost employee productivity.

exactly: AI is highly applicable to model those business processes !!

Big Data with Advanced Analytics are the fuel for innovation in artificial intelligence. In order to better comprehend and anticipate competitor tactics and activities, big data in SME requires gathering varied inputs. Most of the study on these technologies examines development out of a technological, architecture, or information system perspective instead of from a managerial perspective, despite the expanding interest to researchers in Big Data with Artificial Intelligence innovation. Therefore, by focusing on the Big Data, Advanced Analytics, and Artificial Intelligence context, this study adopts a novel strategy to address business problems. It serves as a means to examine how current business techniques, products, and solutions are evolving into cutting-edge, data driven strategies, products, or solutions, which have a significant impact on more established corporate strategies, products and services, and may even lead to new business models or services for SMEs.

Using Big Data, Advanced Analytics, and Artificial Intelligence as a system for evaluating the potential utility of each in the SME sector is the goal of this research paper. In order to conceptualize a model that combines the identified components, it also applies and expands the "Unified Theory of Acceptance and Use of Technology" (UTAUT) and the technology-organization-environment (TOE) framework.

The following is how the paper is organized. The section that follows will present a literature review based on previous research investigations and theories. The critical analysis is then offered. Lastly, future research directions are discussed in the research paper.

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II. Literature Review

Small and Medium-sized Enterprises are the cornerstone of any country's economy. They provide nearly 40% of UAEs gross domestic product. Consequently, they have a key role to play in the economic growth of any nation throughout the world [3]. Nevertheless, these companies are facing several business challenges and difficulties in implementing and adopting digital technologies because of innovation culture, lack of IT personnel, security systems and budget issues.

A. Theoretical Background

The resource-based theory of E.T. Penrose first suggested that economic entities possess tangible and intangible resources, but a firm's performance evaluation reflects it's ability to utilize these precious resources to the fullest extent in changing environments. The resource-based theory, which is now known as resource-based view theory (RBVT) [4], was later developed by categorizing commercial resources into two classes, such as heterogeneity and immobile assets. It is a competitive advantage and a risk mitigation tool for companies in any environment where resources are at risk, according to several academics. Thus, according to Barney's RBVT, artificial intelligence and big data are valuable corporate assets that can help you manage operational risks during economic and pandemic crises[4].

i. Big Data

Data are regarded as among the most significant concerns in the automation of businesses in the age of technological growth. Business development and technical advancement have been linked to human activities in recent decades. As a result, big data is now a component of business as usual and continues to inspire potential ingenuity. Big data is currently used in the majority of corporate sectors, including R&D management, supply chain, sales, and marketing.

In the current digital landscape, big data is among the newest commercial and technological concepts. Applications of big data serve as indicators of how well a corporation can innovate in response to market opportunities. Big data, for example, is utilizing analytical capabilities to inform business answers to the difficulties of COVID-19 and for the future. Despite being generally accessible, many data types are sophisticated and cannot be handled simply. During the last few decades, it has gained prominence among businesses because of its benefits and potential to sculpt strategic values through business operations [5]. The current research agenda emphasizes the advantages of using big data in the corresponding corporate business activities. Big data's capacity to be used quickly enables corporate processes to change and adapt to new possibilities and problems.

ii. Artificial Intelligence

Business executives have paid considerable attention to the topic of AI throughout the past couple of decades. Artificial intelligence (AI) is able to understand and learn like a human being in ever-larger areas, function intelligently, and accurately comprehend external inputs. AI is gradually taking over our reality and forecasting how businesses will be run in the future, covering everything from supply chain management to personnel management, business model selection, and inventory management. As a result, corporate executives and academic researchers agree that AI will fundamentally alter how businesses operate. As an example, Xerox Services used an AI recruitment algorithm to help managers assess applicants' skill sets in an instant.

Instead of focusing on technology, AI is viewed through the prism of a firm's capabilities. From a wide perspective, AI can be concerned with a number of essential requirements in the operations of businesses, including process automation, data analysis and interfacing with employees, clients, and vendors. As an instance, in comparison to traditional financing, Artificial intelligence and machine learning-enabled budgetary control is developed, controlled, managed, and analyzed automatically by AI algorithms, allowing for faster budget variation identification and prompt readjustment [6]. Numerous companies have started to recognize the possibilities of AI and machine learning and have started integrating them into their operational procedures. As an intelligent company's operations in the demanding business environment require new concepts, forms, means, architectures, and technological systems, AI facilitates this.

B. Major Challenges faced by SMEs

There exist various challenges to SMEs growth in current digital landscape and economic crisis as below.

i. Supply-Chain Management Issues

COVID-19, lockdowns, travel bans, and financial market volatility worldwide have disrupted the supply chain at all levels, including the local supply chain and the worldwide supply chain. Production processes are far more sophisticated now than they were a few decades ago. It is necessary to source different parts from around the world, and then ship finished goods worldwide [7]. Imports, exports, and production are difficult to conduct when supply chains are broken.

In order to ensure smooth business operations amid any crisis, AI and big data are still not being incorporated into production and supply chain activities. It is now crucial for businesses to be able to maintain a reliable supply chain and deal with imbalances between demand and supply during the epidemic. During the crisis, manufacturers of crucial products looked frantically for alternative supplies to keep their factories operating [8].

ii. Business Model and Innovation Issues

Consumer behavior, opinions, and shopping habits have drastically changed in recent years. In addition to supply chains, inventory management, employee well-being, and business continuity, businesses of all sizes are evaluating how it will affect their business models. Organizational value chains were at danger and there hasn't been a rapid fix [9]. The current situation, particularly in these epidemic times, shows that old business models are no longer useful or unable to ensure that business operations will run as smoothly as they once did. Businesses must modify their business strategies, realign their current operations, and adopt new distribution channels.

The crisis has fundamentally altered consumer demand and purchasing behavior, making it more important than ever for firms to rely on a fresh, cutting-edge marketing approach to survive. Companies now have a rare opportunity to broaden their current product offerings and speed up the

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digital business by developing new business lines as a result of changing consumer behavior [10]. These changes might compel businesses to re-evaluate their current business plans and innovate in order to tap into fresh markets and digital client segments.

iii. Inventory Management Issues

Operations at commercial organizations have been significantly disrupted by the pandemic, particularly inventory management. A major deterioration of global supply chain and unbalanced demand and supply requirements resulted from the pandemic's increased demand for inventory management and absence of essential products, including food and medical supplies. [10]. Due to a lack of raw materials, organizations run the risk of experiencing supply-chain interruptions.

It has never been more important to track and manage inventory precisely than during the current pandemic outbreak. A shortage of essential items prompted customers to gather stock and manage it. As part of the supply chain, food and other goods should be flowing efficiently in order to prevent inventory shortages [11]. When large orders were for necessities like food, medicine, and other items of high priority, meeting client requests had become a reality many suppliers had never imagined.

iv. Workforce Management Issues

In an unforeseen workplace and social environment, the management of the workforce is crucial to helping employees cope with the challenges they face. Remote employees must also could collaborate and digitize.

v. Budget Planning Issues

The environment, growth strategy, and interpersonal relationships are just a few of the variables that might affect a company's budget. A pandemic impacts the global economy by causing manufacturers to reduce production, resulting in a separation of the global supply chain network [11]. These effects continue throughout the year, leading businesses to wonder what impact they are having on their annual budgets due to this ongoing impact.

C. Proposed Strategy Using Big Data and Artificial Intelligence as Possible Business Solutions

i. Strategy for improvised Supply-Chain Management Disruption

The management of supply chains has become much more challenging in recent years. A company is expected to be able to overcome these challenges by using artificial intelligence-based supply-chain management. Using artificial intelligence-integrated methods that analyze enormous amounts of data, all business opportunities and constraints can be addressed, relationships can be understood, activities can become visible, and decisions can be made quickly.

There are many new business opportunities available with big data and artificial intelligence. SMEs can leverage AI and big data in all sectors. AI and big data have overcome the limitations of human data gathering and analysis by allowing companies to process and analyze more data at faster rates, thereby enabling timely decisions [12]. Consequently, companies can improve their supply chains by using big data analytics and AI to deal with future crises such as COVID-19.

ii. Business Model and Innovation Strategies

Over the years, company operations have changed, from supply chains and production to business analytics. As AI and big data have gathered huge amounts of data, innovation, ideas, and creations have been fundamentally altered. Technology such as big data and artificial intelligence may change global business models [13]. In chaotic times, new business models frequently emerge, making it simpler for firms to continue operating after the crisis.

An artificial intelligence's judgment is similar to a human's judgment due to computed and mathematical algorithmic models and human experience. Technologies like Artificial Intelligence can create a useful business model and assist managers in making wise decisions when combined with training data. As with earlier findings, a number of enterprises have presented additional evidence that AI technologies are fueling the digital transformation of digital platforms in difficult situations like COVID-19. As a result, a business model that incorporates AI could improve operations for a company amid any economic crisis [14].

iii. Inventory Management Strategies

The most potent activity in the supply chain is inventory management. For controlling inventory, having access to data has become crucial. Big data analytics and artificial intelligence have overcome human limitations in data collection and processing. Because they make data collecting, analysis, and information provision for managerial decision-making simple, business intelligence and analytical technologies are employed for accuracy.

Big data may be quite helpful in controlling inventory, especially when figuring out the demand side of the market. The process will become proactive instead of reactive when data volume is reduced, making it easier to estimate demand. AI-based inventory systems are capable of accurately interpreting supply-demand data, learning from it, and using what they have learned to accomplish specific objectives and tasks through adaptable changes [14]. With the ability to regulate the quality of goods and services and boost sales amid any crisis, an AI-based inventory management system might enhance a company's commercial operations.

iv. Workforce Management Strategies

Automation typically occurs when economic hardships are coupled with developing technologies. While some employments are impacted by automation, many more are still created. Artificial intelligence enabled robotic process automation (RPA) helps businesses support collaboration across teams and networks, while maintaining customer satisfaction and remaining stable during difficult times.

Robots may have an equivalent impact by increasing the requirement for workers to upgrade their existing abilities and learn new, difficult ones. The monotonous job of human workers can be successfully supported by robots and automation procedures powered by AI. Workplace productivity is increased by robots [15]. Through learning from the current scenarios, business executives can leverage robots to enhance business operations during any crisis, such as COVID-19.

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v. Budget Planning Strategies

To assess, forecast, and pinpoint the underlying reasons of budgeting, budget-planning teams frequently employ driver-based models. The budget planning team requires a fresh, systematic methodology in this period of unparalleled pandemic that will inform them of their alternatives for resolving the rapidly worsening issue. Companies can find enormous opportunities amid the crisis by embracing big data and AI. The budgeting process inside the firm can be enhanced by utilizing data science approaches and big data analysis. Budgeting involves more than simply creating a financial table from a collection of sales numbers [15]. Instead, it gives the operational projection, which is based on abundant internal and external information bases.

Comprehensive business-centered data analysis to increase sales can be made possible by AI, machine learning, and predictive analysis. Businesses can examine client demands and preferences with the aid of big data analytics. These elements help a business run more efficiently and generate more income. Big data has played a critical role in raising the competitiveness of corporate enterprises in a volatile market environment. In the modern era, organizations collect and process more data than ever before, increasing the reliability, accuracy and comprehensiveness of information processing [16]. The use of big data allows organizations to improve strategic decision-making in the face of any crisis, such as COVID-19.

D. Modeling UTUAT Constructs and T-O-E Frameworks

Human and/or organizational problems are solved by adopting and/or applying such innovations for problem-solving purposes. TOE theoretical frameworks are more predictive and explanatory when used with individual contexts, therefore adopting the framework independently is insufficient. In this study, a conceptual framework combining the TOE and UTAUT concepts is proposed, in which the relevant elements of the UTAUT framework are captured to capture the characteristics of different adopters. To form the suggested integrated framework described below, recent literary discoveries have been used to refine these two technological adoption models [17]. The UTUAT model's constructions are incorporated into the TOE framework as below, along with two additional constructs—perceived cost (PC) and perceived technological security—for a total of 11 constructs. In defining the individual adoption environment from the standpoint of social factors, the framework in place has incorporated pertinent literary sources.

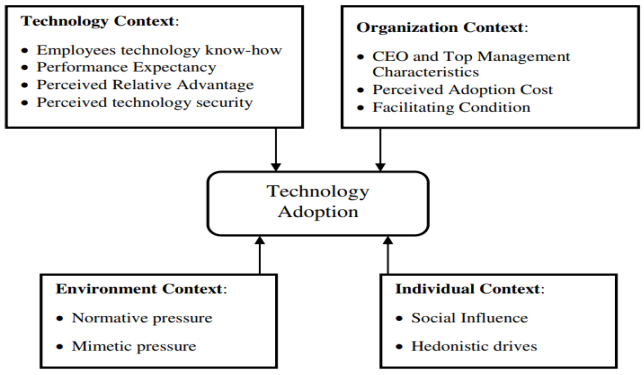

Figure:UTAUT & TOE Integrated Framework

The framework identifies four determinants of adoption, each of which is distinctive to at least two to four different elements.

i. Technology Context

All technologies deemed relevant for the company are included in the context of technology, including those previously used by the company and others that are currently available on the market but not being used. Similar to that, it encompasses both the technologies i.e., internal and external to an organization [18]. The planned research approach, however, only accounts for the employee's technological proficiency, perceived comparative advantage, performance expectations, and concerns about privacy and security.

ii. Organization Context

As part of the organizational context, we examine the characteristics and assets possessed within a firm, including internal communication channels, employee relationships, firm size, scope, social influences, cultural configurations, mission and vision of the organization, information sources, perceptions of adoption costs, CEO beliefs, facilitative conditions, and market structure complexity. An earlier study by Puklavec et al. finds that CEOs and senior managers make the majority of decisions in SMEs and do so based on their decisions as to whether or not to employed newer technical innovations [19]. The research looked at the top management, the perceived cost of adoption, and the facilitating environment within the context of the firm.

iii. Environment Context

As part of the environmental context, industrial structure, technology services providers, and regulation are all considered. This refers to the organization's business environment with respect to other industries, competitors, and interactions with governmental organizations. Due to its role as a catalyst for the adoption of technological innovation in technology and organizations, the environmental context has therefore been identified as the most important factor influencing the intention to implement technological innovations. [20]. The institutional theories and normative and mimetic pressures, in contrast, have been found to sum up nearly all the external elements emphasized by other scholars.

iv. Individual Context

The adoption of new innovations by SMEs is significantly influenced by individual circumstances. Many academics have underlined that the decision-makers' functional and/or emotional motivations are important factors to be considered in the innovation adoption at the company level. This reflects their beliefs, world views, psychographics, motivation, and other important personal traits [25]. Additionally, according to several research studies, the traits of owner-managers, like academic credentials, dedication, desire, management style, technological expertise, and alertness of technical innovation leanings, are important determinants in SMEs' adoption of technology in UAE. Individual factors have been assessed in the current study within the context of social influence and hedonistic impulses.

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III. Conclusion

This research paper offers examples of potential solutions for challenges faced by SMEs in response to this crisis utilizing artificial intelligence and big data. As a result of this tough environment, it explores the importance of digital technologies like Big Data and AI in supporting the success of business operations. AI and big data applications for crisis management in the future are outlined in the study, providing a new perspective on modern social scientific research and corporate management.

The use of intelligent conversational agents and Chatbots-AI technology, as well as the ambition to utilize it, is a factor that is developing very slowly among SMEs in emerging nations like UAE. Due to their influence on the technologies and the overall environment, environmental factors have been identified as the strongest motivators for SMEs to adopt new innovation, whereas perceived trust in technology are the most challenging factors. In addition, SMEs' willingness to accept and/or implement an innovation is more strongly predicted by CEO and top management traits, and this applies to all three stages of adoption. This research seeks to provide information about how to understand and forecast the adoption of technologies among SMEs by incorporating perceived technology security and UTUAT constructs. When additional components are incorporated and/or combined with the T-O-E paradigm, both explanations and predictions will become easier to understand and anticipate and subsequently increase its application. Furthermore, each construct is correlated with a different weight of influence at each choice time based on a combination of both the adoption factors and their constructs. A theoretical framework is presented across four adoption settings to analyze UAE SMEs' desire to implement Big Data & AI. An empirical testing of the theoretical validity and reliability of the framework could be conducted in the future.

IV. Limitations And Future Work

Big data and Artificial Intelligence are discussed in this paper mainly in the context of business processes, as it is primarily focused on theoretical aspects of crisis management. Future studies might examine the manager's perspectives on AI and big data in a pandemic scenario. Researchers can collect qualitative and quantitative data through interviews, focus groups, panel discussions, questionnaires, and databases. To assess the effectiveness of big data and AI-related technology in a certain business enterprise, an industry-wide study may be carried out. It is important to consult with a diverse range of experts to guarantee the generalizability of research findings when conducting a quantitative/empirical investigation. In order to investigate the role of AI and big data in business processes during the pandemic, researchers can ask questions from interviews, focus groups, panel discussions, questionnaires, and databases. The role of AI and big data in business processes can also be assessed by examining economies, including developed, developing, and poor nations. Research opportunities also exist for prospective researchers to compare pre- and post-COVID-19 circumstances and to apply big data and artificial intelligence technology to corporate processes of these companies.

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