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Regular Article

Practices of artificial intelligence to improve the business in Bangladesh

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ABSTRACT

This research paper explores the practices of artificial intelligence (AI) and its impact on improving businesses in Bangladesh through the review of existing literature and primary data analysis. Additionally, a conceptual analysis has been conducted on key AI concepts and their potential applications in the Bangladeshi business context. The study's objectives include providing a detailed understanding of specific AI technologies, measuring the benefits of AI, assessing the challenges faced by the industry in implementing AI and finding probable solutions to overcome these challenges. Data were collected from 120 respondents from 10 types of businesses in Bangladesh and analyzed using MS Excel and SPSS (V. 25). According to the results, using AI in enterprises may have a significant positive impact on efficiency, decision-making, production, cost, fraud detection, and supply chain optimization. However, obstacles to AI deployment include a lack of qualified personnel, poor data quality, money, infrastructure, and legal frameworks. Businesses should raise employee understanding of AI, look for diversified financing and qualified personnel, work with the government on infrastructure support and legislation, address concerns about job displacement through training, and encourage employee acceptance of change in order to overcome these challenges. Businesses in Bangladesh may improve operations and competitiveness by using these techniques. Business executives, decision-makers, and academics interested in maximizing the potential of AI and enhancing business outcomes in Bangladesh might learn from this study.

1. Introduction

Artificial intelligence (AI) has the potential to significantly improve businesses in Bangladesh by automating repetitive tasks, optimizing operations, and providing insights through data analysis (Babu, 2021a, 2021b). Such as, AI can be used to improve efficiency by controlling and monitoring production processes, identifying defects, and predicting maintenance needs in manufacturing sector. Moreover, AI-powered chatbots can be used to provide customer service, while AI-based systems can be used to optimize inventory management and predict consumer demand in retail industry. In financial sector, AI can be used to detect fraud and analyze credit risks (Komal Singh, Hasan, & Rajendran, 2023). Additionally, AI can be used to improve healthcare in Bangladesh by analyzing medical images, detecting diseases, and predicting patient outcomes (Uzir, Al Halbusi, Jerin, Hamid, Ramayah, & Haque, 2021).

The impact of AI on business practices is evident, and it has resulted in substantial changes. Figure-1 shows that in 2022, the world market for artificial intelligence was worth USD 136.55 billion. It is expected to grow at a rate of 37.3% per year from 2023 to 2030 (Grand View Research, 2022). Approximately 80% of businesses say AI has helped create jobs. By 2023, AI-powered businesses may enhance customer satisfaction by 25% (Zapanta, T., 2023). A table summarizing potential areas of application for AI in different industries (see Table 1).

Overall, the use of AI in business is becoming increasingly widespread, and companies in Bangladesh are also starting to adopt this technology to improve their operations and stay competitive in the global market.

Bangladesh implemented an AI strategy in March 2020, but development has been slow since then. Bangladesh can exploit its scientific and technical infrastructure to reap the benefits of AI by establishing specialized AI research organizations and attracting top personnel. It has the ability to launch AI-based research programs tackling local issues such as Bangla NLP, factory automation, agricultural support, personalized education, and healthcare for underprivileged regions (Sayeed Ahmed, The Daily Star, January 28, 2023). One of the most important methods to improve businesses in Bangladesh is through AI automation

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of monotonous jobs. In the industrial business, for example, AI-powered robots may undertake assembling, welding, and painting, resulting in increased productivity and cost savings. The World Bank analysis emphasizes the potential for automation and robotics in Bangladesh's ready-made garment (RMG) industry, which is beleaguered by high labor costs, low productivity, and a significant number of unskilled employees (World Bank, 2018). AI implementation in the RMG business may greatly improve efficiency and competitiveness while mitigating the disadvantages of low-cost labor. AI may also help Bangladeshi firms by optimizing processes. AI systems analyze sales data, estimate customer demand, and optimize inventory management in the retail business, resulting in cost savings and enhanced supply chain efficiency. Analyzing customer data provides personalized advice and targeted marketing strategies. In the financial industry, artificial intelligence identifies fraud, analyses credit risks, and forecasts loan defaults. According to a research conducted by the Bangladesh Institute of Bank Management, AI-based solutions in banking can cut costs, improve efficiency, and improve service quality. Furthermore, AI reveals hidden patterns in data, assisting in fraud detection and risk management (BIBM, 2017).

AI has enormous promise in Bangladesh's banking industry. Artificial intelligence-powered systems can detect fraud, assess credit risks, and increase financial forecasting accuracy. A study shows that AI has the potential to minimize fraudulent transactions and improve credit risk assessments (Husain, Hamdan, & Fadhul, 2022).

AI has the potential to dramatically help Bangladesh's industrial industry. AI systems can regulate and monitor manufacturing processes, detect problems, and forecast maintenance needs. Sikka, Sarkar, and Garg (2022) assert that artificial intelligence (AI) holds the potential to automate operations within the textile industry, hence yielding cost reductions in production, heightened productivity levels, and improved product quality.

Retail is another area in Bangladesh that might benefit from AI. Chatbots enabled by AI can deliver effective customer support and answer commonly asked queries. AI systems can optimize inventory management and forecast consumer demand, resulting in greater sales and customer satisfaction (Duong, Wood, & Wang, 2018; Rathore, 2023).

AI has the ability to revolutionize diagnosis and treatment in healthcare. AI-powered systems can analyze medical images such as X-rays, CT scans, and MRIs, allowing for faster and more accurate illness detection. AI can also forecast patient outcomes, which can help with treatment decisions.

AI application has the potential to assist Bangladesh's healthcare business. AI-powered systems can analyze medical pictures, diagnose illnesses, and forecast patient outcomes (Hasan, Shamael, et al., 2023). Outcome of another relevant study focus that AI in healthcare leads to enhanced diagnosis accuracy and a reduction in misdiagnoses (Loh, 2018). Bangladesh's Transportation and tourism industries are beginning to use AI to reduce costs, increase productivity, and enhance services and tourist familiarity which will lead to a prosperous future (Khan et al., 2021; Babu, 2021a, 2021b). Here are the statistics of using AI in Business of Bangladesh (see Table 2).

AI application in several industries in Bangladesh has the potential to boost production, cut costs, and improve decision-making. However, successful implementation necessitates technological skills, enabling policies, and equitable benefit distribution. Workers affected by automation must receive enough training and assistance. AI has the potential to automate activities, optimize operations, and provide data-driven

Table: 1
Potential area of application for AI.

Industry	Potential Areas of Application for AI
Healthcare	Medical diagnosis and treatment, medication discovery, medical imaging analysis, and patient monitoring are all areas of expertise.
Finance	Fraud detection, risk assessment, investment analysis, customer service, chatbots, and personal financial management are all examples of services available.
Retail	Customer service, personalized marketing, inventory management, demand forecasting, price optimization, and supply chain management
Manufacturing	Quality assurance, predictive maintenance, supply chain optimization, self-production, and inventory management
Education	Intelligent tutoring systems, automated grading, educational material production, student engagement and retention are all examples of personalized learning.
Transportation	Route optimization, fleet management, and predictive maintenance are all examples of autonomous cars.
Agriculture	Crop yield prediction, precision agriculture, livestock management, disease detection, and irrigation management are all examples of precision agriculture.
Energy	Predictive maintenance, demand forecasting, renewable energy management, energy efficiency optimization, and defect detection are all examples of predictive maintenance.
Legal	Contract review, litigation prediction, due diligence, and document management are all examples of legal research.
Marketing	Consumer segmentation, predictive lead scoring, content development, campaign optimization, sentiment analysis, and chatbots are some of the services available.

Table: 2
Percentage of businesses using AI.

Sector	Percentage of Businesses Using AI	Data Source
Finance	35%	"The State of AI in Bangladesh" report by LightCastle Partners
Healthcare	20%	
Manufacturing	18%	
Retail	15%	
Transportation	8%	
Other	4%	

Source: LightCastle Partners. (2020).

	2022 (Global Revenue)	2023 (Billion)	2023-2030 (Billion)
Asia Pacific AI Market size	37.3%		
North America AI Market	36.8%		
AI Market size value (Estimated)	USD 136.6 billion	USD 196.63	
Advertising accounted (AI)	More than19.5%		
data-driven applications (AI)	Around 36.4%		
AI Market size value in 2023 (Expected)		USD 196.63	
Revenue forecast in 2030			USD 1,811.75
Compound Annual Growth Rate (CAGR)			37.3%

Figure −1. Impact of AI in global Business.
Source: www.grandviewresearch.com

insights, aiding industries such as manufacturing, retail, finance, and healthcare. Nonetheless, issues like data privacy, security, and ethics necessitate suitable legislation and norms.

Despite increased interest in AI adoption in the business sector in Bangladesh, there is a scarcity of research on AI practices and their effects on business results. While some study has looked into the possibilities of AI in areas such as e-commerce and banking, there is a need for additional in-depth studies of the individual AI technologies employed and the problems that businesses encounter when adopting and deploying these technologies. Recent study reveals that AI can improve corporate operations in a variety of areas in Bangladesh, but there is little research on how businesses might overcome challenges and efficiently adopt AI. Moreover, there is a deficiency in empirical research regarding the influence of AI on business in Bangladesh. Additionally, there is a dearth of investigation into the specific advantages that enterprises in the region may derive from AI adoption and potential areas of AI application in various industries.

2. Literature review

AI is becoming more and more common in business, which has several advantages, including improved decision-making, accuracy, and efficiency. Retailers like Walmart employ AI for personalized suggestions and inventory management. Chinese insurer Ping uses AI to simplify the distribution of benefits. Thesetechnologies streamline procedures and aid in the expansion of the financial sector (Kabulova, J., 2023). In Bangladesh, where companies are actively looking into how AI may help them run their businesses better, this worldwide trend of AI adoption is also noticeable. The use of AI in a variety of industries has made it possible to increase production, efficiency, and competitive advantage. Increasing interest in using AI for business optimization is reflected in Bangladesh's fast increasing AI literature.

The e-commerce sector of Bangladesh is also investing in the integration of artificial intelligence (AI), blockchain, IoT, and big data for achieving the Sustainable Development Goals (SDGs) (Talukder, 2021). This evaluation of the literature attempts to evaluate the present level of AI practices in various Bangladeshi industries and investigate their potential to improve business processes.

The potential uses of AI in the Bangladeshi corporate sector have been recognized by a number of research. A study examined the application of AI in Bangladesh's banking industry where AI has the potential to enhance banking industry customer service, fraud detection, and risk management (Babu, 2021a, 2021b). Another investigation of AI use in Bangladeshi healthcare was part of a larger research. The study discovered that using AI can help with patient monitoring, therapy, and diagnosis (Uzir, et al., 2021).

In addition, for improving company processes in Bangladesh, AI has a wide range of applications. Data input processes may be automated, saving time and lowering mistake rates. Huge volumes of data may be analyzed by AI, revealing patterns and insights that are hard to find manually (Ghahramani, Qiao, Zhou, O'Hagan, & Sweeney, 2020). This makes it possible to build successful strategies and make educated decisions.

However, there are difficulties that must be overcome in order to integrate AI in Bangladeshi company. These include issues with insufficient data infrastructure and standardization, prejudice and privacy ethics, and a lack of qualified people for AI development and deployment (Polas et al., 2022).

One of the sectors that have been studied for the potential of AI applications is education. Khan, et al., (2019) evaluated the potential of AI in the education sector of Bangladesh. They highlighted that AI can be used to provide personalized learning, assess student performance, and improve the overall quality of education. Similarly, in the banking industry, Shetu et al. (2021) identified several opportunities for AI applications, such as fraud detection, customer service, and loan processing. However, they also highlighted some challenges, including a lack of data and skilled professionals.

Iqbal, Islam, Zayed, Beg, and Shahi (2021) explored the role of AI in business and provided evidence of AI adoption in different sectors in Bangladesh. They found that businesses are adopting AI to improve efficiency, customer service, and decision-making processes. Similarly, Khan, et al. (2021) conducted an empirical study on the adoption of AI in the banking sector and identified factors affecting its adoption. They found that organizational readiness, IT infrastructure, and perceived benefits significantly influence AI adoption.

In addition, Ahmad and Al Mamun (2020) identified the prospects of AI in the banking sector of Bangladesh, while Hasan, Rahman, Rahman, Islam, and Mazid-Ul-Haque (2023) explored AI for sustainable development in Bangladesh. Babu (2021a, 2021b) identified the potential of artificial intelligence and its challenges in several sectors of Bangladesh, including services, transportation, education, agriculture, health, and the environment. Hossain, M. S. et al. (2022) highlighted the potential of AI in the healthcare sector, while Haque, Islam, Samrat, Dey, and Ray (2021) explored its potential in the agriculture sector.

Moreover, Sikka et al. (2022) presented a study based on textile industry in Bangladesh and demonstrated the application of AI in operational modernization. Avi, Nasrin, and Hassan (2021) identified the application of AI (robot) in the tourism industry. Finally, Rashid (2020) conducted an empirical investigation on the application of AI, 5G network and The Internet of Things (IoT) in financial services. According to the literature, artificial intelligence (AI) may improve company operations in a variety of areas in Bangladesh. However, addressing issues such as a shortage of qualified experts, data, and IT infrastructure is critical. Additional study is required to find particular AI applications and create solutions to overcome these obstacles.

To summarize, artificial intelligence has the potential to dramatically increase efficiency, accuracy, and insights in the Bangladeshi corporate setting. However, fixing implementation issues is required. Future research should concentrate on overcoming these obstacles and developing profitable AI applications for Bangladeshi enterprises.

2.1. Research question

Based on the identified research gap, the following research question can be formulated-

1. What are the specific AI technologies that businesses in Bangladesh are currently using, and what are the hurdles that enterprises experience in adopting and using these technologies?
2. What are the specific benefits that firms in Bangladesh have seen by utilizing AI, and what are the prospective areas of use for AI in other industries?
3. What effect does AI have on company success in Bangladesh?
4. What recommendations should be offered to Bangladeshi firms and policymakers to help them adopt and use AI technologies, and how can these technologies be used to improve business outcomes?

2.2. Objectives of the study

The main objective of this paper is to understand the present state & practices of Artificial Intelligence (AI) in Business of Bangladesh.

Other sub-objectives are-

- To know how Artificial Intelligence (AI) is being used to improve businesses in Bangladesh.
- To measure the impacts (benefits) and challenges of applying AI in Business of Bangladesh.
- To find out the probable actions, measures, and solutions to overcome the challenges of implementing AI.
- To provide major findings and recommendations based on the literature review and data analysis of this study.

3. Methodology

Conduct a thorough review of existing literature on the use of AI in business in Bangladesh, as well as in other developing countries. This will provide an understanding of the current state of AI implementation in the country and identify any gaps in the literature. Conceptual Analysis has been conducted on the key concepts related to AI and business, such as machine learning, natural language processing, and computer vision, and their potential applications in the Bangladeshi business context.

3.1. Sampling plan

The present study used a non-probability convenience sampling method to select the sample from the concerned person from various firms (Business organizations) in Bangladesh who have experience to apply AI in their business organization. As there is no specific sample frame (population is unknown) so convenience sampling method has been chosen to collect primary data. Self-administered questionnaires surveys were used to get quantitative data from respondents for this study. Face to face survey and computer technology (Online Google form) were used to pass out questionnaires. Respondents filled out the form both on hard copy (printed paper) and online.

3.2. Target population

Non-probabilistic convenience sampling was used to approach and select respondents for this investigation. The population of interest was comprised of Bangladeshi businesses that have used AI at the time the survey was conducted in 2023.

Convenience sampling was used extensively since there was no predetermined sample frame. Both in-person surveys and Google forms were used to reach out to respondents, with the latter giving respondents the option to respond on paper or digitally. In all, 78 online replies and 42 face-to-face surveys were analyzed from the study's target sample of 120 respondents, who were supposed to represent different sectors in Bangladesh. This provided a rich and varied dataset for analysis.

Due to the dynamic nature of AI policy in the country, however, a standard sample frame is not yet available for this research. To provide a representative and meaningful research, a comprehensive approach will be employed to collect data from a wide range of business sectors and sizes.

3.3. Sample size

Sekaran and Bougie (2016) say that the size of a study's sample should be between 50 and 500.

Response has been collected from the target respondents in eight (8) divisions of Bangladesh, including Owner, Manager, CEO, Factory In-Charge, DGM and Officer. In Bangladesh there is no sample frame because it's unknown yet that how much business organization are using AI in Bangladesh. Self-administered survey questionnaires were utilized to collect data from over 120 respondents from Dhaka, Rajshahi, Chittagong, Sylhet, Rangpur, Khuluna and Barishal divisions that represent the whole picture of Bangladesh utilizing a non-probability judgmental sampling approach.

3.4. Data collection approach

Data has been collected from Primary and secondary sources. Primary data has been collected from the convenience sampling method from the concerned person from various firms (Business organizations) in Bangladesh. As there is no specific sample frame (population is unknown) so convenience sampling method has been chosen to collect primary data. Primary data has been collected from the 120 respondents from 10 types of Business organizations through a 31 Semi-structured questionnaire survey with face-to-face and an online survey.

Participants (respondents) of the study were recruite based on the list of organizations' name who are currently using AI in their business in Bangladesh searched by the help of google. Email address, contact numbers and address of that targeted participants (respondents) has been collected from online google search. After collecting their email addresses and contact information author emailed the Google questionnaire to the selected respondents (90 in total), and only 85 respondents sent back the questionnaire after completing it. After scanning the Google questionnaire forms, 78 were selected for the final analysis. The author conducted the remaining 42 surveys in person to collect respondents' responses through face-to-face data collection using printed questionnaires by going to that specific organizations (respondents) according to the addresses of those organization taken form google search.

Secondary data has been collected from online sources, journals, magazines, and books on the current use of AI in businesses in Bangladesh, including the types of AI technologies being used, the industries in which they are being used, and the challenges and opportunities associated with their implementation.

3.5. Data analysis tools and techniques

The study of the data is used to find the central trend, the range, the frequency, and the percentages. The study used descriptive statistics like Frequency Distribution, Percentage, and Ranking study to figure out how AI affected things and what the most likely way was to get around the problems.

A total of 120 questionnaires were collected for this study, and the findings were analyzed using the SPSS (version 25.0) and Microsoft Excel (version 13) programs. Based on the analysis and interpretation, come up with some conclusions and suggestions for companies in Bangladesh that want to use AI to make their operations better.

3.6. Privacy and ethical issues

The survey prioritized privacy and ethics by handling respondents' personal information with meticulous care and strict confidentiality. All participants provided informed consent, and their identities remained confidential during data processing. The study adhered to research ethical norms, handling sensitive material with respect for privacy throughout all phases, including data collection and analysis.

4. ResultsDemographic characteristics and general information

The table titled "Table: 3 Demographic Characteristics and General information regarding AI in the business of Bangladesh" presents data on the demographic characteristics and general information related to AI use in the business of Bangladesh. The data is based on a survey of 120 respondents.

In terms of the respondents' designation, 40% identified as CEOs, followed by factory in-charge at 26.7%, managers at 20%, and owners at 6.7%. DGMs made up the remaining 6.7% of respondents. Regarding industry, healthcare had the highest representation at 20%, followed by manufacturing at 23.3% and construction at 13.3%. Banking and finance, energy and utilities, and retail each had 6.7% representation. In terms of annual revenue, 33.3% of respondents reported having less than BDT 1 crore, followed by 30% with BDT 1–5 crores and 26.7% with BDT 5–10 crores. The remaining 10% reported annual revenue of BDT 10–50 crores. All 120 respondents reported using AI in their business, with 93.3% using it in a specific sector of their company and 6.7% using it in all sectors. Overall, the data indicates a relatively high level of AI adoption among businesses in Bangladesh, with a diverse range of industries and revenue levels represented (see Table 3).

4.1. Measuring impact (benefits) of AI in business of Bangladesh

Table 4 provides insight into the perceived benefits of implementing AI in businesses in Bangladesh. The table presents the frequency and percentage of responses to various questions related to the impact of AI on business efficiency, decision-making, customer service, productivity, costs, personalization, predictive maintenance, fraud detection, and supply chain optimization.

Overall, the vast majority of respondents believe that implementing AI in their business can provide significant benefits. Over 96% of respondents answered "yes" to questions regarding the potential of AI to increase efficiency, improve decision-making, enhance productivity, reduce costs, detect fraudulent activities, and optimize the supply chain. Moreover, over 93% of respondents believe that AI-powered chatbots or virtual assistants can improve customer service, while AI can be used to provide personalized experiences to customers by analyzing their preferences and behavior in over 93% of cases. The adoption of AI-powered predictive maintenance systems to avoid equipment failure and reduce downtime is also widespread, with 96.7% of respondents answering "yes." Notably, all respondents answered "yes" to the question of whether AI can help detect fraudulent activities and reduce the risk of financial loss.

In conclusion, the results suggest that businesses in Bangladesh are becoming increasingly aware of the benefits of implementing AI technology in various aspects of their operations. The findings highlight the potential of AI to increase efficiency, improve decision-making, enhance productivity, reduce costs, detect fraudulent activities, and optimize the supply chain.

Table: 3
Demographic Characteristics and General information regarding AI.

		Frequency	Percent (%)	Cumulative Percent
Designation	Owner	8	6.7	6.7
	Manager	24	20.0	26.7
	CEO	48	40.0	66.7
	Factory In-Charge	32	26.7	93.3
	DGM	8	6.7	100.0
	Total	**120**	**100.0**	
Industry	Agriculture	4	3.3	3.3
	Banking and Finance	8	6.7	10.0
	Construction	16	13.3	23.3
	Education	4	3.3	26.7
	Energy and Utilities	16	13.3	40.0
	Healthcare	24	20.0	60.0
	Information Technology	8	6.7	66.7
	Manufacturing	28	23.3	90.0
	Retail	8	6.7	96.7
	Transportation and Logistics	4	3.3	100.0
	Total	**120**	**100.0**	
Annual revenue (company/ organization)	Less than BDT 1 crore	40	33.3	33.3
	BDT 1–5 crores	36	30.0	63.3
	BDT 5–10 crores	32	26.7	90.0
	BDT 10–50 crores	12	10.0	100.0
	Total	**120**	**100.0**	
Using AI in Business (Organization)	Yes	120	100.0	100.0
Sectors of using AI	All sectors of our company	8	6.7	6.7
	Specific sector of our company.	112	93.3	100.0
	Total	**120**	**100.0**	

Table: 4
Impact (benefits) of AI in business of Bangladesh.

		Frequency	Percent (%)	Cumulative Percent
Do you believe that implementing AI in your business in Bangladesh can help increase efficiency?	Yes	116	96.7	96.7
	No	4	3.3	100.0
	Total	**120**	**100.0**	
Do you think that AI can help in better decision-making for your business in Bangladesh?	Yes	116	96.7	96.7
	No	4	3.3	100.0
	Total	**120**	**100.0**	
Do you think that the implementation of AI-powered chatbots or virtual assistants helps to improve your customer service in your business in Bangladesh?	Yes	112	93.3	93.3
	No	8	6.7	100.0
	Total	**120**	**100.0**	
Do you think that AI tools and software can help enhance productivity in your business in Bangladesh?	Yes	116	96.7	96.7
	No	4	3.3	100.0
	Total	**120**	**100.0**	
Do you believe that implementing AI in your business in Bangladesh can help reduce costs?	Yes	116	96.7	96.7
	No	4	3.3	100.0
	Total	**120**	**100.0**	
Have you implemented AI to provide personalized experiences to customers by analyzing their preferences and behavior in your business in Bangladesh?	Yes	112	93.3	93.3
	No	8	6.7	100.0
	Total	**120**	**100.0**	
Have you implemented AI-powered predictive maintenance systems to avoid equipment failure and reduce downtime in your business in Bangladesh?	Yes	116	96.7	96.7
	No	4	3.3	100.0
	Total	**120**	**100.0**	
Do you believe that implementing AI in your business in Bangladesh can help detect fraudulent activities and reduce the risk of financial loss?	Yes	120	100.0	100.0
	No	00	00	00
	Total	**120**	**100.0**	
Have you implemented AI to optimize your supply chain by predicting demand, reducing waste, and identifying inefficiencies in your business in Bangladesh?	Yes	116	96.7	96.7
	No	4	3.3	100.0
	Total	**120**	**100.0**	

4.2. Assessing the challenges the business industries are facing to implement AI

Table 5 provides an analysis of the challenges that businesses face in implementing AI in Bangladesh. The table shows that the majority of respondents reported facing challenges in finding skilled professionals with AI expertise, inadequate data quality, funding, and a lack of supportive infrastructure and regulatory framework. Additionally, most respondents reported that resistance to change and fear of job displacement were major challenges for companies in Bangladesh in adopting AI. Moreover, all respondents reported that there is a lack of awareness and understanding of AI technology among businesses in Bangladesh.

The Table 5 shows the percentage of responses to five challenges faced by companies in implementing AI in Bangladesh. 96.7% of the companies face challenges in finding skilled professionals with AI expertise, while 86.7% have limited access to data or face inadequate data quality issues. 100% of the respondents believe that there is a lack of awareness and understanding of AI technology among businesses in Bangladesh. 66.7% of the companies face funding challenges in

Table: 5
Challenges of implementing AI in Business.

		Frequency	Percent	Cumulative Percent
Does your company face challenges in finding skilled professionals with AI expertise?	Yes	116	96.7	96.7
	No	4	3.3	100.0
	Total	120	100.0	
Does your company have limited access to data or face inadequate data quality issues?	Yes	104	86.7	86.7
	No	16	13.3	100.0
	Total	120	100.0	
Do you think that there is a lack of awareness and understanding of AI technology among businesses in Bangladesh?	Yes	120	100.0	100.0
	No	00	00	00
	Total	120	100.0	
Does your company face funding challenges in implementing AI?	Yes	80	66.7	66.7
	No	40	33.3	100.0
	Total	120	100.0	
Does your company face challenges due to the lack of supportive infrastructure and regulatory framework in Bangladesh?	Yes	112	93.3	93.3
	No	8	6.7	100.0
	Total	120	100.0	
Do you think that resistance to change and fear of job displacement are major challenges for companies in Bangladesh in adopting AI?	Yes	116	96.7	96.7
	No	4	3.3	100.0
	Total	120	100.0	

implementing AI, and 93.3% face challenges due to the lack of supportive infrastructure and regulatory framework in Bangladesh. Additionally, 96.7% of the respondents consider resistance to change and fear of job displacement as major challenges for companies in Bangladesh in adopting AI. Overall, the table suggests that businesses in Bangladesh face significant challenges in implementing AI, which require significant efforts from the government and other stakeholders to overcome.

4.3. Actions and measures to overcome the challenges of implementing AI

Table 6 presents the responses of 120 businesses in Bangladesh to six questions related to measures taken to address challenges in implementing AI. In order to measure and depict the distribution and predominance of replies in the context of resolving obstacles in the implementation of AI, the percentage is an invaluable tool. Priority Identification provides a basis for comparisons and benchmarking, and acceptance or implementation of various policies may be measured in terms of percentages of responders. It shows how generally or narrowly accepted particular actions or solutions are to overcome the difficulties of deploying AI. These statistics provide a quantitative look at how people responded and how far various actions have been taken to overcome the obstacles presented by integrating AI in Bangladesh's commercial sector. The summary of probable actions, measures, and solutions to overcome these challenges based on the table are as follows:

Table 6 shows the percentage distribution of responses from firms in Bangladesh regarding the challenges of applying AI. Of the issues noted, 70% of organizations claimed that they had taken no effort to address the scarcity of competent employees with AI experience, while just 30% have taken some action. Similarly, 86.7% of organizations have not implemented any measures to address limited access to data and poor data quality, while only 13.3% have taken action. In terms of raising knowledge and understanding of AI technology, 60% of organizations have done nothing, while 40% have looked into various options. Furthermore, just 20% of enterprises have collaborated with the government and other organizations to establish supportive infrastructure and regulatory frameworks for AI implementation, while the remaining 80% have not. Finally, 93.3% of organizations have not addressed

Table: 6
Probable actions, measures, and solutions to face the challenges of implementing AI.

		Frequency	Percent	Cumulative Percent
Have you implemented any measures to address the limited availability of skilled professionals with AI expertise?	Yes	36	30.0	30.0
	No	84	70.0	100.0
	Total	120	100.0	
Have you implemented any measures to address the limited access to data and inadequate data quality?	Yes	16	13.3	13.3
	No	104	86.7	100.0
	Total	120	100.0	
Have you taken any steps to increase awareness and understanding of AI technology among businesses?	Yes	48	40.0	40.0
	No	72	60.0	100.0
	Total	120	100.0	
Have you explored various sources of funding to support the implementation of AI?	Yes	36	30.0	30.0
	No	84	70.0	100.0
	Total	120	100.0	
Have you worked with the government and other organizations to develop supportive infrastructure and regulatory frameworks for AI implementation?	Yes	24	20.0	20.0
	No	96	80.0	100.0
	Total	120	100.0	
Have you addressed concerns of job displacement and resistance to change among employees through training and other initiatives?	Yes	8	6.7	6.7
	No	112	93.3	100.0
	Total	120	100.0	

concerns about job displacement and employee resistance to change through training and other activities, while just 6.7% have taken some steps to address these concerns. Overall, the findings reveal that organizations in Bangladesh have several problems when it comes to integrating AI, but there are a number of activities, measures, and solutions that can be implemented to overcome these challenges. Businesses can utilize the benefits of AI and improve their operations and competitiveness by implementing these tactics.

4.4. Solutions to overcome the challenges of implementing AI in Bangladesh

Table 7 and Fig. 2 demonstrate alternative solutions to address the problems of applying AI in Bangladesh, along with their ranking and percentage, based on respondents' responses (total respondents are 120). Ranking and proportional are key in determining the preferences

Table: 7
Potential solutions.

What other potential solutions do you think can help overcome the challenges of practicing and implementing AI in Bangladesh?		
Potential Solutions	Ranking	Percentage
Encouraging and investing in AI education and training programs to increase the availability of skilled professionals in Bangladesh.	110	91.67%
Developing a supportive infrastructure and regulatory framework to facilitate the implementation and adoption of AI in businesses in Bangladesh.	120	100%
Encouraging collaboration between academia and industry to drive research and development in the field of AI in Bangladesh.	112	93.33%
Establishing public-private partnerships to pool resources and share knowledge and expertise in AI implementation in Bangladesh.	110	91.67%
Promoting awareness and understanding of AI technology and its potential benefits among businesses and the general public in Bangladesh.	120	100%

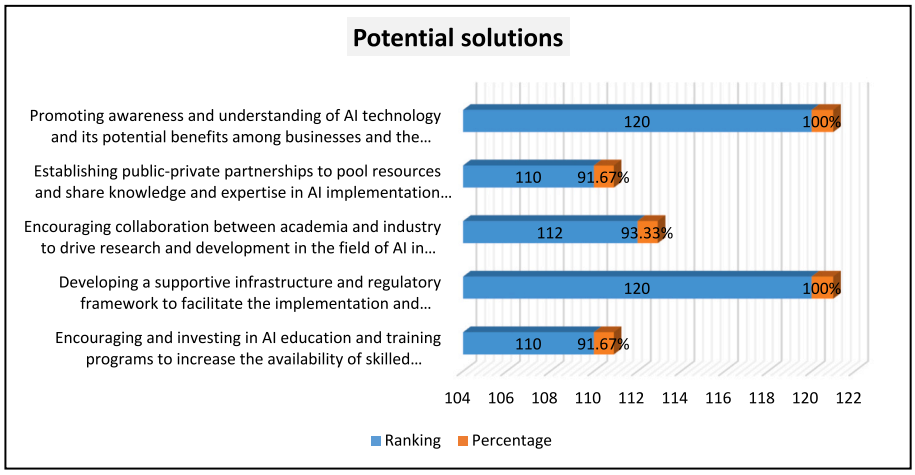

Figure-2. Potential and probable solutions to overcome the challenges of practicing and implementing AI in Bangladesh.

and priorities of prospective solutions to Bangladesh's AI issues. Ranking and percentage measurements are essential for analyzing Priority Determination, Quantification of Support, Resource Allocation, and Informed Decision-Making in the context of contemporary business in the AI era. Higher-ranked solutions are deemed more important or relevant to AI implementation difficulties. The combination of ranking and percentage shows which options are popular and have more support. This information helps Bangladeshi AI implementation strategists make educated decisions.

Supporting and investing in AI education and training programs to enhance the availability of trained people in Bangladesh received the most support, with 91.67% of respondents in favor of this approach. 100% of the people who answered the survey agreed that Bangladesh needs to raise knowledge and understanding of AI technology among business people and the general public. They also agreed that Bangladesh needs to create the infrastructure and rules that will allow AI to be used in organizations (Rank is 120).

A significant majority of respondents, namely 93.33%, express their support for the promotion of collaboration between academia and industry as a means to enhance research and development in the field of artificial intelligence. This finding is noteworthy, as it ranks at 112 in terms of importance. Finally, it is evident from the survey results that a significant majority of 91.67% of respondents strongly advocate for the establishment of public-private partnerships as a means to successfully pool resources, share knowledge, and leverage capabilities in the application of artificial intelligence (AI). This viewpoint is further supported by the ranking of this recommendation at 110.

5. Findings and discussion

According to the findings, businesses in Bangladesh see the major benefits of artificial intelligence in numerous sectors of their operations. AI-powered chatbots for customer service and predictive maintenance systems to prevent equipment breakdown are two popular uses. Businesses, on the other hand, confront challenges in applying AI owing to a scarcity of trained AI workers, poor data quality, budgetary restrictions, and a lack of supported infrastructure and legal frameworks. Concerns about job dislocation and opposition to change are also significant problems.

5.1. The findings underscores several noteworthy trends and challenges are as follows

5.1.1. Skilled professionals

The study found that 30% of organizations had taken steps to solve the AI skills gap. This supports the rising acknowledgment of the importance of trained AI implementation people. A lack of AI professionals is growing across industries, especially emerging countries like Bangladesh (Hossain, 2022).

5.1.2. Data quality and access

The report shows that just 13.3% of businesses have addressed data quality and accessibility issues. This discovery is similar to Bangladesh's data shortage and dependability issues. In 2020, a study found that data quality and accessibility concerns hinder the use of artificial intelligence (AI) in emerging economies (Aly, 2020).

5.1.3. Awareness and understanding

This study shows that 40% of firms actively promote AI technology comprehension in Bangladesh. Increasing awareness among the remaining 60% of firms can be improved. In the global environment, lack of knowledge and understanding regarding AI's potential benefits is a barrier to its adoption (Benbya, Davenport, & Pachidi, 2020).

5.1.4. Funding and support

30% of firms have examined financial options for AI implementation. Some firms of Bangladesh are aggressive in pursuing financial resources to invest in AI technology. In line with its global strategy, PwC US has announced plans to invest $1 billion over the next three years to expand and scale its artificial intelligence (AI) offerings and assist clients in reimagining their businesses through the power of generative AI. (PwC, 2023).

5.1.5. Collaboration and infrastructure

This study shows that only 20% of firms collaborate with government and organizations to create supportive infrastructure and regulations in Bangladesh. This supports the necessity for public-private partnership to enable AI adoption. Public-private collaborative data networks necessary to create data sharing across the stakeholders for AI growth (Mikhaylov et al., 2018).

5.1.6. Employee concerns (training)

The survey found that just 6.7% of organizations had tackled job displacement and employee resistance through training and initiatives in Bangladesh. This confirms that employee opposition and job dislocation limit AI adoption worldwide. Therefore, businesses must ensure their employees remain current by providing them with regular training and making an effort to retrain them in new areas of AI application (Li, 2022; Zirar, Ali, & Islam, 2023).

5.2. Regarding potential solutions, the study's participants have provided valuable insights those could be implemented to adopt and use AI technologies

5.2.1. AI education and training

The high score (91.67%) for promoting and investing in AI education and training programs represents a solid consensus on the necessity of building local AI competence in Bangladesh. Various papers, including the UN's AI for Good Global Summit, suggest skill development in emerging countries (United Nations, 2019).

5.2.2. Infrastructure and regulatory framework

The 100% support for a supporting infrastructural and regulatory framework emphasizes the role of government and policy in promoting AI adoption in Bangladesh, while another study from India recommends improving clear norms and strategies to provide comprehensive inputs for AI policy. This research also suggests prioritizing security, privacy, and governance (Chatterjee, S., 2020).

5.2.3. Academia-industry collaboration

The 93.33% endorsement of collaboration between academics and industry highlights the symbiotic link between research and practical implementation. A report emphasizes the necessity for such alliances and international cooperation on AI to solve AI concerns in disadvantaged nations (Cameron F. et al., 2021).

5.2.4. Public-private partnerships

Support (91.67%) for public-private partnerships shows unanimity on the need for collaboration. The stresses that partnerships may leverage resources and knowledge for AI implementation in poor nations (IISD, 2023).

5.2.5. Awareness promotion

100% agreement on marketing AI's potential advantages resonates globally. The OECD recommends awareness programs to refute myths and promote AI's benefits (OECD, 2020).

AI is being used in Bangladesh to improve efficiency and reduce costs in a variety of areas. Grameenphone (GP), the country's largest mobile phone provider, has integrated artificial intelligence (AI) in customer care operations, using AI-powered chatbots to manage consumer enquiries, decreasing the pressure on human agents. Furthermore, businesses such as bKash, a mobile financial service provider, use AI-powered fraud detection systems to protect consumer transactions. The Bangladesh Rice Research Institute (BRRI) has devised an AI-powered method to estimate crop production and analyze soil quality in the agricultural sector. This technology helps farmers optimize crop output while also increasing operating efficiency.

AI is being used in the healthcare industry to improve diagnosis accuracy and patient care. Apollo Hospitals Dhaka, for example, has incorporated AI-powered diagnostic technologies to improve diagnosis precision and reduce doctor burden. Businesses in Bangladesh, on the other hand, face significant hurdles in AI deployment, needing significant efforts from the government and other stakeholders to overcome. AI is being used in a variety of industries throughout the world to improve efficiency and cost-effectiveness, and Bangladesh is following suit in order to remain competitive in the global market.

The study concludes that Bangladesh's business sector must address issues such a lack of trained staff, poor data quality and expertise, money, collaboration, and employee concerns to successfully adopt artificial intelligence. Current research and worldwide guidelines support the proposed methods to expedite AI adoption and improve business processes in the country. The study advises that the government and other stakeholders take considerable steps to resolve these concerns. Increasing knowledge and understanding of AI, building supportive infrastructure and legislation, and addressing concerns through training and other activities to prevent job displacement and resistance to change are all examples of these.

6. Recommendations

Based on the analysis of the current practices of AI in business in Bangladesh, the following major recommendations can be made:

- To promote AI education, businesses might offer training programs, competitive salaries and perks, and collaborate with educational institutions.
- Businesses can set up data management systems, invest in data gathering and analysis technologies, and interact with third-party data suppliers.
- Companies can provide training and education programs, hold workshops and seminars, and encourage industry collaborations to share knowledge and skills.
- Companies can lobby for policies that encourage AI development, interact with lawmakers to create regulatory frameworks and join industry associations to influence policy decisions.
- Corporate companies can provide training and reskilling programs, inform employees about the benefits of AI deployment, and involve employees in the AI implementation process.
- Invest in AI training and education- In order to fully exploit the potential of AI in business, organizations in Bangladesh should engage in employee training and education programs. This will help to ensure that they have the requisite abilities to use and manage AI technology efficiently.
- Form alliances with AI professionals- Businesses in Bangladesh may explore building alliances with AI experts to have access to the newest technology and stay current on the latest trends and best practices in the industry.
- Prioritize data quality and security- As businesses in Bangladesh begin to rely more heavily on AI, it will be crucial to ensure that the data used to train and operate AI systems is of high quality and is properly secured.
- Experiment with AI in various fields- Companies in Bangladesh should experiment with AI in different fields and use cases to find the most effective ways to implement the technology.
- Government support- The government of Bangladesh should develop policies to support the adoption and implementation of AI technology in the country. This could include providing funding for AI research and development, as well as offering tax incentives for companies that invest in AI.
- Ethical concerns- As AI is adopted more widely, it will be important for companies to consider the ethical implications of the technology. This includes things like data privacy, transparency, and bias.

By following these recommendations, businesses in Bangladesh can take advantage of the opportunities offered by AI, while minimizing the risks and maximizing the benefits of the technology.

7. Conclusion

This study's findings emphasize both the potential advantages of AI for Bangladeshi companies as well as the difficulties they will encounter in putting this technology into practice. Notwithstanding the challenges, there are numerous instances of successful AI implementations in a variety of industries, including customer service, banking, agriculture, and healthcare. The government, businesses, and other stakeholders must collaborate to create regulatory frameworks and supportive infrastructure, raise public awareness of and understanding of AI technology, as well as to address concerns about job displacement and resistance to change through training and other initiatives. Several recommendations have been made based on an examination of current AI practices in business in Bangladesh, including prioritizing data quality and security, investing in AI training and education, creating relationships with AI

professionals, and experimenting with AI in diverse disciplines. Businesses in Bangladesh may take full advantage of the potential provided by AI and remain competitive in the global market by following these tips.

8. Limitation of the study

One major limitation of this study is the limited scope of data sources available on the use of AI in businesses in Bangladesh. Although efforts were made to gather information from multiple sources, including academic publications, industry reports, and news articles, the overall volume of available data was relatively small. This limits the generalizability of the findings and may not provide a comprehensive picture of the AI landscape in the country. Additionally, the study relied on secondary data sources, which may have limitations in terms of accuracy and reliability. The collection of primary data from a larger pool of respondents was not possible because of time and resource constraints, as well as a lack of a standardized sampling framework. Finally, the study only focused on the use of AI in businesses and did not explore its application in other sectors, such as government, healthcare, or education.

9. Future research direction

Based on the findings and limitations of this study, there are several potential directions for future research in the area of AI in business in Bangladesh. Some of these directions include:

- Investigating the potential of using AI in other industries in Bangladesh beyond the ones explored in this study.
- Conducting more in-depth studies to identify specific challenges and limitations of using AI in the business context in Bangladesh.
- Exploring the potential for AI to facilitate cross-border business transactions and partnerships in the region.
- Investigating the potential impact of AI on job creation and job displacement in various industries in Bangladesh.
- Exploring ethical considerations in the use of AI in business in Bangladesh and potential solutions to address these concerns.
- Investigating the potential of using AI to enhance the customer experience in various industries in Bangladesh.

Overall, there is a need for more comprehensive research to fully understand the potential and challenges of using AI in business in Bangladesh, and to identify the most effective ways to leverage this technology to improve business outcomes in the region.

10. The novelty of this study

The novelty of this research lies in its focus on the application of artificial intelligence (AI) in the context of businesses in Bangladesh. While there is a growing body of literature on AI and its potential for improving business operations, there is limited research on how AI is being used in Bangladesh specifically. This research provides a detailed understanding of the specific AI technologies being used, the challenges that were overcome, and the benefits that were achieved in the context of Bangladesh. The study also offers insights into potential areas of application for AI in this region. Overall, this research makes a significant contribution to the understanding of the use of AI in business in Bangladesh and offers valuable insights for future research and practical implementation of AI in this context.

CRediT authorship contribution statement

Md. Touhidul Islam (1st & Corresponding Author): Wrote the manuscript, Writing (review & editing), Formal analysis, Visualization. **Dr. Md. Mahadi Hasan (Co-author):** Contributed to language editing, Engaged in proof-reading, Formal analysis. **Dr. Md. Redwanuzzaman (Co-author):** Contributed to language and grammatical editing, Writing (review & editing). **Dr. Md. Kamal Hossain (Co-author):** Worked on data collection, Engaged in data analysis, Participated in the revision process.

Declaration of competing interest

No conflict of interest.

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