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Artificial Intelligence in Ready-Made Garments Industry of Bangladesh: Practices and Challenges

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Abstract

This research paper examines the utilization of artificial intelligence (AI) and its influence on enhancing business in the RMG industry in Bangladesh. This will be accomplished through a comprehensive study of existing literature and secondary data. The study aims to gain a comprehensive understanding of particular AI technologies, quantify the advantages of AI, and evaluate the obstacles encountered by the RMG industry in adopting AI. Artificial intelligence (AI) has significantly enhanced the efficiency, cost-effectiveness, productivity, customization capabilities, trend prediction accuracy, and sustainability of garment creation. Nevertheless, it gives rise to concerns over unemployment, ensuring consistent standards, safeguarding personal information, reliance on technology and ethical dilemmas. The RMG sector should enhance employee comprehension of AI, seek varied sources of funding and skilled personnel, collaborate with the government to obtain infrastructure assistance and enact legislation, tackle concerns regarding job displacement through training, and foster employee receptiveness to change in order to surmount these challenges. The garments sector in Bangladesh has the potential to enhance its operations and competitiveness by implementing these approaches. This study will provide valuable insights for corporate executives, decision-makers, and academics who are interested in optimizing the capabilities of artificial intelligence and improving business results in Bangladesh.

Keywords: Artificial intelligence (AI), Ready- made garments (RMG), Industry challenges, Bangladesh.

1. Introduction

Over the past decade, Artificial Intelligence (AI) has gained significant interest from researchers, academics, governments, company owners, and practitioners worldwide. The term AI was originally introduced by John McCarthy in 1955 (Deowan S. A., 2020).

The ready-made garments (RMG) industry in Bangladesh has emerged as a global leader, contributing significantly to the country's economic growth and generating a substantial number of employment opportunities (Mia & Akter, 2019). In recent decades, this industry has experienced significant growth and has consistently sought innovative methods to enhance its efficiency, competitiveness, and product quality. The utilization of Artificial Intelligence (AI) in the field of garment design is gaining significant interest as a potential transformative force (Bhalerao & Dev, 2024). This study examines the potential advantages and challenges that artificial intelligence (AI) presents to Bangladesh's Ready-Made Garments (RMG) industry.

Artificial intelligence (AI) technologies have rapidly advanced and hold the potential to revolutionize all

aspects of the RMG industry. Artificial intelligence (AI) has the potential to enhance production efficiency, reduce expenses, and enhance a company's competitiveness in the global market. This can be achieved through the automation of specific design tasks, improved pattern recognition capabilities, and the facilitation of more creativity among designers (UNDP, 2024).

Advocates of AI who have a positive outlook on the future of humanity argue that the adoption of AI technologies will not only solve difficult human problems (Saha & Sarker, 2019), but also enhance human abilities, resulting in increased productivity and the creation of more high-paying jobs with better quality (Lane & Saint-Martin, 2021).

Bangladesh initiated the implementation of an artificial intelligence (AI) strategy in March 2020 (Bangladesh, 2020); however, progress has been sluggish since then. Bangladesh has the potential to leverage its scientific and technical infrastructure in order to harness the advantages of artificial intelligence (AI). This can be achieved by developing dedicated AI research institutions and hiring highly skilled professionals. The system possesses the capability to initiate AI-driven research initiatives that address specific local challenges, including Bangla natural language processing, manufacturing automation, agricultural assistance, personalized education, and healthcare for disadvantaged areas (Ahmed, 2023). AI automation of repetitive tasks is a crucial approach for enhancing organizations in Bangladesh. In the industrial sector, artificial intelligence (AI)-enabled robots may perform tasks such as assembly, welding, and painting, leading to higher productivity and reduced costs. The World Bank report highlights the capacity for automation and robotics in Bangladesh's ready-made garment (RMG) business, which is burdened by expensive labor, low efficiency, and a substantial proportion of untrained workers (Bank W. , 2018).

2. Artificial Intelligence

Artificial Intelligence (AI) refers to the emulation of human cognitive abilities by technology, particularly computer systems. These processes encompass learning (the act of acquiring information and rules for its utilization), reasoning (employing rules to arrive at approximate or definite conclusions), and self-correction. Specific examples of AI applications include expert systems, speech recognition, and machine vision **(**Craig, Laskowski, & Tucci, 2023). Artificial Intelligence (AI) refers to an autonomous entity capable of executing activities that typically necessitate human intelligence. Some examples of these duties are the ability to process visual information, recognize speech, make decisions, and translate across different languages. Artificial intelligence has completely transformed the field of information technology. Artificial Intelligence is a specialized area within computer science that involves developing robots and software capable of emulating human behavior and responses. Artificial Intelligence is revolutionizing various aspects of human life, including work, economy, communication, combat, privacy, security, ethics, and healthcare. Nevertheless, the consequences of this phenomenon remain uncertain, and we have yet to witness its future trajectory - whether it will propel humanity towards creating a more habitable planet or one fraught with calamity (Newman, 2019).

3. Artificial Intelligence: Bangladesh Perspective

Bangladesh has 173 million people, making it one of the densest nations (Worldometer, 2024). Agriculture is the country's main industry, and new technology have given its regions new life. Automation and control are used in many industries. Bangladesh has recently become interested in AI, IoT, Big Data, and blockchain. AI technology has been evolving for a long time, but its effects are just now being felt in our

country. Bangladesh has selected education, agriculture, health, transportation, services, and the environment as AI-effective areas. The use of AI technologies in ride-sharing, Bangla NLP, Chat Bot, real-time navigation, and flight and hotel booking is widespread. These innovations have greatly enhanced our daily lives. As 34% of Bangladeshi youth are technology-driven, integrating AI into the approach bodes well for the country's future (Deowan D. S., 2020).

Various sources predict a substantial expansion in the artificial intelligence (AI) business in the next decade. Based on Statista statistics, the AI industry is expected to increase from $241.8 billion in 2023 to about $740 billion in 2030, with a compound annual growth rate of 17.3%. Next Move Strategy Consulting predicts that the value of the company will increase by a factor of nine, from around 208 billion U.S. dollars in 2023 to around 1.85 trillion U.S. dollars by 2030. Undoubtedly, the AI industry encompasses a wide range of industries, such as healthcare, education, finance, media, and marketing. The global rate of technology adoption and deployment is increasing significantly. Chatbots, AI systems that can engage in conversation with users, image-generating artificial intelligence, and mobile applications are all significant advancements that will contribute to the development of AI in the upcoming years (Thormundsson, 2024). AI is extensively utilized in service operations, strategy, and corporate finance, with over 20 percent of industries reporting its utilization in these areas. In 2023, the financial services industry made the most significant utilization of AI in product manufacturing, with more than 30 percent of respondents reporting its usage. The utilization of AI in manufacturing and marketing is limited due to the need for human intuition, which makes these areas less suitable for AI implementation (Statista, 2023).

3.1. AI in RMG of Bangladesh

The Ready-Made Garment (RMG) business in Bangladesh is widely acknowledged as the foremost and prevailing source of the country's export earnings. The Bangladeshi Ready-Made Garments (RMG) industry necessitates technological innovation and enhanced efficiency, both of which can be attained by adopting Artificial Intelligence (AI) techniques.

We are proud to have achieved the coveted status of being the second-largest manufacturer of clothing in the global market. The sector has been essential in the economic advancement of our nation, and we have gotten substantial support from it. Based on statistics provided by our partner, the international non-governmental organization Swiss contact, the ready-made garment (RMG) industry plays a substantial role in the economy of Bangladesh. The entity comprises a multitude of industrial facilities and offers job opportunities to more than 4 million employees, with females constituting over 60% of the labor force. Despite being geographically separated by nearly 5,000 miles from the UK, the workers in those industries maintain a direct link with UK consumers. Reports indicate that Marks & Spencer procures approximately £1 billion worth of apparel from Bangladesh on a yearly basis. According to Statista data from January 2023, H&M sources products from 139 suppliers in Bangladesh, which are situated at 235 factories (Wazed, 2023).

3.1.1. Present AI Practices in RMG Sector in Bangladesh

The ready-made garment business in Bangladesh has experienced a significant increase, driving the country's economy ahead. Nevertheless, the industry's swift expansion has been accompanied by difficulties pertaining to worker safety, operational efficiency, and management. An innovative solution has been developed to directly address these concerns: the Smart Worker Tracking and Monitoring System (SWTMS), which utilizes state-of-the-art Artificial Intelligence (AI) and advanced Computer Vision technologies (Hossain, 2023).

3.1.2 Smart Worker Tracking and Monitoring System Leveraging Advanced Computer Vision

In the ever-changing realm of industries, the ongoing tasks of guaranteeing worker safety and maximizing operational efficiency are persistent hurdles. The garment manufacturing industry in Bangladesh is also affected. The Smart Worker Tracking and Monitoring System (SWTMS) is an innovative solution that aims to transform workplace safety and productivity. It utilizes state-of-the-art Computer Vision technology to achieve this goal.

3.1.3 Unveiling the Smart Worker Tracking and Monitoring System (SWTMS)

The fundamental element of the SWTMS resides in its capacity to integrate state-of-the-art computer vision capabilities with practical workplace dynamics. Envision a system that not only monitors the movements of workers but also comprehends their activities, promoting a safer and more efficient work environment.

3.1.4 Real-time Monitoring with Precision

The core of the SWTMS consists of a complex network of strategically placed cameras across the factory floor. The cameras record live video feeds, which are then carefully analyzed by an advanced AI-powered Computer Vision system. This engine utilizes sophisticated algorithms for the purpose of object identification, tracking, and activity recognition.

3.1.5 Elevating Worker Safety

The SWTMS significantly enhances worker safety to an unparalleled level. The AI system detects potential safety violations by closely examining video streams. This entails identifying instances where a worker is using machinery without adequate protective equipment or participating in activities that have the potential to cause accidents. Swift notifications are activated in certain situations, allowing prompt corrective measures and avoiding possible accidents.

3.1.6 Amplifying Operational Efficiency

The SWTMS is remarkable not just for its safety features, but also for its ability to improve operating efficiency. The system's activity identification capabilities enable managers to acquire insights about the utilization of machines and resources. Consequently, this helps to enhance the efficiency of industrial processes, reduce periods of inactivity, and ultimately boost overall productivity.

3.1.7 Environmental Vigilance

In addition to worker activities, the SWTMS is sensitive to environmental influences. Integrated environmental sensors continuously monitor variables such as temperature and humidity. Instant alarms are sent for any departures from safe levels, enabling managers to swiftly rectify adverse situations and preserve a supportive working atmosphere.

3.1.8 Data-Driven Insights for Informed Decision-Making

Over time, the SWTMS gathers a substantial amount of data, which it then converts into practical and useful insights. These insights provide a more profound comprehension of worker behavior, rates of compliance, and areas of concern. This information enables management to make well-informed decisions, improve safety standards, and allocate resources more efficiently.

3.1.9 Challenges and the Road Ahead

Implementing a Smart Worker Tracking and Monitoring System poses many obstacles. Transparency is essential in addressing privacy issues, since it helps to reassure workers about the usage of their data. Scalability is an important issue to consider, as it ensures that the system can easily adapt to changes in the workforce and manufacturing layout. Furthermore, continuous improvement of AI models is crucial to uphold precise activity recognition.

3.1.10 Enhancing Worker Safety

The essence of the SWTMS is in its capacity to guarantee the real-time safety of workers. The AI technology identifies potentially dangerous actions by monitoring video streams, such as engaging in machinery operation without appropriate safety equipment or carrying large objects in an inappropriate manner. As soon as these activities are detected, instant notifications are activated, averting possible accidents and fostering a more secure work environment (Hussain,2023).

The issues confronting the Ready-Made Garments (RMG) sector are diverse, encompassing production floor performance, efficiency, and labor management. To address these difficulties, Intellier utilized IoT, AI, and Machine Learning to develop Nidle, an advanced solution that provides real-time monitoring of production floor productivity and quality management.

Intellier, the IT division of Team Group, has established itself as a leading entity in Bangladesh's information technology industry. Established in 2018, Intellier has quickly gained recognition by delivering innovative solutions that not only optimize business operations but also foster sustainability. The key to their success lies in their flagship product, Nidle, which is a domestically developed breakthrough that has gained national acclaim and is transforming the apparel business.

Nidle is an advanced 4.0 IR technology that effectively addresses the challenges faced by the contemporary RMG business, surpassing limitations and barriers. The tech solution developed by Nidle has not only been used in RMG markets but has also effectively addressed efficiency issues on manufacturing floors. The solution has received numerous accolades from ICT and Bangladesh Brand Forum over the years, making it a highly acclaimed and recognized achievement (Odyssey).

Nidle offers a range of benefits to garment factories, enabling them to:

- Streamline: Nidle simplifies the input process by automating request, hence minimizing the workload on staff.
- Maximize workforce efficiency: The system strategically assigns people to certain sectors, guaranteeing optimal use and decreasing labor expenses by up to 15%.
- Cost reduction: Nidle achieves a substantial decrease in overall costs by optimizing operations and improving efficiency, which has a beneficial impact on the company's financial performance.
- Prompt supply of materials: Nidle guarantees the availability of materials at the input line precisely when they are required, thereby resolving any gaps in the production line's input.
- Precise data: Nidle collects up-to-date information on production and quality, offering vital insights for making well-informed decisions.

An outstanding characteristic of Nidle is its capacity to deliver real-time data autonomously, without the need for human involvement. The sewing machines are equipped with IoT sensors that gather essential data on worker productivity and production line information. The data is thereafter delivered effortlessly to a centralized dashboard, allowing factory managers to immediately make well-informed decisions (Star, 2024).

3.2 Industrial Revolution 4.0 and impact on RMG sector of Bangladesh

3.3 Current Trends in the RMG Industry

Currently, Bangladesh ranks as the third largest global exporter of garments, following China and Vietnam. The number 48 is represented as (WTO, 2021).

Nevertheless, Vietnam has surpassed Bangladesh as the second-largest garment exporter in 2020, leaving Bangladesh behind in the battle. In 2020, the country maintained its position as a significant exporter of garments to Europe, with a market share of 12.5%. Furthermore, it experienced a growth rate of 7%

between 2011 and 2020. However, the trajectory of this growth is currently at risk due to Vietnam's participation in a new advantageous trade agreement with the European Union (EU) in 2020. Regarding United States exports, Vietnam has consistently surpassed Bangladesh for more than ten years as the favored place for U.S. CEOs to source from (Berg, Chhaparia, Hedrich, & Magnus, 2021). One major factor contributing to this deficiency is that the Vietnamese RMG business has been more successful in adopting 4IR technology compared to Bangladesh.

The fourth industrial revolution (4IR) fundamentally transforms the way individuals engage in work and lead their lives. The garment business is being transformed by the Fourth Industrial Revolution (4IR) with the implementation of automation, artificial intelligence, 3D printing and knitting, robotics and intelligent manufacturing, augmented reality, and other advanced technologies. Simultaneously, it is altering the sector by bringing novel consumer patterns. With the RMG sector facing growing competition due to the implementation of 4IR technology, it is crucial for Bangladesh to actively embrace and utilize these technical advancements in order to maintain a significant portion of the global garment exports.

3.3.1 Labor-Intensive Low Productivity switching to High Productivity

Historically, the global fashion clothing sourcing industry has primarily operated within a cost-saving paradigm (Uddin, 2021). The reason why ready-made garments became popular in Bangladesh is that the country was able to offer high-quality clothing at a low cost. Each year, around 37 public and private institutions in Bangladesh contribute to the labor force by producing graduates specialized in the field of textiles. Skilled labor plays a crucial role in ensuring the quality control of fabrics and design, thereby contributing to the maintenance of high-quality standards (Stitchdiary, 2018).

Bangladesh possesses one of the most meager minimum monthly rates for clothing manufacture. This, together with the presence of a significant labor force, has rendered the country an appealing center for sourcing apparel (Stitchdiary, 2018).

Bangladesh's ability to compete on a global scale is hindered by its low productivity in labor-intensive industries. Instead, companies must promptly implement enhanced technology into all aspects of their operations, leading to increased productivity (Bank ,2021).

3.3.2 "Accurate Fashion" substitutes "Fast Fashion."

As previously said, the fast fashion industry has grown as a result of employing workers who receive cheap wages. Due to the rapid changes in customer demands, the fast-fashion model is gradually transitioning into a more precise and responsive approach called 'exact fashion' (Hussain). Precision in fashion entails accurately aligning with the constantly changing trends of the fashion business. It involves meticulously adhering to consumer preferences and creating clothing that precisely aligns with these preferences and current fashion trends. Accurate fashion can be influenced by prominent worldwide sporting events, like as the Olympics, or significant fashion events, like the Met Gala. Flexibility is unquestionably necessary to align with precision, as the demand for apparel may be contingent upon the outcome of a football match. As a result of this trend, the average time it takes to manufacture a product has decreased from 120 to 90 days (Hussain).

This innovative fashion approach has introduced four distinct trends: near-shoring, automated production, computerized designs replacing human labor, reduced transportation time for items, and a refined and precise garment supply.

3.3.3 Reshoring and Near-Shoring

The need for rapid response and efficient market entry in the fashion industry has led to an emerging trend of reshoring or near-shoring. Reshoring is the act of bringing production back from offshore locations,

while near-shoring involves relocating production closer to the market to reduce transit time. Currently, the cost savings achieved by offshore are often outweighed by the ability to quickly offer apparel on-demand within a matter of days or weeks. This challenges the traditional supply chain of global garments industry.

Another emerging phenomenon is the growing recognition of the ecological consequences associated with the conventional linear global supply chain. McKinsey & Company predicts that by 2025, environmental sustainability will be a crucial feature in the decision-making process of purchasing clothes. In order to tackle the linear supply chain and growing demand for fast transit, companies must allocate resources towards automation, nearshoring, and sustainability (Andersson, Berg, Hedrich, & Magnu, 2018).

3.3.4 Green Industrialization

As to the World Bank, the worldwide fashion business is accountable for 10% of the annual global carbon emissions. The present growth rate indicates that this statistic will increase by over 50% within the next decade. The sector is also a major contributor to water usage and waste. This industry consumes a total of 93 billion cubic meters of water per year, which is sufficient to fulfill the consumption needs of 5 million individuals. Additionally, approximately 20% of the global annual wastewater is generated via the process of fabric cleaning and dyeing (Bank T. W.,2019). The proliferation of fast fashion has intensified the detrimental effects of the sector on the environment. Cloth manufactures are currently faced with the problem of finding a sustainable approach to growth and operations that does not harm the environment.

In light of these issues, the Bangladeshi RMG sector has taken strong measures to implement 'green manufacturing' methods, utilizing cutting-edge technology to address energy, water, and resource conservation. Technology has introduced other options, such as waterless dyeing, bio fibers, and the transformation of waste into new garments.

Bangladesh currently has the most environmentally friendly Ready-Made Garment (RMG) sector in the world, with more than 150 clothing factories surpassing the rigorous standards set by the US Green Building Council (USGBC) for Leadership in Energy and Environmental Design (LEED) certification (Hossain, 2023). Out of the top ten clothing manufacturers worldwide that have received LEED certification, six are situated in Bangladesh. Bangladesh is the global leader in green manufacturing, with the highest number of LEED-certified facilities compared to any other country.

Green factories have the ability to reduce energy usage by 40% and water consumption by more than 30%. In addition, they release a lower amount of carbon dioxide in comparison to conventional industries. In addition to implementing environmentally friendly techniques, ensuring workplace safety has also been prioritized during the creation of green factories (Hossain, 2023) . These endeavors have enhanced the value of Bangladesh's RMG products, resulting in a preference for the country among global buyers and investors in the RMG sector. A poll conducted by McKinsey has revealed that a significant majority of respondents, specifically 87.5%, have identified sustainability and transparency as their primary concerns when it comes to purchasing garments.

3.3.5 Concentrated Production & Export Destinations

Vietnam has surpassed Bangladesh due to its RMG sector having a more extensive range of products compared to Bangladesh. The primary components of Bangladesh's apparel export, accounting for around 73% of the total, are the following top 5 goods: trousers, men's shirts, y-shorts, women's shirts, and sweaters. These products are predominantly made from cotton (Rakib,2021). Out of all the products, the cotton t-shirt stands out as the country's most famous export, making up 20% of the total exports of ready-made garments to Europe in 2019. Europe bought the majority, specifically 59%, of its cotton t-shirts from

Bangladesh. Bangladesh's reliance on cotton hampers its progress in the garment industry due to shifting global market trends. In recent years, the global market share of cotton fiber apparel decreased from 75% to 25%. As a result, there has been a decline in the demand for cotton in the sector (Rakib,2021).

Bangladesh exhibits a significant reliance on the European market, which accounts for 62% of its total exports, and the United States market, which accounts for 18% of its total exports. As mentioned in the introduction of the article, Vietnam has established a preferential trade agreement with the European Union. Furthermore, Vietnam surpasses Bangladesh in terms of exports to the United States. In 2020, Vietnam's exports of RMG products were 2.5 times more than those of Bangladesh. In order to remain competitive, Bangladesh must expand the range of products it exports. Engaging in bilateral and multilateral agreements with countries that import goods can also be beneficial in addressing this matter.

3.3.6 Lack of Financing

Large apparel manufacturers are the pioneering users of automation in the RMG industry of the country. These factories employ a substantial number of workers, possess their own manufacturing facilities and properties, and receive consistent export orders. The implementation of new technology has significantly enhanced operational efficiency in factories, enabling them to satisfy customer requests more expeditiously and expand the range of products they offer.

Conversely, small and medium-sized factories are lagging behind due to their inability to bear the costs of costly automation. These factories rely on subcontracting. Due to their limited negotiating leverage, they frequently accept export orders at reduced pricing. According to a survey performed by the Financial Express, over 50% of small and medium-sized enterprises (SMEs) identified insufficient capital as the primary obstacle to adopting new technologies. Due to their inability to adapt to automation, numerous small and medium-sized factories are currently facing significant challenges in operating at a minimum level of profitability (Behtarin, Rashid, & Basher, 2020). Therefore, it is necessary to have a stronger financial sector and government assistance in order to promote automation in small to medium-sized garment companies.

3.3.7 Decrease In Female Employees

The proportion of female workers in the business has gradually declined. The proportion of women employed in the clothing sector decreased from 64.7% in 2015 to 59% in 2020, with an annual reduction of -0.7% (Haque & Bari, 2021). This is due to the fact that female employees are predominantly found in low-wage positions within the 'producing' industry. The production industry employs 97.1% of women and 80.8% of men. In addition, the majority of the managerial roles within the production department were occupied by male individuals. The production department has seven wage categories, with grade 1 being the most highly compensated and grade 7 being the least highly compensated. According to a survey conducted by the International Labor Organization, there is a higher representation of men in positions at the grade 1 and 2 levels, whereas women outnumber men in the lower-level positions (grades 3 to 7) (ILO, 2020). Automation resulted in the displacement of workers, particularly women in lower-level professions, who experienced job loss. There is a bias towards men in the selection of skilled work roles, as indicated by research (Rahman, 2021).

3.3.8 The shift from People-Centric to Process-Centric

A significant number of manufacturers in the industry depend heavily on a small group of persons, especially those in high-level managing roles. The dependence is so significant that only a few prosperous factories ultimately shut down following the resignation of a General Manager or Executive Director. The excessive reliance of individuals must be redirected towards procedures instead. Apparel factories can

enhance overall efficiency and reduce reliance on personnel by implementing new technologies and adopting efficiency-enhancing practices simultaneously (Rakib,2021).

3.3.9 Becoming Super Vendors

Super vendors offer quick turnaround times, expedited order processing, a wide range of designs, and trendy fashion clothing. In order to keep up with the fast-paced and precise fashion industries, it is necessary to decrease the lead time in order to accommodate a greater number of style modifications. Additionally, digital transformation aids in cost reduction when bidding for additional orders. Vendors can provide many technologies, like Assist AI, artificial solutions, creative virtual, etc. (Noor, 2020). In order to maintain the majority of the market, Bangladesh must adopt digital transformation and position itself as a leading supplier.

Although there are challenges to overcome, the future of Bangladesh's RMG sector is not excessively gloomy, as it is witnessing the emergence of new chances. US-based fashion companies are diversifying their sourcing strategies by moving away from China in response to the trade tensions between the US and China. Bangladesh has emerged as a highly favorable alternative for these companies. Several Chinese RMG factories have already relocated and commenced operations in Dhaka. Moreover, the adoption of compliance, transparency, factory and occupational safety, and green industrialization enhances the appeal of RMG products. By providing comprehensive training to the workforce, offering financial support to small and medium enterprises (SMEs), and adopting advanced technologies across the industry, the ready-made garments (RMG) sector has the potential to regain its position as a key driver of the Bangladeshi economy.

4. Challenges

The difficulties or obstacles that need to be overcome. In order to utilize artificial intelligence technology, the government of Bangladesh must undergo extensive preparation. Adopting the technology without adequate planning will provide numerous obstacles. This challenge of adopting AI is not exclusive to Bangladesh; it is a global issue that every government must address. The Bangladesh government must make preparations, including the implementation of infrastructural Artificial Intelligence, development and technology upgrading, and addressing other relevant concerns, in order to effectively control AI.

4.1 Accompanying the Transformation

Artificial Intelligence (AI) encompasses not just technology advancements but also represents a significant social innovation. Hence, the influence of artificial intelligence can bring about several advantages as well as diverse intricacies that have the potential to fundamentally reshape society, especially the public sector. The widespread implementation of artificial intelligence (AI) can frequently impede the relationship between users and companies. In order to overcome obstacles, it is necessary to implement societal and cultural changes that foster a harmonious and enduring interaction between digital technology, its users, and administrative entities.

4.2 Data Eco-System

Data is referred to as the unprocessed substance of artificial intelligence technology. In order to facilitate the development of interactive and intelligent systems, it is vital to establish a comprehensive and interconnected database that provides high-quality raw data for artificial intelligence technology, along with the necessary tools and methods. A significant obstacle in data marketing in Bangladesh is the limited availability of data. Not all administrative data pertaining to government ministries and departments is accessible or compiled on the internet. Therefore, it is imperative to possess readily accessible data for the

purposes of study, business, and decision-making. Data.gov.bd serves as an open data platform for the collection, generation, and administration of essential data.

4.3 Technology and Infrastructure:

Bangladesh faces a deficiency in both technological and infrastructural advancements necessary for the use of AI technology. There is a significant deficiency in the development of infrastructure in the areas of data handling, storage, computation, scaling, extensibility, and data security. Therefore, the absence of adequate infrastructure development continues to pose a significant obstacle to the successful deployment of this technology. As a result, advanced technologies such as big data, machine learning, deep learning, and decision making are not readily accessible in Bangladesh. In order to address these difficulties, it is necessary to develop a cloud-based platform specifically designed for artificial intelligence technology. Furthermore, it is imperative to install advanced counting equipment and establish a competent training program to ensure their optimal functionality.

4.4 Skilled AI Resources

There is a shortage of skilled workforce in Bangladesh to effectively utilize artificial intelligence technology. Nevertheless, the Bangladesh government has already implemented comprehensive measures to develop a highly trained workforce. Bangladesh has initiated numerous IT training initiatives aimed at equipping public sector professionals with the necessary skills to utilize this technology. In this scenario, an initial training period of either three or six months can be organized for individuals who will be tasked with implementing technological solutions on behalf of various governments. By implementing this approach, the whole workforce of the nation can be systematically trained in stages.

4.5 Connectivity:

AI technologies and the Internet of Things (IoT) necessitate networks with high data transfer rates. Therefore, Bangladesh still faces the issue of implementing a 5G network. Establishing wireless communication among LoRa, Sigfox, or other forms of Narrowband IoT network is a difficulty due to the low power consumption of IoT devices. Bangladesh is anticipated to deploy a 5G network by the year 2023.

4.6 Economic Impacts:

The relationship between inequality and technological unemployment Despite widespread concerns about technology leading to significant job losses, the World Economic Forum asserts that artificial intelligence (AI) and robotics have the potential to generate more employment opportunities than they displace. If individuals are terminated from their jobs, it becomes the responsibility of the government to provide other sectors for their employment. If new work opportunities arise, it is essential to develop a corresponding pool of skilled individuals. The presence of a significant number of low-skilled workers plays a crucial role in driving economic growth across multiple manufacturing industries. If individuals become unemployed as a result of automation, it is imperative for the government to establish alternative provisions for their sustenance. Free or subsidized large-scale population training should be made available.

4.7 Accountability, Transparency, and Privacy:

When it comes to artificial intelligence technology, it is essential for the individuals engaged to possess the requisite skills to ensure transparency in all aspects of the technology. Neglecting to do so may result in a deterioration of the industry. There is no definitive method to determine the party accountable for any unforeseen catastrophe. Due to the lack of a definitive explanation, the reasons for the functioning of an Artificial Intelligence and its applications remain uncertain. The 117 algorithm utilizes a Digital Image

Processing (DIP) system in a specific decision-making procedure. The EU General Data Protection Regulation (GDPR) could potentially address this dilemma, however it is crucial that every procedure is accompanied by a clear rationale.

4.8 Human Dignity, Autonomy, and Psychological Impact:

There is concern that as machines increasingly take over many parts of human daily life, there is a risk that human roles may gradually become less significant. It remains uncertain how the increasing indifference towards natural languages will impact human connections and the work ecology. 9.9 Artificial Intelligence Safety Inadequate design of AI systems can compromise the safeguarding of artificial intelligence, potentially resulting in accidents or the misuse of AI for harmful or inappropriate purposes. AI frameworks must avoid encountering issues related to accidents.

5. Recommendations

After analyzing the present practices of AI in business in Bangladesh, the following significant recommendations can be proposed:

- In order to further the teaching of artificial intelligence, firms can provide training programs, attractive salaries and benefits, and establish partnerships with educational institutions.
- Enterprises have the ability to establish data management systems, allocate resources towards data collection and analysis technologies, and engage with external data providers.
- Companies can offer training and educational initiatives, organize workshops and seminars, and foster industry partnerships to facilitate the exchange of knowledge and expertise.
- Companies have the ability to engage in lobbying efforts to promote the development of artificial intelligence, collaborate with lawmakers to establish regulatory frameworks, and participate in industry groups to exert influence over policy decisions.
- Corporate entities have the ability to offer training and reskilling initiatives, educate employees about the advantages of AI implementation, and engage staff in the process of integrating AI technology.
- Organizations in Bangladesh should prioritize investing in AI training and education to fully harness the promise of AI in business. This will help to ensure that they possess the necessary skills to effectively utilize and oversee AI technology.
- Establish partnerships with AI professionals - Businesses in Bangladesh can consider forming partnerships with AI experts to gain access to cutting-edge technology and stay up-to-date with the latest industry trends and best practices.
- Emphasize the importance of data quality and security- As businesses in Bangladesh increasingly depend on AI, it is essential to prioritize the usage of reliable and well-protected data for training and operating AI systems.
- Explore the application of AI in many domains - Companies in Bangladesh should explore the application of AI in numerous disciplines and use cases to identify the most efficient methods for using the technology.
- Government support- The Bangladeshi government should formulate policies to facilitate the adoption and application of AI technology in the country. This may involve allocating funds for AI research and development, as well as granting tax benefits to corporations who make investments in AI.
- Ethical considerations - As the adoption of AI becomes more widespread, it will be crucial for companies to carefully evaluate the ethical ramifications of this technology. These encompass aspects such as the protection of data, the clear disclosure of information, and the avoidance of prejudice. By

adhering to these guidelines, organizations in Bangladesh may capitalize on the potential presented by AI, while mitigating the dangers and optimizing the advantages of the technology.

6. Limitations of the study

There is a shortage of literature on the topic, which limits the scope of the current study. Open and focus group discussions can improve the survey's structure.

Future directions of the study:

More research should be conducted to understand the prospect and practices of artificial intelligence. Analysis of the current AI application available in practice and future demands will be useful for both practitioners and administrators. Analysis of the current AI in the field of education and explore the future research challenges.

7. Conclusion

In the context of Artificial Intelligence, it is very difficult now to predict the future of humanity. We can accept AI as a new technology, but it should bring positive impacts for the welfare of the society and humanity. An outstanding technology can exhibit positive impacts on society along with its severely negative impacts too. While applying this new technology, we have to be ready to face consequences of the negative effects too. Regarding this, we certainly need a legal policy framework to mitigate the challenges associated with AI and compensate the affected parties in case of a fatal error so that the serious threat to humanity could be minimized.

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