REFLECTION

BRAC University Research For Development Club

REFLECTION

Publisher
Tangon
30, Concord Emporium Shopping Complex, Katabon, Dhaka-1205
+8801738077239 Email: ajoykr1986@gmail.com

Online Distributor
www.rokomari.com

Copyright
@BRAC University Research For Development Club (BURED)

First Edition
3rd July 2024

Cover design
BURED Team

Printed by
Moitry Communication Ltd
Katabon, Dhaka, Phone: +8801720243284
E-mail: moitrybd@gmail.com

Composer
BURED Team

Price
BDT 300 , USD 05

ISBN
978-984-99069-9-5
Reflection (A BURED Book)

REFLECTION

Advisory Board & Editing Panel

Professor Dr. Sang Lee
Professor
College of Business and Management
Vin University, Hanoi, Vietnam
& Former Dean, Brac Business School
BRAC University, Dhaka, Bangladesh

Dr. Tarnima Warda Andalib
Assistant Professor
Brac Business School, Brac University, Dhaka, Bangladesh.

Professor Dr. Charalabos (Haris) Doumanidis
Professor
Former Vice President, Research, Brac University, Dhaka, Bangladesh.

Md Saif Kabir
Lecturer
Office of Academic Advising (OAA)
Adjunct Lecturer, Department of Electrical and Electronic Engineering,
Brac University, Dhaka, Bangladesh.

REFLECTION

Desk Editing & Designing Panel

Abtahi Noor
Desk Editor
President, BURED
BRAC University

Md Ahshanul Mahbub Labby
Concept & Design Planner
Founding President, BURED
BRAC University

Monjur Ahmed
Template Designer
Founding General Secretary, BURED
BRAC University

Tasnim Kabir
Manuscript Building
Director of Research, BURED
BRAC University

Jubaida Niyasa Chowdhury
Manuscript Editing
Assistant Director of Research, BURED
BRAC University

Compilation Executives

Meer Zeshanul Wazid
Muhtasim Sanaan Novo
Rejwana Habib Ome
Mugdha Saha
Durba Saha
Atifa Hossain Prottasha

Anisha Meridha
Namira Armin
Fahim Islam Farhan
Golam Tawhid
Chowdhury Suprove
Mubassir Rahman

BRAC University Research For Development Club (BURED)

PREFACE

First and foremost, we are grateful to the Almighty for receiving this opportunity to publish this volume of the book. This book has brought the perception of various minds regarding today's world. In today's world of technology, people have easier access to electronic devices, media and reading materials which they can use for various purposes. Nevertheless, the upgradation of these technologies in this society is creating a whole new era. Majority of the papers here are from the young minds who are in the learning processes and feel committed to society for a beautiful change in the upcoming future. Moreover, as we embark on the journey through the pages of this book, we are delighted to present a diverse collection of research theme papers authored by the bright minds who are the reflections of this society. It summarizes the result of rigorous inquiry, critical thinking, and scholarly dedication that have been cultivated by these authors across various disciplines. The prosperity of this collection lies not only in the diversity of topics but also in the depth of investigation and the innovative approaches adopted by the contributors. The research theme papers capture a range of perspectives, methodologies, and findings, reflecting the multifaceted nature of academic inquiry within our academic community.

May this compilation serve as both a reflection of the academic vibrancy within our institution and an inspiration for future generations of scholars who will undoubtedly continue to push the boundaries of knowledge, shape the contours of our intellectual landscape and prove to be very useful to the students in particular.

Dr. Tarnima Warda Andalib
Md Ahshanul Mahbub Labby
Abtahi Noor

BRAC University Research For Development Club (BURED)

Editors' Note

All papers offer compelling examinations on timely and relevant issues with sound research methodologies and insightful analyses. Most papers present innovative views and balanced perspectives on the potential impacts of integrating advanced technologies into human life. Forward-looking and transformative changes are envisaged in the use of AI, robotics, nanotechnology, blockchain, artificial organs, and virtual reality. Bain and Company argued that "Speed of adoption is essential to realizing the value" and moving quickly with right organizational choices is critical to fully benefit from these advanced technologies. Therefore, presenting more empirical evidence and pilot project results across different firms and industries would strengthen the practicality of these researches. In addition, exploring the ethical considerations, regulatory challenges, and potential barriers to adoption and implementation will provide more comprehensive discussions.

Professor Dr. Sang Lee
Dr. Tarnima Warda Andalib
Professor Dr. Charalabos (Haris) Doumanidis
Md Saif Kabir

RESEARCH THEME PAPERS
CONTENTS

Proxemics – Interaction of Personal Space and Workplace; Influence of Personal Space on Womens' choice of Workplace

Syed Shahnawaz Mohsin[1]

[1]Political and International Affairs Analyst,Project Design Coordinator, Adjunct Faculty, Independent University of Bangladesh and South Asian Institute for Policy and Governance, North South University, European University of Bangladesh, Canadian University of Bangladesh

,

Introduction

In the modern social, economic, political, legal and technological spheres women participation in the labor market is a consistent discourse, and is tangent to many other overarching discourses i.e. feminism, gender equality and more. Significant progress is achieved in Bangladesh related to women's contribution in the governmental and economic spheres. Although the key gender-related issues remain prevalent, the country has gone through a structural change in the last 30 years. A strong effort on the part of the non-government organizations, and government's staunch support has manifested into accelerated improvement in women rights, and economic participation. In Bangladesh and across the world, the issue of disparity against women in leadership and decision- making positions continues to be the mainstream. There is little work done in Bangladesh on the issue of why certain sectors of the formal economy in Bangladesh are still lagging behind in women participation, although women's economic participation in the formal sector has increased notably. But, this increase remains clustered in a few sectors in the formal economy. This assessment tries to look at personal space and physical space factors, and their perceived implications on women's decisions for not choosing particular sectors as their choice of economic engagement. While there is significant progress made in women's economic empowerment, the structural and social barriers remain, and these barriers are not only figurative and culturally

defined; they are also physically defined through the women's perception of how much of her physical and personal space would be compromised while in the workplace of a particular sector. A lot of individuals view their offices as second homes. It's easy to become comfortable when one shares a workspace with coworkers where they spend 40 hours a week or more. Sadly, such comfort can also result in less defined boundaries, particularly with regard to personal workspace.While everyone has their own limits when it comes to personal space, maintaining an environment that is secure, cozy, and prolific for all involves respecting personal space, even for those who feel like one big happy family with their coworkers. In light of this, one should think about how to respect others' personal space when it comes to physical contact, privacy, workspaces, and surroundings (Annual Report of Bangladesh Bank 2013-14, 2014).

As per Annual Report of Bangladesh Bank 2014-15 (2015), when one returns to the office, the study of proxemics aids in adjusting to the drastic changes in personal space. Proxemics is the study of interpersonal space. Its nonverbal nature is one of its key characteristics. Instead of approaching strangers and asking if they can pass them, people usually read their body language to choose how to go through their space as needed.The 1960s observed the development of classical proxemics theory by anthropologist Edward T. Hall. He categorized the four levels of proximity or interpersonal distance that we sense as follows: Public distance: Between 12 and 25 feet, there is little connection between two individuals since it is harder to keep direct eye contact and one has to talk loudly to be heard.

Social distance:Between 4 and 12 feet, people are still too far away to touch or sense body heat, thus making a connection depends on visual and audible signals. Personal distance: Between 1.5 and 4 feet, interactions among friends are conducted. It is observed that clear vision, good eye contact, and easy communication are present here. Intimate distance: Between 0 to 1.5 feet, more stronger than any visual or auditory cues is the aura of an individual. The connection is furthered by body heat and the sense of smell. Since close proximity is required to establish relationships and have successful communication, proxemics research is crucial. A lot of people contend that intimacy is crucial for mental well-being. People have the ability to regulate how close they are to other people and how much exposure to them they feel comfortable with. People might approach their friends and touch them

when conversing, but after a lecture, they might step back and keep eye contact with the lecturer. People may react badly and view a stranger standing too close as an invasion of their personal space. Five feet is all it takes for an engagement between two individuals to go from public to intimate, and that possibility alone can cause a major deal of worry according to B.D Demography and Health Wing Bangladesh Bureau of Statistics Statistics and Informatics Division Ministry of Planning (2022). As female participation in the workplace in Bangladesh is rising, there seems a dire need to understand the impact and influence of proxemics in women choosing particular industries over others as choice of employment. The physical and personal workplace are very much different from each other and are essential for improving the productivity of an organization or a professional person.

- ➢ **Professional Workplace**
    - ■ **Encourages team building –** The new physical workplace provides the time and space for training and in-person development of staff and teams.
    - ■ **Contributes significantly to creating and defining corporate culture –**This is an opportunity to reset and establish a worker-friendly environment that enables teams to feel secure as they return to a post-COVID work setting, a combination of style and sophistication.
    - ■ **Facilitates social interaction and bonds between employees -** This is particularly important to employers whose staff have had more than 18 months of remote or reduced relationships with other employees.
    - ■ **Allows for more spontaneous idea-sharing and problem-solving –** Teams and Zoom are great for flexibility, but the fundamental ideas have always come from think tanks and networking sessions where teams can collaborate, share and innovate.
    - ■ **Champion the tackling of mental health and well-being –**The mental well-being of staff is a real and relevant concern for employers as they navigate towards a post-COVID work environment. Attracting staff back into the office with the availability of a sophisticated, post-covid compliant physical space is an attractive incentive for teams heading into 2022.
    - ➢ **Personal workplace**
      Tasks are individual. Engagement happens when people

have an emotional bond with their occupations, the firm they work for, and the objectives the company has set for both itself and its staff. As a result, it's critical to measure employee engagement and understand why it matters because it can lead to the sharing of ideas that enhance business outcomes and work processes, give staff members the confidence to solve problems creatively, and infuse workers with enthusiasm and positivity, all of which increase productivity. Work is incredibly personal, despite the common misconception that it is just business. Efficiency, profitability, innovation, and general happiness are all strongly impacted by an individual's feelings about their job and the organization they work for. People feel more engaged, motivated, devoted, and dedicated when their feelings toward their jobs and employers go beyond satisfaction. Work is private. When there is an emotional bond between an individual and their work, the firm they work for, and the objectives the organization has set for itself and its staff, engagement happens.Since employee engagement can lead to the sharing of ideas that enhance work processes and business outcomes, empower staff members to feel empowered to come up with creative solutions, and infuse employees with positive energy that subsequently increases productivity, it is vital to measure it and understand why it is essential.

In modern times, a woman's personal and professional identities merging and overlapping still seem transgressive. It has long been expected of women to wear each of these hats separately.
However, talking about how challenges in their personal life influence their employment and vice versa is becoming increasingly common. Removing barriers for working women will require making room for them to be their entire, true selves both at work and at home. The aim of this research proposal is to outline the discussion that will be developed within the assessment, focusing on Bangladeshi women's perception of their own physical and personal space, and their concerns about it being breached in a workplace in a particular sector.

Literature

In Bangladesh, only 13% of the workforce works in the formal sector as per the theory of Bhuyian and Hossen(2020). According to a survey from the Aspire to Innovate (a2i) Program, women are as important to the growth of the nation as their male counterparts, but their labor is not given as much credit because 92% of them work in the informal sector to this day (Bryan, 2020). However, more and more women have been joining the formal sector in Bangladesh recently.In this report, the focus will be on women's contribution in some of the most important formal sectors of Bangladesh, including the Government, Army, Police, Banks, and NGOs.

➢ Government

Women's participation in the government sector plays a significant role as it not only reduces gender inequality but also utilizes their skills in decision making and management. Bangladesh's patriarchal society and social barriers are some of the key reasons behind fewer women in the government sector. In contrast, statistics show that there are more educated women than men at the secondary level so a basic assumption could be made that there should be more women in government jobs since it requires a certain level of education (Brown, 2001). A recent government publication in 2022 has shown the employment percentage of women in various government positions in 2020 and this remained the same going to 2021. The lowest of involvement belonged to divisional and deputy commissioner offices with 12.2% and 12.9% in autonomous bodies and corporations. A slight increase of 19% was found in the ministry division with the highest being 31.5% in the department of directorates (BJensen, 2022). Although men take up 70-87% of these positions, it shows promise and more importantly trust in women's capabilities as an authoritative figure.

Furthermore, in the national parliament of Bangladesh, women occupied 73 out of 350   seats contributing to 20.86% in 2021 which remains stagnant as no sign of significant rise was seen in the past several years (Khan & Rahman, 2016b). There are just five women out of the 54 members of the present cabinet, including the prime minister (Hamlin, 2018).

➢ Army
The Bangladesh Army currently has a major number of female officers serving in a range of professions, like the Special Security Force, Army Aviation, Army Educational Facilities, CMH Doctors, Military Police Units, and other Army branches, except the East Bengal Regiment, Bangladesh Infantry Regiment, and the armored corps (Khan & Rahman, 2016b). According to the data by Mouri (n.d.), the Bangladesh Army has a larger percentage of male personnel than any other public service in the nation (Khan & Rahman, 2016b). Consequently, the Bangladesh Army has the lowest percentage of female recruits. Since it is believed that activities connected to national security institutions are exclusively for men, not only do traditional societal, cultural, and religious norms in Bangladesh reject female involvement in these organizations, but also the institutions themselves(Khan & Rahman, 2016b). Furthermore, Khan and Rahman, (2016) also mentioned that for female officers, the training climate in DSCSC and other military academies is unfavorable, whereas, in reality, 60.64% of male and 78.57% of female officers in the Bangladeshi armed forces agree with this. Moreover, it's evident that there aren't many female officers at the top of the military, which means that fewer of them participate in governance and decision-making (Khan & Rahman, 2016b) . According to the study conducted by Karim & Beardsley in 2017, governments are frequently hesitant to commit a significant number of women to these operations due to the social norm of protecting women and the fear of political repercussions from deploying women on risky peacekeeping missions (Hoque, 2019) . However, on January 24, 2019, the Bangladesh Army elevated four female majors to the rank of lieutenant colonel. It is a breakthrough for the future of Bangladeshi women in the military (Khan & Rahman, 2016b).

➢ Police
The Bangladesh Police Force has been experiencing a gradual rise in female participants since 1974, when women started to first enter the field. But in 2018, only 6.66% of the 198,653 recruited police personnel were women (Bhuiyan and Hossen, 2020) (Hoque, 2019). Several focus groups and surveys with female police officers of all ranks, conducted by the

Commonwealth Human Rights Initiative (CHRI), give us interesting insights on the experiences of Bangladeshi Policewomen. CHRI (2015) informs that almost all the women feel respected, supported and enjoy their work and they also believe more women are needed in the force. According to Karim & Beardsley (2017), these women, contrary to popular beliefs, prefer operational duty just as much as desk jobs. But they do face some difficulties as most of them believe that the facilities and policies in place don't make it easy for women. Majority of policewomen claim that there are no separate washrooms for women in the stations while many, mostly inspectors, claim that they are not given serious or sensitive cases as much as their male colleagues. Above 10% of constables have claimed to have been sexually harassed. According to Rahman (2011), some demands suggested by female police personnel during surveys include: more female recruitments, providing opportunities for them to live together with their police husbands, a day care center for those with young children, maternity leave being increased from 4 months to 6 months, and having separate women's toilet facilities etc as per Karim, (2011).

➢ Banking
SeparateToday women are proudly employed by the nation's banking sector. Women working in the field contribute to its expansion. Beyond the banking industry, elite, privately-run corporate entities favor hiring women over males. However, the government still rigidly enforces the female applicant quota. According to Hoque (2019), Women presently make up 63% of the workforce in private banks, 27% in state-owned banks, 6% in state-owned specialized banks, and 6% in foreign banks, as per the Bangladesh Bank (BB) July-December 2018 report. Approximately 15,767 women are employed by commercial banks, 6,843 by state-owned businesses, 907 overseas, and 1,474 by businesses with specific lending missions (Khatun, 2018). According to the BB survey (2021), the proportion of female employees in the banking industry who are 50 years or older is 8.70%, while the proportion of female employees under 30 is 20.71%. According to Murtuza (2019), the proportion of female employees in banks dropped to 18.32 percent in 2020 from

18.99 percent in 2019. According to Noor (2021), January-June 2020 Bangladesh Bank report states that in the banking industry, 28,078 women work, which represents 18.67% of all employees. The foreign commercial banks have 978 female employees making up 33.16 percent of the total workforce. Women make up 18.89% of the workforce in the 41 private commercial banks, which employ 17,603 women. 7670 women work for the six state-run banks, bringing the proportion of female employees to 18.02% (Noor, 2021). The specialized banks employed 1827 women in 2013-2014.

15% of the overall refinance fund from Bangladesh Bank for the (CMSME) sector has been designated for women, with a rate of interest of 5% over the bank rate (which is at present 10 percent). At least three prospective female entrepreneurs who have not yet requested for a loan from a bank branch must be selected, per a directive from the Bangladesh Bank to all banks and NBFIs (Rahman, 2011). According to BB, the bank should annually bring at least one-woman entrepreneurs under its financial services. However, the report of the central bank finds that child daycare centers, policy formulation for sexual harassment prevention/awareness, travel facilities, and gender equality training season are also contributing factors to women's increased participation in this sector, with a change in the workplace for women in specialized commercial banks greater than in state-owned, foreign, and private banks. In addition, bank loans to women business owners have grown; at the end of June 2015, the cottage, micro, small, and medium enterprise (CMSME) sector had a total credit of Tk 1,0445 crore, or 4.45% of the overall loan amount, compared to Tk 8,801 crore, or 4.08%, in June of the previous year,2014 (ROUGH ROADS TO EQUALITY - Women Police in Bangladesh, n.d.). In conclusion, it is evident that the number of women working in the banking industry in Bangladesh is rising steadily.

➤ NGO
In Bangladesh, where women make up the vast bulk of the organizations' workforce, there is one of the largest NGO sectors globally. The NGOs offer microcredit to the rural

women to advance their business and lifestyle. These microfinance NGOs are assisting Bangladeshi rural women become prosperous mini-entrepreneurs. Bangladesh Rural Advancement Committee (BRAC), Proshika Human Development Center, and Association for Social Advancement (ASA) are the three main non-governmental organizations in Bangladesh; all the three NGOs have shown a loan recovery rate of 98% (report of the author's field research, 2007) (Uddin, 2018). In the past 20 years, the microcredit schemes have proved very popular in Bangladesh and played a significant role in reducing poverty. Governments alongside NGOs have stepped up to use microcredit programs to get women involved in the workforce. In these NGO sectors, women are typically the target audience for employment. According to a 2011 report, Compared to their younger counterparts, women over the age of 25 are more likely to be involved in NGO activities (Women in Politics: 2021, 2021).

The underlying assumption of the thesis question is that women of this nation consider personal space as a major criterion when it comes to choosing a job. Bangladesh in the cultural context is principally a conservative nation and the women residing here maintain severe boundaries. Furthermore, the cultural practices and religious views have predominantly blended and fused a norm in a woman's lifestyle where they prefer to keep a definite distance between herself and a fellow male coworker in the workplace. For a Bangladeshi woman, personal spaces are not only an extremely sensitive case or a regular right of any human being, it is treated much more than one could ever imagine.

As they prioritize this psychologically generated region so much that they tend to work in jobs where they feel comfortable and safe. Statistics show that women choose occupations like registered nurses or academic teachers, preferably elementary and middle school teachers, because they are less likely to be breached in their unwanted radius of zone. Occupations similar to these also offer a desired level of privacy and less exposure to people, especially men, whom most women do not want to interact closely with based on the country's notorious reputation relating to women encountering to sexual violence and harassment. According to most surveys, an estimation of more than three-fourth of women face such

inappropriate deeds which has instilled fear, uneasiness and vulnerability amongst them. As a result, women, most certainly, prefer to work in selective jobs to avoid invasion of personal privacy, work remotely or where the number of men are smaller comparatively so that they could continue to do their respective jobs comfortably, easily and have adequate sense of security in that environment.

Despite lacking formal gender equality laws, a large number of organizations, particularly the corporate sector in Bangladesh, practice gender equality in hiring, training, salary, promotion, and other areas. However, in the effort to enforce gender equality, women's personal space is being invaded in the workplace, which has an impact on the employment sectors they select. Personal privacy is one of the most important for a human being regardless of gender, and statistics say in most developing countries women find their personal space violated by men in job sectors and Bangladesh is one of them. The women in Bangladesh are very much concerned about their privacy because it is usually not safe for them as the reputation suggests. One explanation for this would be that males who violate women's privacy might not receive the proper justice they deserve, allowing them to carry on. A report was done by the Daily Ittefaq which suggested that the violation of women in workplaces had been going on for a long time in Bangladesh. The obvious step for women is to get into sectors where it does not require them to work closely with coworkers. This invasion of personal space also might result in sexual harassment. So, women feel comfortable pursuing jobs like teachers or nurses, etc. There are also women who are not very vocal about incidents of violation of personal space, and who rather move to a different job than stand and protest as there is the idea that proper justice is not met in such cases. Safety is always our first priority as human beings and so women prefer certain jobs over others due to personal space.

Research Questions
The main questions that this study would like to find the answers to is as follows (#1), succeeded by the fringe answers that would need to be answered and/or will be answered in the course of the study:
- While women's participation in the workplace and labor market increases, the increase is clustered in a few sectors, and women participation in many formal sectors

remains low. Is the reason behind this low participation in such sectors due to the women's concern of compromising her perceived notion about her personal and physical space?

- ○ How do women of Bangladesh understand the concept of personal space?

- ○ How do women of Bangladesh relate the concept of proxemics or physical space to that of their personal space perceptions?

- ○ How do women of Bangladesh relate proxemics to their personal space and workplace dynamics?

The aforementioned questions have been hypothesized based on informal discussions and interviews with a number of women who are holding mid to senior-mid level positions in various sectors in the formal sector. The findings of those informal discussions are provided below in order to establish the basis of the underlying hypothesis of the research questions. The first discussion was held with two women. We interviewed two Bangladeshi women working in the financial sector at two different financial institutions. We asked them some specific questions, and their responses led us to the general information that we need for this research paper. They were asked these questions- what personal space meant to them, how personal space and professional workplaces correlate in their field of work, was their idea of personal space ever invaded, and if so, how did they cope with it, and some similar questions. The discussion garnered what personal space means to them. They responded by saying personal space has two aspects, physical space, and mental comfort level. But as this study mostly focuses on the physical aspect, we tried to identify their perception towards it. And from what we have gathered, both respondents had the same narrative, that is, "discrete space," a term they used to describe a space they felt no one else in the workplace would invade for them. But they also further mentioned how these criteria would not play a vital role in career progression. For instance - if they were offered jobs with much bigger workspaces and separate washrooms than the ones they have now, they wouldn't necessarily gravitate towards the latter. For them, it all comes down to a secure environment to work in the workplace for women. According to our respondents, personal space was not a large factor for them when choosing their line of occupation. They said that they already knew which sectors they were willing to work in and which they were

not. For example, they were not willing to work in labor-intensive sectors such as construction. However, this predetermination of which sectors they choose stems from the level of comfort and safety they know they will have in that sector. Therefore, people may be actively unaware of it, but personal space still factors into job choices. One of the respondents mentioned that she felt that there was a big difference between women's personal space in Bangladesh and abroad. According to her, she felt much safer working abroad; her sense of personal space in the workplace was never invaded, and people also respected her privacy and boundaries. She did not feel this safe and comfortable while she was working in Bangladesh. She also added that she thought working abroad was much safer and more comfortable for women due to cultural differences. People abroad take this matter seriously as this is a sensitive matter, and they respect each other's ideas of personal space and privacy. Lastly, she also mentioned that she has a long experience of work overseas and that things might have changed in Bangladesh now, but she still prefers working abroad. They both have similar views on personal space, in some aspects, their perspectives on culture and upbringing are parallel in terms of personal space. Culture and upbringing have heavily influenced them. According to the respondents, not just culture and upbringing but a mixture of many things has affected them, including educational background, family, city, and even workplace location. Still, there are certain things that she is not willing to do because of her upbringing.

A second conversation was held with a former female MP, who revealed many of her personal struggles as a politician. We asked for her insights about her professional life when it comes to her personal space. She revealed how harsh and unaccepting the political environment is for women. She had to physically go from door to door to introduce herself and her mission to people and they insinuated that they would prefer a man to be in her place. SImply for her gender, she was underestimated to a point where other representatives did not want to include her name on banners and didn't even want to give her a chair to sit on. When asked how a woman should protect her personal space in a field like hers, she said that women need to be strong and confidently demonstrate their power. She mentions how much negativity there is and how other representatives voluntarily dismiss listeners or supporters before orations in order to sabotage or belittle her. We wanted to know about

instances where her personal space had been breached and she mentioned how she was forced to not hold meetings with her supporters after 9pm because people would gossip about her character if she was talking to men at night. A woman's reputation can be easily tarnished with gossip. We asked whether she had seen any improvement on people's treatment towards her as the years progressed and she said no. Men and women still speak about her behind her back. When asked whether the thought of her personal space being breached held her back from choosing her profession, she said she had to overcome many obstacles to survive in her profession. She needed to stand her ground and protect her personal space. She refused to compromise and fearlessly pushed through. We wanted to know if she thought the clash between personal space and professional workspace in our social and cultural fabric is an influence for women to choose working in certain industries and not in others. She didn't think so, she said she believed that no one could stop a woman from achieving her goals. Familial pressure can be an issue but it can be resolved. Lastly we wanted to know whether she heard about other women having their personal space invaded. She said that it does happen quite often but the situations are usually too sensitive or personal to bring up. The most she can do in those cases is stop others from gossiping about it. Bangladeshi society is still patriarchal, and women in leadership roles or politics are not widely accepted, particularly in rural areas. It is difficult for women to establish their own identity in a male-dominated workplace; their contributions are overlooked, preferred when there is a man backing them up, and their accomplishments are always questioned by those around them. Character assassination is a tool used to undermine their credibility. Their self-esteem is shattered when they are hammered with everything, starting with what they are wearing, how they are in their personal and professional lives, how they speak, and so on. The men or the society at large, does not even acknowledge the existence of their personal space and this is due to the lack of education and improper socialization process. They are expected to multitask without any recognition, sacrifice their ambitions and personal comfort without any compromise and work harder without paying attention to the conjecture surrounding. This goes to show how despite being under the female leadership for over a decade, the work culture in Bangladesh is yet to progress and accept women in diversified roles. We tried to delve deep into this issue by talking to some women working in the telecommunication and agricultural

science industry. We interviewed Ms. Rumana Afroz who is working as a Direct Procurement business partner in Syngenta Bangladesh Ltd. and Ms. Fahmida Nasir who is a Project manager in Ericsson Australia. Their corporate experiences will help to give an insight into the workplace perception of Bangladeshi working women. While many people believe that personal space is a problem primarily regarding gender, this isn't always the case because it depends on the individual and the situation too. Ms. Fahmid expressed the opinion that it might be the inexperience of a new employee that caused them to feel that way when one of our team members shared their experiences working as a woman and how their personal space was being invaded. The struggle to follow company policies for their work flow is a major reason that managers frequently speak to the employees in ways that can be perceived as disruptive. Ms. Rumana gave the crucial advice that new employees must first learn to adapt into the company's working culture before they can provide value to the business based on their role. However, If someone feels they are being interrupted constantly despite their work and deadline being predefined, then they should try to negotiate with them about it without being offensive and if that fails then it is better to move on from that company and choose a better place. Empowerment should also be taken into account when talking about personal space. Not being able to voice your opinion matters as collaboration of ideas helps to improve business outcomes. Ms. Fahmida shared a similar experience when she first joined Ericsson, Australia. The team she was assigned to was being driven by old white males that had no female voice which was infamous within that workplace which shocked her the most. Her opinion had no value as the decisions were already made beforehand. Later, Ms. Fahmida moved onto another team after requesting a change. As a matter of fact, she was offered a higher position to work with the same team, but she did not choose it because she felt it was not suitable for her. Furthermore, she emphasized on the fact that speaking up about these issues is tough as you would need to submit a lot of evidence along with several other workers' experience to HR. Additionally, as these matters are confidential, no one likes to come on record as they fear their job might be in danger. Ms. Fahmida and Ms. Rumana concurred that today's world has changed drastically compared to the last 10-15 years. Previously, women would choose nurse or school teacher as they felt more comfortable in their personal space, but nowadays, companies are becoming more diversified and women specifically are

entering into more challenging roles. Ms. Rumana worked for a company with fewer female employees, but instead of being shunned away, she was valued for her work, and her performance, rather than her gender, was the primary determinant of additional bonuses and rewards. From their experience, they saw that women have a preconceived notion of their gender being the reason they are behind men, and that translates into their workplace as well. Instead of thinking of themselves as a female employee, they should consider themselves an asset to the business. Performance will ultimately determine if they gain a solid foothold there. Thinking about these problems just clouds one's thinking. The goal should be to present one confidently and professionally because doing so will boost women's self-confidence.

According to Shegufta Sharmin, Risk Management Officer(WFP), personal space refers to the area—or unwritten perimeter people feel they must create among both themselves and others in order to feel at ease while communicating. It is crucial in the workplace because when people lack privacy, they become uncomfortable and stressed, which results in low performance. She works in a place where it is essential to respect others' personal space. Due to her position as a senior official, she didn't notice any personal space issues in her office. She has heard throughout her experience that personal space isn't always respected in workplaces like call centers or the banking industry, especially for women. She believes that cultural factors have a significant impact on personal space. For instance, embracing and handshakes are common social customs at work in nations like the USA and Canada. However, in Bangladesh, it interferes with women's personal space. Women generally preferred more privacy from people than did males in all of the countries studied. A lack of respect for others' personal space can be seen in Bangladeshi culture. Due to the fact that there are more women in the field of work than ever before, it is essential that we create a secure atmosphere for all people. Authorities continuously work to keep everyone in check by protecting each person's personal space and other belongings, as seen in many types of sectors. It's high time for everyone to recognize the significance of respecting others' personal space. Then everyone would feel more safe and comfortable in the workspace.

Methodological framework
According to a report (2022), the research framework to be used is

Focus Group Discussion. Focus groups are discussions led by a facilitator with a small group of people who are experienced or interested in a certain topic. They are used to discover the opinions and attitudes of a certain group of people. Focus group talks can be used from project design to program evaluation, at any point in the project or program cycle. Focus groups are one type of qualitative research. Future research on consumer choices, goods and services, or contentious subjects may be directed by observations of the group dynamic, participants' answers to focus group questions, and even their nonverbal cues. Focus groups are widely used in the domains of marketing, library science, social science, and user research.

People who possess experience or knowledge in the subject matter will be selected to participate in the focus group and provide information on the targeted topic in order to obtain the necessary data. So in comparison to others, they are able to give more subtle and organic feedback. That's why focus groups are simpler to plan than large-scale surveys or experiments. So, it's a useful research tool. Focus groups differ from other techniques in that they encourage natural conversation among participants, allowing for the collection of individual data. Compared to single-interview data, group social contact often yields a wider range and diversity of data that is deeper and more detailed. People who don't want to be interviewed alone or who don't think they have anything to say can be encouraged to participate. Additionally, they do not treat illiterate people unfairly. The focus group approach also carefully examines the participants' thoughts and emotions on the topic. A well-planned pre-session makes it easier to gather relevant and comprehensive data pertaining to the targeted topic. Focus groups are a great tool for exploring a wide range of topics in order to gather further information on particular objectives and theories. The costs are relatively low in comparison to other research devices. Focus groups can also be created in mixed- and quantitative-only formats. Focus groups, however, work very well as a qualitative data collection technique. Focus groups have become more popular as a qualitative data collection method due to its versatility, richness, and many advantages.

This method can be utilized for research since focus group talks are commonly used as a qualitative way to obtain a thorough grasp of social issues. It looks for information from a specific group of

people selected at random rather than from a statistically representative sample of the general population. In the women participation project, when attempting to establish the distinction between personal and professional space, a selected group of individuals will be involved with the goal of collecting their opinions as the necessary research data. The collected data will provide an overall perception of this topic, facilitating decisions and actions regarding this issue. Focus group discussions help to learn new things about one's research since the participants own and provide collectively a greater variety of viewpoints on the chosen subject than the researcher could have imagined working alone. Focus group conversations offer a great opportunity to record and take into account participants' thoughts, feelings, expressions, opinions, and replies while gathering information. They can be employed when a researcher wishes to gather expert opinions or various points of view, or at the pre-strategy stage of the study to ensure that all relevant aspects of a topic are known to the researcher. So undoubtedly we can use this method for our research.

This research framework will be effective for the topic mentioned here. Focus groups can be helpful in bridging the gap between research and policy by revealing different point of views among the various teams or individuals participating in the modified process. This can help the process be conducted more smoothly. Using it before creating surveys is also a smart idea. So, in the question of effectiveness, focus group discussion easily reaches the bar. However, one can always enhance the research framework's efficiency by following these steps-

- Ensuring strong aims.
- Recruiting the precise individual for the conversation.
- Testing focus group before the actual event.
- Creating a pleasant environment.
- Keeping the conference controlled.
- Trying to stay away from direct inquiries.
- Roping a coworker to take on the role of assistant moderator.
- Ensuring that the participants leave with a favorable impression of their experience.

References:
1. Annual Report of Bangladesh Bank 2013-14 (2014), Chapter on Agriculture and SME Finance, Bangladesh Bank.
2. Annual Report of Bangladesh Bank 2014-15 (2015), Chapter on Agriculture and SME Finance, Bangladesh Bank."
3. B.D Demography and Health Wing Bangladesh Bureau of Statistics Statistics and Informatics Division Ministry of Plannin (2022), Women and Men In Bangladesh Facts and Figures 2022.
4. Bhuyian, S.A. & Hossen, M.M. (2020), Inclusion of Women in the Bangladesh Police Service: Institutional Concurrence or Professional Compromise?. https://www.researchgate.org/publication/346082020_Inclusion_of_Women_in_the_Bangladesh_Police_Service_Institutional_Concurrence_or_Professional_Compromise
5. Bryan (2020), Navigating the new rules of personal space in the workplace (wework.com) para 1, 5, and 6.
6. Brown, N. (2001), Edward T. Hall, Proxemic Theory, 1966. CSISS Classics. UC Santa Barbara: Center for Spatially Integrated Social Science. Retrieved from https://escholarship.org/uc/item/4774h1rm.
7. Despite a Woman at the Top, Bangladesh's Politics are Still Male Dominated. (Oct 28, 2021). International Republican Institute. https://www.iri.org/news/despite-a-woman-at-the-top-bangladeshs-politics-are-still-male-dominated/
8. Focus-group-discussions.pdf - FOCUS GROUP DISCUSSIONS Focus group discussions are facilitated discussions, held with a small group of people who have | Course Hero.
9. Hafiz T.A. Khan Twyeafur Rahman , (2016),"Women's participations in economic and NGO activities in Bangladesh", International Journal of Sociology and Social Policy, Vol. 36 Iss 7/8 pp. 491 . 515. https://www.researchgate.net/publication/288496909_Women%27s_Participations_in_Economic_and_NGO_Activities_in_Bangladesh_An_Empirical_Study_on_the_Bangladesh_Demography_and_Health_Survey_BDHS.

10. Hamlin, 2018 Respecting a Co-worker's Personal Space - Career Trend, para 1."

11. Hoque M.(2019, August 17), The Growing Footprint of Women in Banking Sector, The FinancialExpress. https://thefinancialexpress.com.bd/views/the-growing-footprint-of-women-in-banking-sector-1566025993.

12. Karim, S. & Beardsley, K. (2017) Equal Opportunity Peacekeeping: Women, Peace, and Security in Post-Conflict States. 1st ed. New York: Oxford University Press. Pp. 1–165.https://www.oxfordscholarship.com/view/10.1093/acprof:oso/9780190602420.001.0001/acprof-9780190602420.

13. Karim, L. (2011). Microfinance and Its Discontents: Women in Debt in Bangladesh (50658th ed.). Univ Of Minnesota Press.

14. Khatun F. (2018, Mar 8). 'Women's participation in the job market'. The Daily Star. Women's participation in the job market | The Daily Star.

15. Murtuza HM.(2021, March 8), Number, Proportion of Female Staff in Banks Drop in 2020, Newage Business https://www.newagebd.net/article/132050/number-proportion-of-female-staff-in-banks-drop-in-2020.

16. Noor A. I.(2021, March 8), Women's Participation in Banking Sector on Rise, Daily Sun https://www.daily-sun.com/post/540026/Women%E2%80%99s-participation-in-banking-sector-on-rise.

17. Rahman, M.M. (2011). WOMEN IN BANGLADESH POLICE: A STUDY ON GENDER PERSPECTIVE. https://ndcjournal.ndc.gov.bd/ndcj/index.php/ndcj/article/view/77.

18. Report, T. (2022b, October 17). 92% women part of informal sector: Report. *The Business Standard*. https://www.tbsnews.net/bangladesh/92-women-part-informal-sector-report-515338

19. The Commonwealth Human Rights Initiative (CHRI). (2015). ROUGH ROADS TO EQUALITY - WOMEN POLICE IN BANGLADESH. https://www.humanrightsinitiative.org/publication/rough-roads-to-equality-women-police-in-bangladesh.

20. Uddin, M.D. (2018), "Transitioning the workforce from informal to formal sector: A ground study of Bangladesh",

International Journal of Development and Sustainability, Vol. 7 No. 8, pp. 2156-2168 https://isdsnet.com/ijds-v7n8-01.pdf.

21. Women in Politics: 2021." Inter-Parliamentary Union. Mar 10, 2021. URL: Women in Politics: 2021 | Inter-Parliamentary Union (ipu.org)

22. Zaman. (2021). Challenges of Bangladeshi Women Working in the National Security Institutions. Journal of Gender and Power, 15(1).
https://doi.org/10.2478/jgp-2021-0005.

Author's Biography:

Syed Shahnawaz Mohsin (nom du plume -Simon Mohsin) is an apprentice of Political Science, Foreign Affairs, Business Management, Policy and Governance, Communication and Media, and Development Studies. Mohsin has more than 15 years of professional experience in a variety of fields that include hands-on, in-depth learning, and participation in fields pertinent to the aforementioned disciplines. Also an entrepreneur with three businesses that include agro, children's toys, artwork, and women's essentials, Mohsin continues endeavouring expanding his professional and academic horizon. He also dons the consultant hat for several organisations in areas of professional training, recruitment, analytical ability, and, sports and health sectors working with children, youth and fresh graduates. He is a health enthusiast with professional certification and practice of physical and fitness training for a niche community of health advice seekers. He is an avid reader and seasoned writer on various topics mainly pertinent to sports, foreign affairs, and regional politics; and is regularly published in several media platforms. He was a professional cricketer in his early career and continues to be a sports enthusiast mostly realised through his sports writings. As a public speaker and adjunct faculty in a number of universities, Mohsin is a blunt and bold narrator, with a strong focus on disseminating of functional skillset, while avidly avoiding any sugarcoating when speaking to and engaging with the student community. Mohsin has recently ventured into fiction writing publishing children's stories, and will continue expanding his endeavours in this area. He has begun working closely in academia and research mainly on business, social sciences, and foreign affairs

RTP102

Will AI Technology Reduce Job Opportunities In Future?

Tasnim Kabir[1], Durba Saha[2]

[1]Biotechnology (BIO), Brac University,
tasnim.kabir1@g.bracu.ac.bd

[2]Biotechnology (BIO), Brac University,
durba.saha@g.bracu.ac.bd

Abstract

The main focus of this study is to perceive whether artificial intelligence influences different aged individuals along with their opinion regarding this new technology that helps us to know the percentage of agreement and disagreement and of the fact that " Will AI technology reduce job opportunities in future?". Data were collected through discussions in peer member groups, and the research portion was surveyed through a Google Form questionnaire. 35 people participated in the survey and shared their opinions by answering the following questions.

Keywords:

AI tools, Job opportunities, AI image, Technology, Automation, Cyber crime, Data management, Solution, Productivity, AI algorithm, Plagiarism, Error free task

Introduction

Will AI technology replace people with machines? How will technology affect tasks and jobs? How will automation affect employees? Asking people around you these questions can yield a variety of opinions. Some will say, "AI will make our jobs easier," while others will respond, "AI tools will be the reason for job loss." It's a debatable subject however while artificial intelligence will replace many jobs, it will also create many others some of which will be

performed independently by both robots and humans. (Thomas,2023). AI is not able to do difficult tasks that a human can do so there's a difference between approaches of human and AI performances.(Glassman,2014). There are a lot of things that a machine can't do but humans can like creative thinking, problem solving, innovating and synthesizing type approaches. An app can dial one's number, even chat and can see face and hear virtually but can't connect emotionally with that person. (Rutledge,2014). Again, it is said that robots will displace old categorized work but again will create new categorized work opportunities. Then in the future there may be observed human-robot work collaborations. (Blumenthal,2014). Again, developing technologies will not replace workforce permanently, rather work will be shifted to other sectors and we still need coders to develop our technologies, and need employees for packaging, sales, assembly and outreach. (Webb,2014). Then, it is predicted that,delivering more services in less time by AI tools with equal level of human involvement will be seen in the future. (Clark,2014).

Figure 1: Source:
https://builtin.com/artificial-intelligence/ai-replacing-jobs-creating-jobs

Literature review

Artificial Technology or AI is now a frontline topic. Different people express their opinions in different ways. For some it's a blessing that can solve complex tasks reducing time. Again, for some it's going to be a future destruction that will disable people's imaginations, creativity, critical thinking ability and will increase plagiarism rate etc. According to Aghion ei.al (2020), AI technology has significant effect in both firm

and industry sectors. But again, Felten et al. (2019) reported based on 'AI occupational Impact', AI has no effect on employment but has a positive impact on earnings. Then, according to Acemogly et al. (2020), they did not find any link between employment and AI technology. Moreover,the influence of automation density on American employment prospects has been discussed through a theoretical framework, which shows that each and every additional robot among a thousand employees is responsible for a 0.2% employment declination and a 0.37% wage declination.

Methodology

In order to know the conception of people about AI technology i.e., whether it will reduce job opportunities or not in future, an online survey has been done among 35 people who belonged to different ages and professions using google form. To conduct the research, qualitative and quantitative data collection methods have been used through observations, perspectives, experiences, numbers and logics. Then, a focus group discussion method has been used based on age group and profession to get an overall idea of the topic. Next, different journals and research papers have been observed to know the depth of the topic. Finally, based on survey results, information analysis has been done using pie charts.

Data Analysis

An online survey has been done among 35 people belonging to different age groups and professions to know their opinion about AI technology. It has been observed that, the highest number of respondent people belonged to the 21-30 years age group (82.9%) and lowest number of respondent people belonged to 31-45 years age group (2.9%). Again, the maximum number of responses came from the student group (94.3%) and the minimum number of responses came from other professional groups (8.6%). Lastly, the questions they answered had different perspectives so the overall ratio is different in each question.

This article examines the impact of the adoption of AI application technology and automation on the future job sectors. Therefore, the results of these studies indicate many possible scenarios for the future workplace and AI- human ratio.
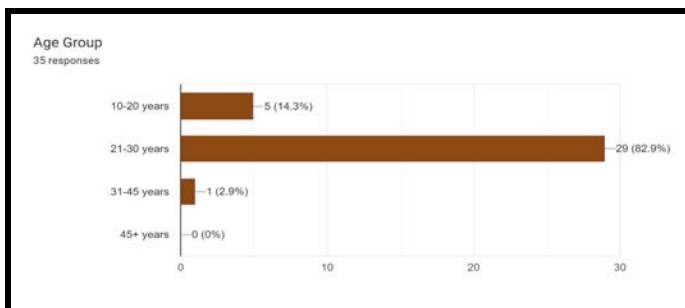
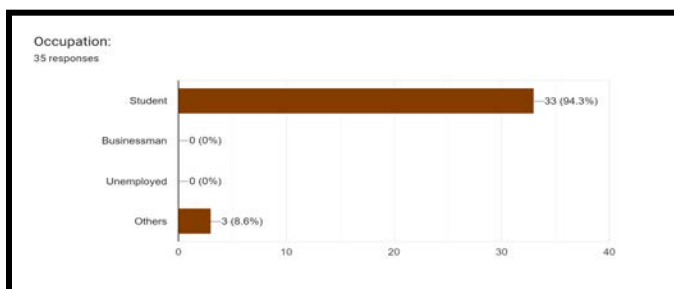Figure 2- Survey Based on different aged groups.

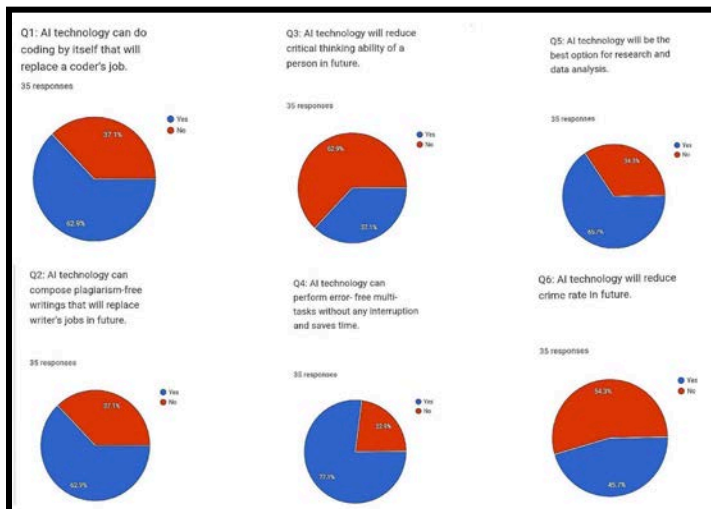Figure 3- Survey Based on Different types of Professions

Figure 4- Online survey responses represented by pie charts.

It has been found that, according to pie chart 1, more than 60% of people responded positively and almost 40% of people responded negatively to the fact that AI technology can do coding that will replace a coder's job. Negative response because thinking that maybe AI based tools can only do specific tasks not jobs with no creative analysis and that a human can do. (Cremer and Kasparov, 2021). According to pie chart 2, more than 60% of people agreed and almost 40 percent of people disagreed with the fact that AI technology can compose plagiarism-free writings that will replace writer's jobs in future. Negative response because maybe AI based tools can write plagiarism free writings but can't add emotional appeal to writings to touch the human heart. (Gupta, 2023).Next, according to pie chart 3, almost 40 percent of people agreed and more than 60% of people disagreed with the fact that AI technology will reduce critical thinking ability of a person in future. Negative response because maybe AI technology based writings, image, video etc will open our imagination window to think in different ways. (Johnston, 2022). Then, according to pie chart 4, almost 80% of people agreed and more than 20% of people disagreed with the fact that AI technology can perform error- free multi-tasks without any interruption and saves time. Negative response because, sometimes due to technical issues AI tools provide wrong outputs or take more time to generate results especially when it reaches to its highest capacity. (Babich, 2023). Next, according to pie chart 5, 65.7% of people agreed and 34.3% of people disagreed with the fact that AI technology will be the best option for research and data analysis. Negative response because, sometimes AI tools provide wrong results or such results that have no existence in reality due to technical issues. (Pearl, 2022).bFinally, from pie chart 6 it is seen that, 45.7% of people agreed and 54.3% of people disagreed with the fact that AI technology will reduce crime rate in future. Negative response because, using AI tools it can affect privacy that leads to crime also on providing wrong data securities and policies get in trouble to catch criminals. (Quest,et.al., 2018).

Arguments and Analysis

The impression of AI on job opportunities is a topic of ongoing debate and speculation. Some experts predict that AI will automate many tasks and potentially result in job losses, while others believe that AI will create new jobs and enhance existing ones. AI can increase productivity and efficiency, freeing up employees to focus on higher-level tasks that

require critical thinking, reasoning, creativity, and interpersonal skills (Mukherjee,2022). AI technology plays an important role in the health sector by analyzing large quantities of medical data and can predict future health issues that help doctors to provide proper treatment on time. AI technology is also helpful in personalizing medicine and in drug discovery, analyzing health and genetic history that helps to identify new probable treatments for diseases. (Deranty,2022). Moreover, the reflection of AI technology is also observed in reducing crime rates. By analyzing crime data through AI algorithms, we can predict the time and place of probable crime, can detect fraud that helps us to enforce securities on time and to reduce money laundering, cybercrime etc. AI based- sensor, camera, facial recognition tool also helps to reduce criminal activities. (Daga,2022).

The use of AI tools is also observable in garment industries. It helps to give a virtual cloth wearing experience to a customer so that a customer can realize which cloth will suit him/her and enhance interest for online shopping. AI tools like- robots also help tailor to design cloth maintaining a balanced speed while cutting and sewing. AI helps optimize inventory management and logistics, ensuring timely production and delivery of garments, reducing wastage, and cutting costs. Also, AI robots equipped with computer vision can perform quality checks during production, detecting defects and ensuring consistent product quality. (Lu,2021). AI tools make a remarkable contribution in the agricultural sector. AI machinery helps to monitor crops growth, tells about soil quality, contamination level, to determine the genetic stability of crops by analyzing genetic data and to plough land in less time. Even, the crop's genome can be identified through AI algorithms by analyzing the crop's patterns and variations, then telling us the proper time of watering the crop and its growth conditions. These will help to yield all types of seasonal and disease free crops in less time. (Morgan,2022). Finally, we can say that AI technology helps to produce error free outputs, and gives unbiased decisions in less time. Therefore, it can be said that, within the next two decades, AI technology will be the cause of 50 percent job losses and rise of unemployment rates according to some experts.

Counter points

There are two sides to every story. AI and robots will adopt some jobs from people, but they will also generate new ones. It's true that AI has

the potential to automate certain jobs, particularly those that are repetitive and low-skilled, but it can also create new employment opportunities in different sectors including software development, statistics study, and machine learning. Since 2000, many manufacturing jobs have been slowly lost to robots and automation systems. Of which it is 1.7 million(Priest, 2021). AI, on the other hand, is projected to create 97 million new jobs by 2025(Balakrishna, 2021).The main reason AI won't take human jobs is that it cannot do all the work that a human does. There is a fine difference between a job and a task that is a combination of various tasks. Artificial intelligence tools can solve and define problems but it is unable to classify the problem. Also, AI tools are unable to express emotional appeal in writings that a human does. In fact, humans are more needed to develop AI tools, new skills and other technological tools. Next, AI technology may increase the plagiarism rate in writings, reduce our critical thinking and reasoning ability as AI tools are doing all tasks no brainstorming is required(Balakrishna, 2021). AI programs are still prone to mistakes. When ChatGPT responds incorrectly to a specific question you ask, that is a hallucination. The machine can write replies that sound plausible yet are inaccurate and rarely admits ignorance. You might discover that the answer the AI produced was wholly incorrect only after the validation. (Babich,2023). But the advantages are more than limitations. Therefore, AI technology will not replace human jobs completely as it can't generate creative thoughts of its own that a human can do.

Solution

The proper use of AI tools needs to be known. Rather than thinking about plagiarism or a word of destruction we can use it to perform repetitive tasks so that we can get more time to solve other tasks. There are three probable solutions for AI that will not reduce job opportunities. According to Balakrishna (2021), the first is to emphasize the importance of problem solving. Regardless of automation, individuals who came forward to find more opportunities to develop and provide value improves worker skills and advances the possibilities of promotion. A WEF survey found that 94% of surveyed executives want their workers to develop new expertise at the workplace. Secondly, retraining is another way. An approach that is competent to all never succeeds since each worker's learning requirements vary in content, timing, intensity, and duration. Rather,

every worker needs to get the freedom to select their way of learning. Digital services like Google Career Certifications, Coursera, and Udemy are framing personalized microlearning to make them widely available (Balakrishna, 2021). Finally, inclusive learning is another area where adaptability and accessibility can support digital learning systems (Balakrishna, 2021). Hiring based on skills rather than degrees,recruiting talent with non-STEM degrees and hiring people from disadvantaged or marginalized backgrounds can increase the diversity and will not take away jobs fully.

Conclusion

Humans are still needed for certain elements, such as how to create value, how to understand people emotionally, and how to see things for what AI can't control. Understanding the difficulty makes humans stand out from the 99% and is irreplaceable. It will be better in the upcoming days, if mutual cooperation between AI tools and humans is observed as both of them are needed to generate error free work in less time. Overall, while AI may change the nature of some jobs, it's unlikely to completely eliminate employment opportunities in the future.

References:

1. Anonymous. (2020, October 26). *Don't fear AI. It will lead to long-term job growth.* https://www.weforum.org/agenda/2020/10/dont-fear-ai-it-will-lead-to-long-term-job-growth/
2. Babich, N. (2023). 4 biggest issues with modern AI tools. *Nick Babich*. https://babich.biz/4-biggest-issues-with-ai-tools/
3. Balakrishna, D.R. (2021). *Automation: 3 ways to ease job loss fears.* The Enterprisers Project.https://enterprisersproject.com/article/2021/10/automation-3-ways-ease-job-loss-fears
4. Bordot, F. (2022). Artificial Intelligence, Robots and Unemployment: Evidence from OECD Countries. *Journal of Innovation Economics & Management*, 37, 117-138. https://doi.org/10.3917/jie.037.0117
5. Cremer,D., Kasparov,G. (2021, March 18). *AI should augment human intelligence, not replaceit*.HarvardBusinessReview.https://hbr.org/2021/03/ai-should-augment-human-intelligence-not-replace-it
6. Daga, V. (2022). Impact of AI on future job roles. *Times of India.* https://timesofindia.indiatimes.com/blogs/voices/impact-of-ai-on-future-job-roles/
7. Deranty, J., & Corbin, T. A. (2022). Artificial intelligence and work: a critical review of recent research from the social sciences. *AI & SOCIETY.* https://doi.org/10.1007/s00146-022-01496-x
8. Duggal, N. (2023). Advantages and Disadvantages of Artificial intelligence [AI]. *Simplilearn.com*.https://www.simplilearn.com/advantages-and-disadvantages-of-artificial-intelligence-article
9. Gupta,A.(2023,February 16). How to Give Human Touch To AI Content. SAG IPL - a TechnologyBlog. https://blog.sagipl.com/how-give-human-touch-ai-content/
10. Johnston, B., & Johnston, B. (2023). Using AI generated images and content in creative projects.*TheShutterstockBlog*.https://www.shutterstock.com/blog/ai-generated-content-creativity
11. Korneti,H.(2022, August 4). 75 Insightful Facts About Artificial Intelligence. https://www.valuer.ai/blog/75-facts-about-artificial-intelligenc

e#:~:text=One%20of%20the%20most%20interesting,2%20mi llion%20new%20job%20positions.

12. Morgan, L. (2022). AI examples that can be used effectively in agriculture. *Enterprise AI*. https://www.techtarget.com/searchenterpriseai/feature/AI-exa mples-that-can-be-used-effectively-in-agriculture

13. Mukherjee, A. N. (2022). Application of artificial intelligence: benefits and limitations for human potential and labor-intensive economy – an empirical investigation into pandemic ridden Indian industry. *Management Matters*, *19*(2), 149–166. https://doi.org/10.1108/manm-02-2022-0034

14. Pearl, M. (2022, December 3). ChatGPT from OpenAI is a huge step toward a usable answer engine. Unfortunately its answers are horrible.*Mashable*. https://mashable.com/article/chatgpt-amazing-wrong

15. Priest, C. (2021). Humans and AI: Why AI Won't Take Your Job. *DataRobot*. https://www.datarobot.com/blog/humans-and-ai-why-ai-wont-t ake-your-job/

16. Quest, L. (2018, August 9). *The risks and benefits of using AI to detect crime*. Harvard BusinessReview.https://hbr.org/2018/08/the-risks-and-benefits -of-using-ai-to-detect-crime

17. Selenko, E., Bankins, S., Shoss, M., Warburton, J., & Restubog, S. L. D. (2022). Artificial Intelligence and the Future of Work: A Functional-Identity Perspective. *Current Directions in Psychological Science, 31*(3), 272–279. https://doi.org/10.1177/09637214221091823

18. Smith, A. (2022, September 15). *AI, robotics, and the future of jobs*. Pew Research Center:Internet,Science&Tech.https://www.pewresearch.org/in ternet/2014/08/06/future-of-jobs/

19. Urwin, M. (2021). AI taking over jobs: What to know about the future of jobs. *Built In*. https://builtin.com/artificial-intelligence/ai-replacing-jobs-crea ting-jobs

Authors' Biography:

Tasnim Kabir is currently pursuing a Bachelor of Science (BSc) in Biotechnology under BRAC University. Her academic interests include- Bacteriology, Gene therapy and Astronomy and hopes to bring out something new for the welfare of mankind through research. Apart from these, she is interested in writing, reciting poems, cooking and traveling.

Durba Saha is currently pursuing a bachelor of science in Biotechnology at BRAC University. Stem cells, nano-technology and arts are some of my sections of interest. She enjoys academic research activities and loves to learn new things every day. Apart from that, she is a dendrophile and creative person with inquisitive nature and a passion follower.

RTP103

Robotics: Future of Schooling in Bangladesh

Abtahi Noor[1] , Tasmia Rahman[2], Monjur Ahmed[3], Opshora Noshin Eshika[4], Faraz Fardin[5] , Ahshanul Mahbub Labby[6]

[1]Department of Computer Science & Engineering, Brac University, abtahi.noor@g.bracu.ac.bd

[2] Department of Computer Science & Engineering, Brac University, tasmia.rahman.mitu@g.bracu.ac.bd

[3]Department of Computer Science & Engineering, Brac University, monjur.ahmed@g.bracu.ac.bd

[4]Department of Computer Science & Engineering, BRAC University, opshora.noshin.eshika@g.bracu.ac.bd

[5]BRAC Business School (BBS) , BRAC University, fardin.faraz@g.bracu.ac.bd

[6]BRAC Business School (BBS) , BRAC University, ahshanul.mahbub.labby@g.bracu.ac.bd

Abstract
Robotics deals with the knowledge of how to design, construct and develop robots. In the present world, technologies are taking over anything because of the efficiency of work over humans. So, children from schools must know robotics to inspire them from childhood to think and develop futuristic technology like robotics. Robotics should be included in the schooling curriculum to influence children to focus on futuristic technologies that will lead the world. Discussing the importance of teaching robotics in school is the main objective of this study. In the present world, robots are taking over anything because of the efficiency of work over human beings. Robotics covers the vast area of knowledge about how to design, construct and develop robots. In the study, the importance of robotics is broadly discussed along with the necessity of the addition of that topic in schooling curriculum.

Additionally, the facts and problems associated with the teaching of robotics in schools will be discussed based on statistical data.

Keywords: Robotics, Technology, Skill Development

Introduction

Don't we see robots everywhere doing anything instead of human beings? Robotics, the future technological marvel, making life easy and all the work efficient. Robotics should be taught and practiced from the schooling period to make children interested in the thing. Robotics is a fascinating topic that would help develop children's brainstorming and problem-solving capacity if they are taught with proper resources and expert facilitators. Experts encourage us to open up all the necessary locks to bring the new robotic era in front of our children. There are many arguments to prove that the necessity of robotics is being taught in our country.(Chauhan, 2022)

Literature Review

According to a report by Prothom-Alo (2022), a robotics training center named "Fabrication Laboratory" has been set up in Comilla under the initiative of the Deputy Commissioner. Also, the country's first robotics school "School of Robotics" was established in Comilla in September last year, where school going students of any age can learn about robotics. The biggest obstacle to teaching robotics at school level in Bangladesh is that there are very few teachers who are skilled in robotics at school level. Also, many parents think about what will happen by studying robotics. They think studying about it is a waste of time. Despite all this, the biggest obstacle for those who want to learn about robotics is the lack of easy access to enough materials. Some are available suddenly which are beyond the reach of ordinary students.Lastly, there are not enough skilled people in our country who can teach the basics of robotics.

Maximum schools abroad are introducing robotics as an educational component in their curriculum. This is because students can learn a lot through it, not only academically, but also develop personally and develop mentally. According to Purdue University, Robotics and simulators affect how kids learn more efficiently when used in education and eventually resulting in the development of a student who is more conversant and well-rounded. But one can know about robotics only when there is a fest or a national competition in our country. But

that too only at the university level. In most cases, what happens is that at the secondary level, students are taught only theoretical reading. As a result, they don't get any idea about the actual usage. As a result, there is no scope to know about robotics. For practical proof of this, a survey has been conducted where it was found that 75% of students do not get any idea about robotics at school level. At present robotics is not taught at the school level in Bangladesh, but recently some schools are being established on robotics in some places.

Arguments & Analysis

Bangladesh lags behind other countries in terms of providing robotics instruction or developing project ideas that would assist students in learning and implementing what they have learned in the real world. Firstly, there aren't enough resources available to use or teach children. There are no robotics-related curriculum or knowledge-sharing possibilities in our country's schools and colleges. While attending university, students mostly have the chance to do research and learn about these topics. Universities typically have the resources to aid students in learning, exploring, and thinking about these technologies. Secondly, there aren't always facilities available. For instance, learning opportunities, much like the introduction of robotics study, are limited in rural locations. Furthermore, many schools in cities are unable to provide regular studies correctly, but these complex topics are more difficult to make easier for students to comprehend (Rahman, 2020). A survey has been made from students of different schools regarding the need of a robotics workshop in their respective institutions. Most of them were students of Primary and Secondary level. The reports are provided below-

Are you taught any kinds of Basics of Robotics in your School?
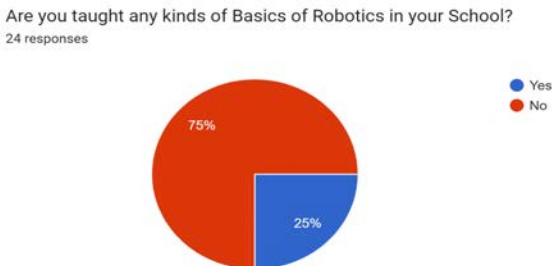24 responses

- Yes
- No

75%

25%

Figure 1: A pie chart showing a statistics of students response

From the above figure 1.1,it is observed that three-fourth of the students responded that they are not taught any kind of basics of

robotics in their respective institutions. Only 25% of the students know a little about robotics and its applications.

Do you want your school to add basics of Robotics course as an optional subject?   N.B- You don't need to appear any exams don't worry!

24 responses
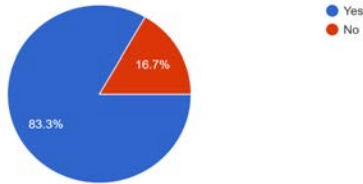
Figure 2: A pie chart showing the interest of students in learning robotics

From the figure 1.2, it is observed that the majority of the students want their schools to add the basics of robotics course as an optional subject. Around 83.3% of primary and secondary level school students want their school to have a robotics course as an optional subject.

Your Age

24 responses
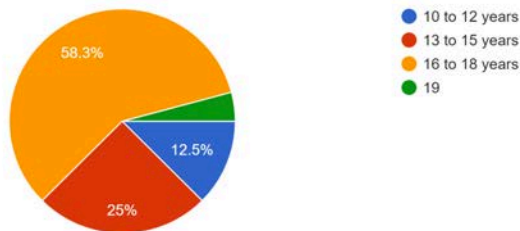
Figure 3: Age range of the correspondents

According to Figure 1.3, the age of most of the respondents are teenagers, mainly ranging from 16 to 18 years old. Thus we can observe that the younger generations are highly interested in learning robotics apart from their academics.

Solutions & Counterpoints

In this era of modern information and communication technology, there is no alternative to robotics to keep pace with other countries. Bangladesh is far behind in the robotics sector compared to other countries, which can be solved only by adopting specific methods. Firstly, some skilled people are required who are interested in robotics and who are ready to contribute in all fields, from education to industry. As people in this country still have very little understanding of robotics, guidance from pioneers will accelerate robotics to greater success (Jonas, 2021). Secondly, Investment in the robotics sector should be increased and everyone should be given the opportunity to participate here (Rahman, 2022). In a developed country like Bangladesh, where people are unable to meet their daily needs, spending money on robotics is still considered a luxury by many, but it is wrong. Because in keeping with the times, if people still choose primitive methods for their sustenance, then nothing new will ever be started in the country. One of the biggest reasons why this sector is lagging behind is that robotics is still not discussed in the education system of our country. Therefore, there is still not much understanding among the children about this matter, so there is a need to be aware of the big changes it can bring later. The first thing that needs to be done is to include the basics of robotics in textbooks so that everyone has more or less knowledge about it (Paul, 2021). Also, we need to focus on this matter so that students can focus more on learning robotics rather than getting good grades on exams. If they have a clear understanding of robotics issues from childhood, then later they will be able to solve complex problems very quickly without starting from scratch. In this case, along with children's books, Olympiads and extracurricular activities, robotics can be popularized among students. In this way, the students of Bangladesh will also be able to showcase their talent in front of everyone on the world stage. How much profit can be brought by using robotics and AI in industries that can lead to further development in a country like Bangladesh is beyond imagination. Because a few years from now, everything will be automated with machines instead of humans. As a result, unemployment will skyrocket if we don't keep up with the times and familiarize ourselves with robotics.The amount of research on robotics in Bangladesh is very less because Most university students and researchers lose interest or go abroad for higher education due to the lack of adequate research facilities. As a result of this, we are losing thousands of talented students every year, so labs, equipment and sufficient resources for research must be arranged in the country.

Conclusion

To sum up, the basics of robotics in school curriculum can be optionally added despite having some barriers. Since our survey opines that the majority of the students actually want these courses to be included in their academic curriculum, the concerned authorities should take steps in assisting the educational institutions for adapting the newest additions to the curriculum.

References:
1. Chauhan, S. (2022). *Robotics curriculum in schools*. https://timesofindia.indiatimes.com/blogs/voices/robotics-curriculum-in-schools/
2. CoderZ Team. (2022). *Why every school should have a robotics curriculum*. https://gocoderz.com/blog/every-school-should-teach-robotics/#:~:text=Kids%20will%20gain%20Problem%2DSolving,to%20solve%20the%20specific%20challenge
3. Jonas. (2021, December 15). *Why robotics is important? How it is changing the world?*" https://jonasmuthoni.com/blog/robotics-importance/
4. Paul, M. (2021, May 31). *Educational robotics for childrens in schools improves learning- ORCHIDS*. Orchids. https://www.orchidsinternationalschool.com/blog/child-learning/robotics-in-school-education/
5. Rahman, A. (2020, August 3). *Future of Robotics Engineering in Bangladesh* | Ewrite Hub. https://en.ewritehub.com/future-of-robotics-engineering-in-bangladesh/
6. Ryan. (2021). *Robotics in education—Advantages, benefits & importance for kids*. https://www.idtech.com/blog/educational-benefits-robotics
7. Valenzuela, J. (2021). *Incorporating Robotics Across the Curriculum*. https://www.edutopia.org/article/incorporating-robotics-across-curriculum/

Authors' Biography:

Abtahi Noor is a robotics enthusiast, and he is currently pursuing a Bachelor of Science in CSE at Brac University. He completed his HSC from Notre Dame College, Dhaka, and SSC from Bangladesh International School & College, Dhaka. He has been fascinated by robotics since he was a child and has always been interested in exploring the possibilities that this field has to offer. In pursuit of his passion, he is involved in various robotics projects at Brac University, such as BracU Dichari, where he is using his expertise to develop cutting-edge robotics technology. His ultimate goal is to create robots that can help make the world a better place by improving efficiency and solving complex problems.

Monjur Ahmed was born and raised in Dhaka, Bangladesh. From an early age, he showed an interest in technology, which later inspired him to study Computer Science & Engineering. He has completed his school education from Ideal School & College and went on to attend Notre Dame College for his higher secondary education. At present, he is studying in the CSE department at Brac University. Aside from his academic pursuits, he has a passion for cycling and photography. He enjoys spending time outdoors, exploring the beauty of nature, and capturing stunning images with his camera. In his free time, he can be found reading storybooks or browsing through various articles on the internet to stay updated on the latest devices and technology.

Tasmia Rahman Mitu is a science enthusiast and is currently studying CSE at Brac University. She has a passion for discovering new things and is always looking for ways to explore the unknown. Her passion involves keeping up with the newest scientific studies and breakthroughs.

Opshora Noshin Eshika is currently studying at Brac University in the CSE department. In addition to being a full-time student, she has a passion for creative endeavors like writing. Her writing style is known for being detailed, expressive, and observative. Apart from her academic pursuits, she enjoys listening to music, reading books, and watching movies.

Fardin Faraz is currently pursuing a Bachelor in Business Administration at Brac University. He has completed his SSC and HSC from Dhaka Residential Model College. He is a sports enthusiast and has a deep love for traveling. His vision is to create impactful events and research works in our society that will contribute to the betterment of our nation.

Md Ahshanul Mahbub Labby is a highly accomplished young professional and entrepreneur with a proven track record of success in public relations, communication, and business. As a third-year student at BRAC University, He has taken on a range of significant responsibilities, including former consulting at 10 Minute School, former head of marketing at Lucent and Digital Sikkhok, and current communication manager at Laughing Elephant. He is an accomplished writer and translator and he has a vision of establishing a prosperous, poverty-free Bangladesh.

Physical currency or Crypto currency, which one will be better for our economy?

Raian Kibria Rohan[1] , Zeba Raisa[2]

[1]Computer Science and Engineering(CSE), Brac University,
raian.kibria.rohan@g.bracu.ac.bd

[2]Microbiology (MIC), Brac University,
zeba.raisa.borna@g.bracu.ac.bd

Abstract
As the world transitions towards a cashless society, there is a growing debate on whether physical currency or cryptocurrency is better for the economy. While physical currency has been the traditional medium of exchange, cryptocurrencies are gaining popularity due to their decentralized nature and potential for lower transaction costs. This paper examines the pros and cons of each option, including factors such as security, ease of use, and potential for financial inclusion. Ultimately, the question of which one is better for the economy depends on a range of factors, including the specific needs and circumstances of each country.

Keywords: Bitcoin, Blockchain, Banknotes, cryptography, currency, financial system, means of exchange, security, consumers.

Introduction
For thousands of years, a key component of human civilization has been the use of currency as a form of trade for commodities and amenities. Physical currency also known as regular negotiable currency refers to the traditional type of currency such as paper notes, coins which are assigned by the government. Whereas, crypto currency is a digital form of transactional currency which uses cryptography for security *(*Kulkarni, 2020) . Each currency has its own benefits and characteristics which are suitable in different areas of the economy. Besides, both physical and crypto currency have their own advantages and disadvantages which is why this paper is going to describe both types of currency very gently and give a certain opinion of the authors.

Both currencies have to be considered before determining which one is beneficial for the economy(Alhaji, 2022) . It is important because it addresses the ongoing debate about the future of money and that's the reason the authors are choosing this matter. There are certain factors that will help individuals to identify which one is better like consumer preference, authorization of government and so on.

Objectives
The objective of discussing the topic of physical currency versus cryptocurrency is to evaluate which one is better for the economy. This involves defining physical currency and cryptocurrency, analyzing their impacts on the economy, and comparing their advantages and disadvantages. Specifically, it is needed for individuals to evaluate the impacts of actual currency on inflation, taxation, and production costs, as well as the potential benefits of cryptocurrency in reducing transaction costs, facilitating cross-border transactions, and increasing financial inclusion. After evaluating both forms of currency, a recommendation can be made on which one is better suited for the economy and explain why.

Research Questions
• How does using physical money versus cryptocurrency affect economic growth, and could cryptocurrency help improve it?
• How can policymakers and financial institutions manage the benefits and risks of adopting cryptocurrency?
• How are consumer accounts secured using cryptocurrency?

Literature review
From the research of Izwan Amsayr and Ethan Christopher we found that Crypto currency has the potential to revolutionize financial transactions by providing a decentralized, secure, and efficient method for conducting digital transactions. They got a major point. Because crypto currency is a form of transaction depending on whether we use it or not. But according to Ahmed et al. (2022), Physical currency, through its tangible form and wide acceptance, plays an important role in facilitating economic transactions and fostering economic stability. Besides, some other research shows that both types of currency have the potential to achieve the main throne of the economy (Grym, 2018) . In the article of (Duque,2020), showed some great advantages of crypto currency such as the management system of this currency is very much

efficient and safe that a consumer can rest assured. So in order to find out which one is the best we need to go through deep down.

Discussions

Physical currency is a type of currency where people can not complete their transaction process in a short time but by using crypto currency people can transfer money faster and it is cheaper because people don't need to give extra charge for transferring their money. As for physical currency, paper notes or coins can be stolen easily which means it is not secured if the user of that money is not conscious. But on the other hand crypto currency is highly secured. In this currency "BITCOIN" is the widely known digital coin which is secured by a public ledger name "BLOCK CHAIN"(Minesso,et.al,2020). In this chain where every block are connected with this unique #code which is why it is impossible to change the # code and hack it. But people who don't have the knowledge of using devices will face difficulty using this crypto currency where physical money can play a vital role. People can find banknotes and coins everywhere but when we talk about crypto currency people need to go through a long process in order to have that digital money. On the other hand, one of the key advantages of digital currency is its ability to assist people without access to traditional banking services, such as bank accounts and credit cards, to participate in the economy (Rose,2015). In terms of the economy, physical currency and cryptocurrency have different implications. Physical currency is subject to inflation and is affected by government monetary policies, while cryptocurrency operates independently of central authorities, making it less susceptible to government intervention. However, The widespread use of cryptocurrencies could result in a shift away from conventional financial institutions, which would damage the stability of the economy and the government's ability to manage monetary policies effectively. However, there are also several challenges associated with both physical currency and cryptocurrency. Physical currency is susceptible to counterfeiting and theft, while cryptocurrency is prone to market volatility, hacking, and fraudulent activities (Williamson,2022). There is also a lack of regulatory frameworks for cryptocurrency, which raises concerns about its legality and stability in the long run .

Strategic path

In the author's opinion, the use of digital currency has the possibility to bring notable advantages in the economic system. However, it also

poses certain risks and obstacles that must be addressed.The government needs to educate the public about crypto- currency to promote its adoption.People around the world need to understand the working pattern of cryptocurrency and its advantages as well as drawbacks. So descriptive knowledge regarding cryptocurrency is highly required to embrace the new leading to speedy adaptation. Besides, in order to develop rules for digital currencies, governments need to leverage collaborative work with other businesses, which ensure safety and growth. This initiative advanced technology can be used while also protecting people's money. Additionally, investment in developing a secure infrastructure to support the use of cryptocurrency is must. Cryptocurrency transactions are secured through blockchain technology (Kulkarni and Patil,2020). Therefore, the government needs to propose an adequate budget for the development of secure blockchain technology infrastructure to establish the security of transactions.

Conclusion

Digital currency offers a lot of advantages that could completely transform our economy to a great extent. Given that the digital currency is decentralized, there are less requirements for middlemen like banks, which lowers transaction costs and faster processing times. The use of digital currency may accelerate economic mobility, particularly for the people who lack access to traditional banking service. The need for balance between invention and usage to safeguard consumers and the financial system while simultaneously promoting economic growth can be corroborated by the digital currencies. Moreover, digital currency not only offers greater transparency but also provides security, and privacy compared to physical currency. Beyond shadow of doubt, employment of blockchain technology, all transactions are documented securely and lowering the feasibility of fraud and hacking. Furthermore, consumers have more privacy and anonymity with pseudonymous money exchange. Digital currency serves numerous benefits to our economy, it is important to draw a balance between innovation as well as stability. However, the adoption of digital currency must be gradual and regulated, for good it should not undermine the integrity of the traditional monetary system. The right regulatory frameworks as well as infrastructure must be in place to ensure the safe and efficient use of digital currency, which can result in a more inclusive and prosperous economy.

References:

1. Ahmed, A. A., Saidu, A. A., & Kawure, J. H. (2022). The Roles of Central Bank Digital Currency over Physical Currency. *International Journal of Social Science Education Communication and Economics (SINOMICS JOURNAL)*, *1*(2), 75–92. https://doi.org/10.54443/sj.v1i2.10

2. Aleksi. G, Bank of Finland, The great illusion of digital currencies https://publications.bof.fi/bitstream/handle/10024/43571/BoF ER_1_2018.pdf?sequence=1&isAllowed=y

3. Amsyar, I., Christopher, E., Dithi, A., Khan, A. N., & Maulana, S. (2020). The Challenge of Cryptocurrency in the Era of the Digital Revolution: A review of Systematic literature. *Aptisi Transactions on Technopreneurship (ATT)*, *2*(2), 153–159. https://doi.org/10.34306/att.v2i2.96

4. Duque, J. J. (2020). State involvement in cryptocurrencies. A potential world money? *The Japanese Political Economy*, *46*(1), 65–82. https://doi.org/10.1080/2329194x.2020.1763185

5. Ferrari, M. M., Mehl, A., & Stracca, L. (2020). Central bank digital currency in an open economy. *ideas.repec.org*. https://ideas.repec.org/p/ecb/ecbwps/20202488.html

6. Ji, Y., & Shen, Y. (2021). Introduction to the special issue on digital currency. *China Economic Journal*, *14*(1), 1–3. https://doi.org/10.1080/17538963.2020.1870283

7. Kulkarni, M. S., & Patil, K. (2020). Block Chain Technology Adoption for Banking Services- Model based on Technology-Organization-Environment theory. *Social Science Research Network*. https://doi.org/10.2139/ssrn.3563101

8. Rose, C. (2015).*The Evolution Of Digital Currencies: Bitcoin, A Cryptocurrency CausingAMonetaryRevolution.*https://www.clutejournals.com/index.php/IBER/article/view/9353/9406

9. Williamson, S. D. (2022). Central bank digital currency and flight to safety. *Journal of Economic Dynamics and Control*, *142*, 104146. https://doi.org/10.1016/j.jedc.2021.104146

Authors' Biography:

Raian Kibria Rohan is currently enrolled in Bachelor of Science in Computer Science and Engineering (CSE) at Brac University. His interests include Dropshipping, stock market and software and he is constantly seeking to expand my knowledge in these areas.

Zeba Raisa is currently pursuing her Bachelor's degree in Microbiology from Brac University. She has a great interest in life science and astronomy.

Advancements in Artificial Organs and Prosthetics: Bridging the Gap Between Biology and Technology

Meer Zeshanul Wazid[1], Jubaida Niyasa Chowdhury[2], Rejwana Habib Ome[3]

[1]Biotechnology (BIO), Dept. of MNS, Brac University, meer.zeshanul.wazid@g.bracu.ac.bd

[2]Biotechnology (BIO), Dept. of MNS, Brac University, jubaida.niyasa.chowdhury@g.bracu.ac.bd

[3]Biotechnology (BIO), Dept. of MNS, Brac University, rejwana.habib.ome@g.bracu.ac.bd

Abstract

The article explores the intriguing connection between biology and technology in the field of artificial organs and prostheses. It highlights amazing advances such as prosthetic kidneys, hearts, lungs, retinas, and limbs. These advances have altered healthcare and empowered those who have lost limbs or organs. In addition, the essay highlights significant actors in this industry, as well as ethical considerations, privacy concerns, and prospects. While artificial organs hold enormous promise, they create complicated ethical and access issues. Nonetheless, continuous scientific and technical breakthroughs offer enormous promise for improving human capacities, affordability, and lifespan in the realm of artificial organs and prostheses in the future.

Keywords: Artificial Organs, Prosthetics, Bioartificial Organs, Artificial Kidney, Artificial Heart, Jarvik-7, SynCardia, Artificial Lungs, Artificial Retina, Retinal Disease, Argus II, Artificial Limbs, Prosthesis, Organ Transplantation Alternatives, Tissue Replacement, Brain-Computer Interfaces (BCIs), Bionic Limbs, Artificial Pancreas Systems, Biocompatibility.

Introduction

Have you ever wondered what would happen if the blind could see? If the damaged organs in a person's body can be replaced with artificial, yet working ones? While these things may sound impossible it is a reality of the present times. The interface of biology and technology, where inventiveness and compassion merge to change lives, is one of the most enthralling domains in the rapidly growing field of medical research and technology. In recent years, the advancements in these sectors have given escalation to outstanding innovations in the sectors of artificial organs and prosthetics. It was stated by Wang (2019) that organ failures were one of the prime reasons for transience all over the world in the past. Despite the improved pharmacological and clinical treatments, the death rates due to these organ failures were still high. Throughout the years, trials have been made to prolong life by transplanting failed organs, and at present, orthotopic organ transplantation is the only way to achieve this. However, this process is still majorly limited due to problems like high cost, immune refusal, donor deficiency, and moral dilemmas. Later on, with the increasing advancement in science and technology along with the development of substantial processing technology, the area of engineering artificial organs and prosthetics, also known as bioartificial organs, is becoming more and more fascinating. Now, some might think, what are these artificial organs? An artificial organ is an artificially made instrument that can be placed into a human body by connecting them to live tissues in order to exchange a natural organ that has become incompetent. This allows a person with organ failure or such condition to return to their regular life as soon as feasible.

Discoveries

According to Frost & Sullivan (2017), In the year 1982, Jarvik-7, the first completely functioning artificial heart was designed and was to be successfully implemented in a human. After that, some successful inventions have been made and more varieties of organs have been artificially made and transplanted. Among them, some noteworthy discoveries are:

❖ **Artificial Kidney**

Kidney failure is common. Patients with this condition can either choose to transplant or opt for dialysis. While both of these options can retain some of the disrupted kidney functions, there are also innumerable drawbacks. As stated by Nagasubramanian (2021), In the year 1943, Willem Johan Kloff introduced the first successful artificial Kidney, "The rotating drum dialyzer". At present, more advanced options are available.

Figure 1: Source: Mir, H. V. (2018). Artificial kidney development leaps forward. *The Oldish®*. https://www.theoldish.com/artificial-kidney-development-takes-leap-forward/

➢ **The Portable Artificial Kidney: (Harris, 2022)** These are lightweight and battery-driven devices that allow a person to filter blood at any time and place. This ensures frequent wastage removal and dialysis ability anywhere. This can enhance people's lifestyle and make it much easier. AKTIV and The Neokidney are some devices in development.

➢ **The Bioartificial Integrable Kidney: (Harris, 2022)** The focus of this device is to be implanted via surgery. It would have the ability to stay within the body for several years. This device will comprise a blood purifying unit along with human kidney cells. This device performs all tasks performed by a real kidney such as blood filtration, hormone secretion, blood pressure control, etc.

❖ **Artificial Heart**

Heart disease can be fatal as it is a significant organ of the body and is common for many. Although there are many medicines to cure heart diseases, they seem to be not very effective. Moreover, in the case of transplantation, the wait for a donor is long and lacks surety of succession. According to Khan & Jehangir (2014), In the year 1969, the first artificial heart was implanted in a human by Dr. Denton Cooley. This device was created using a roller pump that can transfuse blood continuously. It consists of a net-like texture that is like vascular grafts. In the coming years, more developments were made in the area of artificial heart and Dr. Robert Jarvik is known for his successful permanent artificial heart known as Jarvik-7. Later in 1982, the first permanent artificial heart was implemented in a 61-year-old patient. In 2010, the Jarvik-7 was renamed as "SynCardia temporary" which works on a motor with hydraulic and contains two artificial ventricles and corresponding valves. At present, SynCardia has progressed temporarily and it makes the patient's life much easier as it allows them the ability to perform daily activities. Today, SynCardia is the most successful artificial heart.

Figure 2: Source: Corscience GmbH & Co. KG. (2021, December 1). *"ReinHeart" Artificial Heart System: Corscience implements physiological control - Corscience.* Corscience https://www.corscience.com/success-stories/reinheart-artificial-heart-system-corscience-implements-physiological-control/

❖ **Artificial lungs**

Lung failures are common among people and many lose their lives due to it. Though lung transplant is a useful treatment, its number of limitations such as durability and lack of donors, an interest in the field of artificial lung support has grown. As per Naito et al. (2018), a new interest in artificial lung technologies has been fascinating. Patients suffering from advanced lung failures are at first given support through mechanical ventilation (MV). After that, in case of an even critical situation, full lung support is provided known as extracorporeal membrane oxygenation (ECMO). This device functions like lungs. In this process,the blood flow from the patient is diverted through an artificial lung for gas exchange, and then it is returned to the patient. More advanced artificial lungs are in the making intending to make people's lives a little easier and more comfortable.
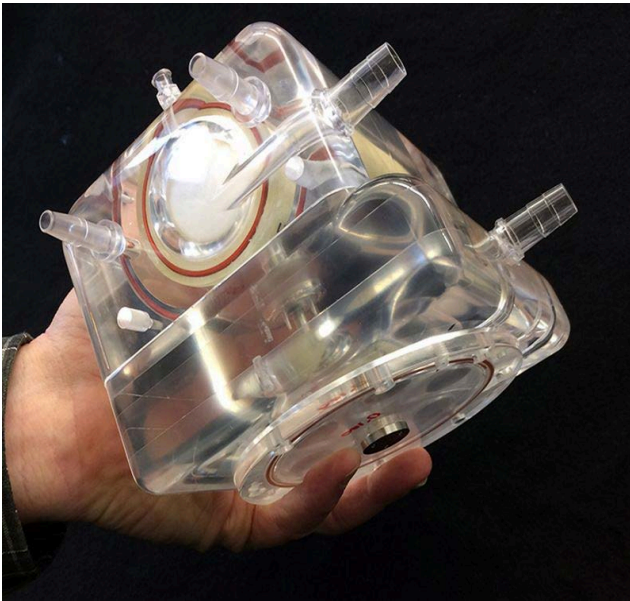

Figure 3: Source : Rieland, R. (2017, April 7). An Artificial Lung That Fits In a Backpack. *Smithsonian Magazine*. https://www.smithsonianmag.com/innovation/artificial-lung-fits-backpack-180962826/

❖ **Artificial Retina**

As stated by Farvardin et al. (2018), Retinal disease is a common yet serious widespread disease that results in vision loss as well as permanent blindness. The number of people suffering from retinal disease is constantly rising and is expected to triple by the year 2050. In these circumstances, one can only rely on technology for cures. Artificial retina, which when integrated in the eyes, allows the blind to see. In 2013, the first implanted device to treat adults with retinitis pigmentosa known as Argus II was approved by FDA. This device is surgically implanted in a patient. After implanting, patients are required to return after a certain time to program and customize the software according to their needs. This device consists of a receiver, electronic, and an electrode array, implanted in and around the eye. Argus II helps improve alignment and movement. It helps to determine people and understand their position. A patient with Argus II implanted can differentiate between colors and shapes. This is a fascinating invention so far and at present is actively being available to more and more patients.(American Society of Retina Specialists, n.d.)
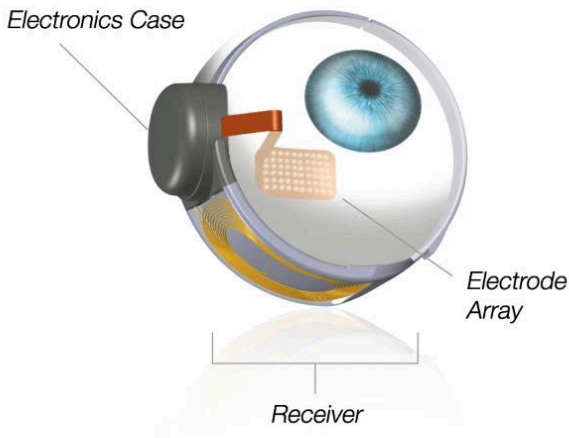

Figure 4: Source: Greenemeier, L. (2013). FDA approves first retinal implant. *Nature*. https://doi.org/10.1038/nature.2013.12439.

❖ **Artificial limbs (Prosthetics)**

In case of a missing body part in any individual, an artificial device is used and in medicine, this is known as a "Prosthesis". Prosthetics can be removable which allows a person to change it from time to time or have different ones for different tasks. E.g., Artificial Hand. There is also another type of prosthetics that are permanently integrated, such as artificial teeth. The use of prosthetic limbs has been going on for a long time. Only in 1948, the electric version of such prosthetics was introduced and in 1960 the first clinical myoelectrical prosthesis was revealed. According to the article *Prosthetics | Artificial Limbs | Limb Replacement for Amputees* (2021), Prosthetics can be of three types:

> ➢ **Cosmetic Prosthetics:** Cosmetic prosthetics are external prosthetics where the main aim is to provide a life-like depiction of an absent body part, which often doesn't have any functional roles.
> ➢ **Body-Powered Prosthetics:** Body-power prosthetics are a great tool that can restore movement such as picking up and holding objects. These prosthetics allow the muscles around it to control the device's cables and enable movement. Though it can control one movement at a time, it provides a greater amount of freedom to its users.
> ➢ **Myoelectric Prosthetics:** The myoelectric prosthetic is the most functional device for an individual. It gives a patient the same experience as regulating the nerves of the same body part. When the device receives the action abilities, it applies a rechargeable battery to increase the electrical signal while using the electric signals to drive the motors that move each separate part of the limb. This gives more freedom and spares the person from having to make recurring and exhausting muscle contractions.

Figure 5: Source: Staff, H. (2021, March 25). *The science behind fabricating prosthetic hands and arms*. Horton's Orthotics & Prosthetics. https://www.hortonsoandp.com/the-science-behind-fabricating-prosthetic-hands-and-arms/

Prosthetic limbs are essential to people who have lost a body part due to any disease or accidents or during birth as these can help them reestablish the abilities that were lost. While these prosthetics cannot fully copy the limb's functions, it's still advancing for the better and will be functioning more like real limbs due to recent significant developments.

Current Applications & Interests

The combination of biology and technology has yielded remarkable progress in the advancement of artificial organs and prosthetics. These advancements have transformed the lives of millions of people worldwide, providing solutions to organ failure and limb loss. Artificial organs and prosthetics have current applications in various fields. These applications advance healthcare, technology, and human capabilities. Some of the current applications are:

❖ **Medical Applications**
- ➢ Organ Transplantation Alternatives: Artificial hearts, kidneys, lungs, and other organs serve as life-saving alternatives while patients await organ transplants.
- ➢ Tissue Replacement: Bioengineered tissues and organs offer potential solutions for patients in need of replacements for damaged or diseased tissues.
- ➢ Limb Replacement: Prosthetic limbs, including advanced bionic and myoelectric devices, restore mobility and functionality to individuals with limb loss.
- ➢ Treatment of Organ Failure: Artificial organs can provide temporary or long-term solutions for organ failure due to conditions like heart failure, kidney disease, or respiratory disorders.

❖ **Brain-Computer Interfaces (BCIs)**
- ➢ These are devices that allow directly connecting the brain with a computer or other extrinsic equipment. (Saha et al., 2021)
- ➢ BCIs enable individuals with paralysis to control robotic limbs, computer interfaces, and communication devices using their thoughts. These systems enhance the independence and communication abilities of users.
- ➢ They provide increased flexibility by either usurping or boosting human outer functioning potential. (Saha et al., 2021)

❖ **Prosthetic Limbs**
- ➢ Bionic Limbs: Advanced prosthetic limbs, including bionic arms and legs, provide users with natural movement and sensory feedback, enhancing their mobility and quality of life. (Fleming et al., 2021)
- ➢ Myoelectric Prosthetics: Myoelectric prostheses are controlled by muscle signals, allowing users to perform precise and coordinated movements.

❖ **Sensory Restoration**

According to Kleinlogel et al. (2020),

- ➢ Cochlear Implants: Cochlear implants rehabilitate hearing in persons who are facing extreme deafness by precisely reviving the auditory nerve.

➢ Retinal Implants: Retinal implants rehabilitate vision for people with specific kinds of blindness, i.e. retinitis pigmentosa.

❖ **Orthopedic Prosthetics**

As per Bashir et al.(2022),

➢ Prosthetic devices for lower limbs, such as below-knee and above-knee prostheses, enable amputees to walk and perform daily activities with greater ease.

➢ Ankle-foot orthoses (AFOs) provide support and improve mobility for individuals with foot drop or other gait abnormalities.

These present applications demonstrate the various and ever-changing uses of artificial organs and prostheses to improve healthcare, human capacities, and overall quality of life for persons with medical conditions and disabilities.

Figure 6: Source: Cartoon_Based_Lifeforms. (n.d.). *Flat icons - artificial organs. EPS 10. Isolated objects*. iStock. https://www.istockphoto.com/se/vektor/flat-icons-artificial-organs-5-g m593300008-101804599

Moreover, many companies and research institutions across the world are engaged in the development and advancement of artificial organs

and prosthetics. These organizations are at the frontline of revolution in bridging the gap between biology and technology.

❖ Medtronic

Medtronic is a global medical technology company, specializing in the creation of artificial organs and devices. They've made life-saving gadgets like pacemakers, artificial heart valves, and insulin pumps in the past (Medtronic, n.d.).

❖ SynCardia Systems

The Total Artificial Heart (TAH), manufactured by SynCardia, is a device intended to temporarily take the place of the human heart. For patients awaiting a heart transplant, it serves as a transitional procedure (Copeland, 2013).

❖ Ossur

An Iceland company, Ossur is a leader in the field of prosthetics and orthopedic devices. They are known for their advanced prosthetic limbs, including the Proprio Foot, which uses sensor technology for a more natural gait (*About Össur*, n.d.).

❖ Deka Research and Development

The DEKA Arm, a highly sophisticated prosthetic arm with several degrees of freedom and natural movement, was created by the Deka business. The Department of Veterans Affairs and DARPA both provided funding for its development (Resnik et al., 2014).

❖ ReWalk Robotics

ReWalk Robotics creates wearable exoskeletons for those who have suffered spinal cord injuries. These technologies let people stand, walk, and explore their surroundings independently. (ReWalk Robotics, 2023)

❖ **University of Pittsburgh - Rehabilitation Institute**

This research institute has made major contributions to the fields of brain-computer interfaces (BCIs) and neural-controlled prosthetics, working on technologies that allow people who are paralyzed to operate robotic limbs with their thoughts (Young et al., 2021)

❖ **Stanford University - Stanford Biomechatronics Lab**

This Stanford lab is dedicated to the development of cutting-edge prosthetic limbs and exoskeletons, with a focus on improving user comfort and control. (*Biomechatronics Laboratory*, n.d.)

To conclude, these organizations are pushing the boundaries of what is feasible in the realm of artificial organs and prosthetics. Their transdisciplinary collaboration and technological developments are bridging the biology-technology divide.

Methodology
Various surveys and interviews with patients and medical professionals as well as researchers are conducted to understand the challenges related to organ failures along with limb loss and various healthcare requirements. Different existing medical data, patient results, and medical experiences are also evaluated to mark the specific area that needs to be improved.
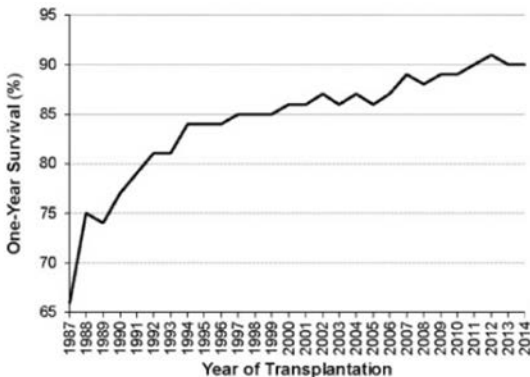

Figure 7: Source : The one-year survival rate of liver transplantation graph exhibits a significant rise from 1987 to 1994, then followed by relative stability.
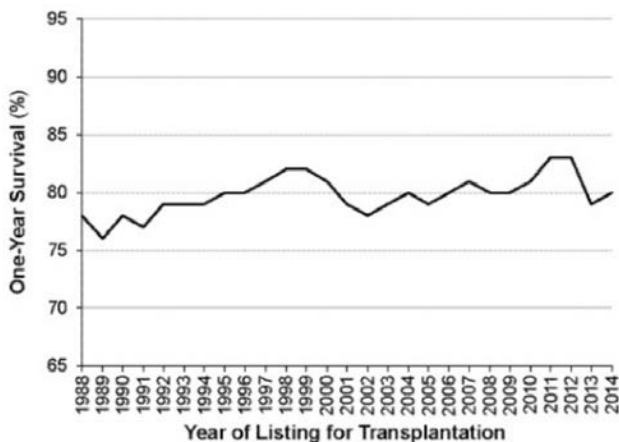
Figure 8: Source: From 1988 to 2014, the one-year intent-to-treat survival rate of the liver transplantaion graph is unchanged.Rana, A., & Godfrey, E. L. (2019). Outcomes in Solid-Organ Transplantation: Success and stagnation. *Texas Heart Institute Journal*, *46*(1), 75–76. https://doi.org/10.14503/thij-18-6749

Moreover, numerous existing research articles, scientific literature, and patient cases related to artificial organs are thoroughly reviewed and gaps in knowledge, emerging trends, and areas with potential for development are identified. Furthermore, some clinical data are collected and analyzed to determine the effect of technology on artificial organs and prosthetics as well as consider strategies to make this technology accessible to a wide population including those with low resources.

Convergence of Biology and Technology

The convergence of biology and technology has aided in the advancement of artificial organs and prostheses. According to Bronzino & Peterson (2016), The following are key components of this convergence:

❖ **Biomaterials:** Biomaterial advancements have been critical in the creation of artificial organs and implants. Biocompatible polymers, metals, and ceramics have enabled the development of long-lasting and safe implants. Researchers are also

investigating the usage of biodegradable polymers that can be absorbed by the body without causing long-term problems.

❖ **Bioinformatics:** Bioinformatics has enabled accurate contriving and intimating biological processes, assisting in configuring and optimizing artificial organs. Researchers can use computational tools and algorithms to examine complicated biological data and imitate the activity of organs or prosthetic devices within the body.

❖ **Tissue Engineering:** Tissue engineering blends biological and engineering concepts to generate functioning, live tissues. This approach is especially relevant to artificial organs thus it tries to create organs or components that closely resemble their natural counterparts. Tissue engineering has been transformed by 3D printing and bioprinting technologies, which enable the fabrication of complex structures with cell-based components.

❖ **Sensing and Control Systems:** Natural movement and feedback are enabled through the integration of sensor and control systems in prosthetics. Microelectronics and neural interface advancements have enabled prosthetic devices to be connected directly to the nervous system, allowing users to operate their mechanical limbs with astonishing accuracy.
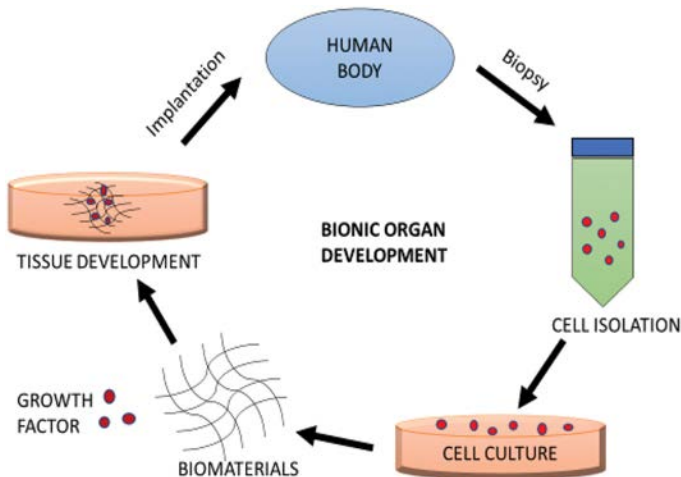

Figure 9: Source : The creation of an artificial organ: Shanmugam, D. K., Anitha, S., Souresh, V., Madhavan, Y., Sampath, S., Venugopal, D. C., & Saravanan, M. (2023). Current advancements in the development of bionic organs using regenerative medicine and 3D tissue engineering. *Materials Technology*, *38*(1). https://doi.org/10.1080/10667857.2023.2242732

Advantages

Advances in prostheses and artificial limbs have enabled people with various illnesses, accidents, or disabilities to experience a major improvement in their quality of life. These developments are bridging the biology-technology divide in several ways, providing many benefits:

- **Improved accessibility and sustainability**

As per Wang, 2019 and Sohn et al., 2020**,** Advances made in Technology and Biotechnology have led to the development of advanced limbs, enabling them to function like natural organs along with compatible materials that have reduced the risk of tissue rejection. As a result, the prosthesis blends more naturally with the body reducing various discomforts and helping the users perform a greater task.

- **Individualized ideas**

Advances in 3D printing and scanning technology are now creating prosthetics and artificial limbs to fit each patient's specific anatomy. These customizations improve the fit and functionality of these gadgets. (Zhu et al., 2021)

- **Improved lifetime along with Decreased health risk, disability, and pain**

Prostheses are stronger and last longer, requiring fewer replacements or repairs. Side by side improved materials and technology are reducing the risk of prostheses and prosthesis-related complications, infections, and other health problems as well as pain and weakness through a variety of treatments (Surgeons., 2002). A prosthetic limb, for example, helps an amputee walk pain-free and lead a more active life. (Klak et al., 2020)

- **Economic benefits**

Such scientific developments have many positive effects on the economy. First and foremost, manufacturing and marketing prostheses have led to a thriving industry, furthering study, innovation, and job prospects. This expansion has helped industry research firms, medical

device producers, and biotechnology firms. The improved quality of life for those who can now afford state-of-the-art prostheses also has a significant financial impact. (Horrocks, 2022)

- **Research possibilities**

Research and innovation in areas such as tissue engineering, regenerative medicine, and neuroprosthetics have been stimulated by the development of artificial limbs and prosthetic limbs. Beyond prosthetics, a wide range of medical fields could benefit from these developments in several ways. (Future Visions: The Future Possibilities of Artificial Organs, 2023)

- **Scientific advancement**

A significant step in the development of prosthetics as well as artificial organs is bridging the biology-technology divide. Through these developments, we leverage our knowledge of biology, including tissue engineering, biomaterials, and medical imaging, to create cutting-edge prostheses and prosthetic devices. For example, regenerative medicine has made it possible to create bioengineered organs such as artificial hearts and kidneys, while 3D printing and nanotechnology have made it possible to create personalized and highly functional artificial organs. (Altınörs, 2021)

Complications

Learn more about some of the limitations and pitfalls involved in the development of artificial limbs and prosthetics:

- **Cost issues**

Access to these advanced life-changing technologies is limited because of the high costs connected with the design, manufacture, and maintenance of sophisticated prostheses and prosthetics. Finding solutions to reduce production costs keeping in mind patient affordability is now an important task. (Malchesky, 2001)

- **Compatibility And Biocompatibility issues**

Despite great progress, total biocompatibility is still difficult to achieve. Moreover, when some manufacturers make individual parts for prosthetic limbs or prosthetic systems, various interoperability issues can arise. Various adjustments are crucial depending on the comfort of the users and the functionality of the device. (Masci, 2022)

- **Limitations of sensory**

Replicating the complex sensory functions of real limbs and organs in artificial devices has not yet been very successful. These devices need further advancements to give people more realistic and better results. (Wan et al., 2019)

- **Complicated surgical operations**

A variety of complex and invasive surgeries are often required when implanting a prosthesis or device. Advances in robotic surgery and minimally invasive surgical procedures can reduce risks and speed recovery. (Sabbih & Kulabhusan, 2021)

- **Fixed life expectancy**

Various prostheses and prostheses have a limited lifespan and may require replacement or maintenance from time to time. Practicing predictive maintenance and extending the life of these devices can reduce the hassle and cost of additional. (De Jongh et al., 2022)

- **Limited self-reliance**

A few prostheses require external regulator structures or current health professional supervision, which limits the user's degree of autonomy. The development of autonomous and self-regulating technologies can enable users to become more successful and independent. (De Jongh et al., 2022)

- **Research deficits**

Although prosthetics and prosthetics research has advanced significantly, these limitations in means of spending on ongoing research and development must be addressed. To foster innovation, it involves multidisciplinary collaboration between biologists, engineers, material scientists, and doctors. (Aman et al., 2019)

Researchers, engineers, healthcare professionals, policymakers, and patient advocates must work together to overcome such barriers. It is expected that continued developments in technology, materials science, and medical research will remove many of these restrictions, making prostheses and prostheses more widely available, efficient, and adaptable to individuals' lifestyles.

Analysis & Controversies

According to Bunnik et al. (2022), While advancements in artificial organs and prosthetics hold immense potential, they are not without their share of analysis, controversies, and ethical considerations. Here, we delve into some of the key points of contention and discussions surrounding this field:

- ❖ **Ethical Concerns:**
  - ➢ Resource Allocation: The cost of developing and implanting artificial organs and prosthetics can be substantial. Ethical conundrums arise regarding resource allocation, because these technologies may not be accessible to all individuals, potentially increasing various healthcare disparities.
  - ➢ Improvement vs. Medication: Enhancement of prosthetics and bionics become more advanced, questions emerge with a doubt about whether these technologies should primarily serve as medical treatments or if they can be utilized for human enhancement, raising ethical debates about the definition of "normal" *Homo sapiens* capabilities.
- ❖ **Safety and Long-Term Risks: (Bazaka & Jacob, 2012)**
  - ➢ Lifetime: Some prostheses have a limited lifespan which requires a replacement of the patient's life.

This increases concerns about the frequency of invasive tumors and their associated dangers.

- ➢ Nerve Connections: Integration of artificial limbs and prosthetics with neural interfaces may raise privacy concerns. Access to individuals' neural data can be exploited which leads to potential breaches of privacy and misuse of personal details.

❖ **Autonomy and Consent:**
- ➢ Approval Information: Informed consent is often required from patients for the placement of advanced technologies such as prostheses. Confirming that patients completely understand the threats, advantages, and associations of these technologies can be challenging, especially when trading with unsafe citizens.

❖ **Cultural and Societal Impact:**
- ➢ Self Image and Identification: The use of artificial limbs and prosthetics can affect a person's body image and sense of identification. Social viewpoints towards people with noticeable prosthetic augmentation may change, potentially leading to issues of taking and inequity.
- ➢ Community-based Principles: As these technologies become more ordinary, community-based norms regarding disorder, individual machine integration, and human ability may develop, leading to debates about "normal" means.

❖ **Technological Limitations:**
- ➢ Control Biological Difficulty: Artificial organs and artificial materials must replicate the difficulty of essential biological systems. Achieving this level of experience is challenging, and technology limitations can lead to substandard results or complications.

❖ **Regulatory Frameworks:**
- ➢ Confirm Security: Regulatory agencies face the challenge of evolving and tooling strong mistakes and security standards for prosthetic limbs and prosthetics to ensure their security and benefit.

❖ **Psychological and Societal Impact:**
- ➢ Depending on Technology: There is a threat that persons who rely on prosthesis or artificial devices

may become dependent on technology, potentially leading to emotional challenges related to identification and self-sufficiency.

➢ Unexpected Outcomes: The combination of advanced technology into the human body can lead to unintended consequences, such as changes in human actions, social direction, and the environment. These findings may raise concerns and debates.

To summarize, improvements in prostheses and prostheses provide great benefits but sometimes lead to heavy debates and disagreements such as safety issues, privacy issues, and access and equity. As technology develops, it is essential to consciously address these issues to confirm that new technologies are developed and applied in ways that benefit all of humanity.

Future Prospects

Artificial organs and prosthetics are a matter of great interest to many. Currently, a great number of advancements can be seen in this sector. Moreover, additional developments are being introduced and are on the way. According to the article *Future Visions: The Future Possibilities of Artificial Organs* (2023), Artificial stomachs, livers, pancreas, sensory organs, etc., can all be artificially made and are mostly still in testing phases. A certain number of limitations needs to be surpassed and that is the main aim for these artificial organs. Certain objectives for the future are:

- Improving human abilities so that the users can perform tasks that are more than what natural organs and limbs can do.
- Ensuring the availability as well as affordability of these prosthetics and artificial organs.
- Increased lifespan and functionality of these devices.
- Overcoming the limitations of organ transplantations like a rejection of organs, the possibility of infections, and other serious complications.

While these features are being integrated into artificial devices, more technological advancements are also in progress. It can be observed that the future of artificial organs and prosthetics is promising and is committed to making the lives of individuals around the world easier.

Conclusion

To conclude, advances in artificial limbs and prosthetics review an interesting intersection of biology and technology, where creativity and sympathy collide to improve life. These discoveries have overcome considerable medical difficulties, providing treatment for organ failure and organ damage that were previously thought to be complex. Despite improvements in pharmacological and therapeutic therapies, organ failure has really been a primary cause of death worldwide. Although orthotopic organ transplantation has saved lives, it has been inhibited by difficulties such as cost, immunological refusal, donor shortages, and ethical issues. However, with significant improvements in science, technology, and operating capabilities, creating bioprostheses has emerged as an fascinating and encouraging avenue. Prosthetics, which are man-made devices incorporated into the human body and attached to living tissues, have the ability to replace defective natural organs, allowing patients to restart normal lives.To guarantee that these discoveries benefit all of mankind in this quickly growing sector, it is crucial to address the ethical, social, and technological concerns deliberately, with the participation of stakeholders from varied backgrounds. The future of artificial organs and prostheses promises an enticing path toward better healthcare and human potential.

References:

1. About Össur. (n.d.). Össur. https://www.ossur.com/global/about-ossur
2. Aman, M., Sporer, M. E., Gstoettner, C., Prahm, C., Höfer, C., Mayr, W., Farina, D., & Aszmann, O. C. (2019). Bionic hand as an artificial organ: Current status and future perspectives. Artificial Organs, 43(2), 109–118.https://doi.org/10.1111/aor.13422
3. Altınörs, M. N. (2021). Prospects of organ transplantation. In IntechOpen eBooks. https://doi.org/10.5772/intechopen.94367
4. Bashir, A., Dinkel, D., Pipinos, I. I., Johanning, J. M., & Myers, S. A. (2022). Patient compliance with wearing lower limb assistive devices: A scoping review. *Journal of Manipulative and Physiological Therapeutics*, *45*(2), 114–126. https://doi.org/10.1016/j.jmpt.2022.04.003
5. Bazaka, K., & Jacob, M. V. (2012). Implantable Devices: issues and challenges. *Electronics*, *2*(4), 1–34. https://doi.org/10.3390/electronics2010001
6. Bronzino, J. D., & Peterson, D. R. (2016). *Tissue engineering and artificial organs*. CRC press.https://books.google.com.bd/books?hl=en&lr=&id=N4Ir BgAAQBAJ&oi=fnd&pg=PP1&dq=biomaterials+bioinformat ics+tissue+engineering,+sensing+system+in+artificial+organ &ots=GPE2sDinMA&sig=4tGh2Ziwjkj3viFNveGzVii7ijI&re dir_esc=y#v=onepage&q=biomaterials%20bioinformatics%20 tissue%20engineering%2C%20sensing%20system%20in%20a rtificial%20organ&f=false
7. Bunnik, E. M., De Jongh, D., & Massey, E. K. (2022). Ethics of early clinical trials of Bio-Artificial Organs. *Transplant International*, *35*. https://doi.org/10.3389/ti.2022.10621 *Biomechatronics Laboratory*. (n.d.). Biomechatronics Laboratory. https://biomechatronics.stanford.edu/
8. Copeland, J. G. (2013). *SynCardia Total Artificial Heart: update and future*. PubMed Central (PMC). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3853833/
9. De Jongh, D., Massey, E. K., Cronin, A., Schermer, M., & Bunnik, E. M. (2022). Early-Phase Clinical Trials of Bio-Artificial Organ Technology: A Systematic Review of

ethical issues. Transplant International, 35. https://doi.org/10.3389/ti.2022.10751

10. Farvardin, M., Afarid, M., Attarzadeh, A., Johari, M., Mehryar, M., Nowroozzadeh, M. H., Rahat, F., Peyvandi, H., Farvardin, R., & Nami, M. (2018). The Argus-II retinal prosthesis implantation; from the global to local successful experience. *Frontiers in Neuroscience*, *12*. https://doi.org/10.3389/fnins.2018.00584

11. Fleming, A., Stafford, N., Huang, S., Hu, X., Ferris, D. P., & Huang, H. (2021). Myoelectric control of robotic lower limb prostheses: a review of electromyography interfaces, control paradigms, challenges, and future directions. *Journal of Neural Engineering*, *18*(4), 041004. https://doi.org/10.1088/1741-2552/ac1176

12. Frost & Sullivan. (2017). Innovations in Artificial Organs. Alliance of Advanced Biomedical Engineering. https://aabme.asme.org/posts/innovations-in-artificial-organs , *Future Visions: The future possibilities of artificial organs*. (2023, August 21). https://www.tomorrow.bio/post/future-visions-the-future-possibilities-of-artificial-organs-2023-08-5018310468-futurism

13. Harris, T. (2022, May 3). The dawn of the artificial kidney. https://pkdcharity.org.uk/news-events/blogs/2-the-dawn-of-the-artificial-kidney

14. Horrocks, L. (2022, October 7). Why study biomedical engineering at the degree level? https://www.hotcoursesabroad.com/study-abroad-info/subject-guides/why-study-biomedical-engineering/

15. Khan, S., & Jehangir, W. (2014). Evolution of Artificial Hearts: An Overview and History. Cardiology Research, 5(5), 121–125. https://doi.org/10.14740/cr354w

16. Klak, M., Bryniarski, T., Kowalska, P., Gomółka, M., Tymicki, G., Kosowska, K., Cywoniuk, P., Dobrzański, T., Turowski, P., & Wszoła, M. (2020). Novel strategies in artificial organ development: What is the future of medicine? Micromachines, 11(7), 646. https://doi.org/10.3390/mi11070646

17. Kleinlogel, S., Vogl, C., Jeschke, M., Neef, J., & Moser, T. (2020). Emerging approaches for restoration of hearing and vision. *Physiological Reviews*. https://doi.org/10.1152/physrev.00035.2019

18. Malchesky, P. S. (2001). Artificial organs and vanishing boundaries. Artificial Organs, 25(2), 75–88. https://doi.org/10.1046/j.1525-1594.2001.025002075.x

19. Masci, D. (2022, April 13). Human enhancement: scientific and ethical dimensions of genetic engineering, brain chips and synthetic blood. Pew Research Center Science & Society.https://www.pewresearch.org/science/2016/07/26/human-enhancement-the-scientific-and-ethical-dimensions-of-striving-for-perfection/

20. Medtronic. (n.d.). *The Medtronic story: Leading healthcare technology innovation since 1949*. https://europe.medtronic.com/xd-en/our-company/history.html

21. Nagasubramanian S. (2021). The future of the artificial kidney. Indian journal of urology : IJU : journal of the Urological Society of India, 37(4), 310–317. https://doi.org/10.4103/iju.IJU_273_21

22. Naito, N., Cook, K. E., Toyoda, Y., & Shigemura, N. (2018). Artificial lungs for lung failure. Journal of the American College of Cardiology, 72(14), 1640–1652. https://doi.org/10.1016/j.jacc.2018.07.049

23. Prosthetics | Artificial Limbs | Limb Replacement For Amputees. (2021, February 11). LeTourneau Prosthetics and Orthotics Southeast Texas. https://www.llop.com/prosthetics/

24. Resnik, L., Klinger, S. L., & Etter, K. (2014). The DEKA arm. *Prosthetics and Orthotics International*, *38*(6), 492–504. https://doi.org/10.1177/0309364613506913

25. ReWalk Robotics. (2023, August 8). *ReWalk Robotics - more than walking*. ReWalk Robotics, Inc. https://rewalk.com/#:~:text=ReWalk%20is%20a%20wearable%20robotic,use%20in%20the%20United%20States.

26. Sabbih, G., Kulabhusan, P. K., Singh, R. K., Jeevanandam, J., & Danquah, M. K. (2021). Biocomposites for the fabrication of artificial organs. In Elsevier eBooks (pp. 301–328). https://doi.org/10.1016/b978-0-12-821553-1.00010-7

27. Saha, S., Mamun, K. A., Ahmed, K. I., Mostafa, R., Naik, G. R., Darvishi, S., Khandoker, A. H., & Baumert, M. (2021). Progress in brain-computer Interface: challenges and opportunities. *Frontiers in Systems Neuroscience*, *15*. https://doi.org/10.3389/fnsys.2021.578875

28. Sohn, S., Buskirk, M. V., Buckenmeyer, M. J., Londono, R., & Faulk, D. (2020). Whole Organ Engineering: Approaches,

Challenges, and Future Directions. Applied Sciences, 10(12), 4277. MDPI AG. https://www.mdpi.com/2076-3417/10/12/4277

29. Surgeons, A. A. O. O. (2002). Atlas of Limb Prosthetics: Surgical, Prosthetic, and Rehabilitation Principles. Amer Academy of Orthopaedic.

30. The American Society of Retina Specialists. (n.d.). *FDA Approves World's First Artificial Retina - The American Society of Retina Specialists.* ASRS. https://www.asrs.org/publications/retina-times/details/131/fda-approves-world-first-artificial-retina

31. Wang X. (2019). *Bioartificial Organ Manufacturing Technologies. Cell transplantation, 28*(1), 5–17. https://doi.org/10.1177/0963689718809918

32. Young, M. J., Lin, D. J., & Hochberg, L. R. (2021). Brain–Computer interfaces in neuro recovery and neurorehabilitation. *Seminars in Neurology*, *41*(02), 206–216. https://doi.org/10.1055/s-0041-1725137

33. Zhu, G., Hou, Y., Xu, J., & Zhao, N. (2021). Reprintable polymers for digital light processing 3D printing. Advanced Functional Materials, 31(9), 2007173. https://onlinelibrary.wiley.com/doi/abs/10.1002/adfm.2020071 73

Authors' Biography:

Meer Zeshanul Wazid, an ambitious undergraduate biotechnology student, currently studying at BRAC University. His ultimate goal is to contribute to revolutionary biotech research and discoveries by combining his academic knowledge, laboratory skills, and love of creativity. Moreover, he has the potential and experience to coordinate events, Trustworthy, Enthusiastic, Punctual, Self-motivated, Critical Thinking, Organizational Behavior, Adaptable, Compassionate to teamwork, time management, enthusiasm for biotechnology, and proactive and growing leadership qualities as well

Jubaida Niyasa Chowdhury, an ardent and creative undergraduate biotechnology student at Brac University. With an innate interest in innovation and an insatiable curiosity in the field of biotechnology, she wants to explore intersections between biotechnology and creativity along with technology. She is dedicated to learning more and discovering the uncharted territories of biotechnology. She envisions a time in the future when innovation and science coexist harmoniously, pushing the limits of biotechnology.

Rejwana Habib Ome, an enthusiastic undergraduate, is working towards a degree in biotechnology. She has actively participated in a variety of research initiatives throughout her academic career since she has a great interest in scientific discovery. Her interest in biotechnology first arose in high school and has only been greater since then.

RTP106

Nanotechnology:
Revolutionizing Drug Delivery, Diagnostics, and Therapeutics

Meer Zeshanul Wazid[1]
[1]Biotechnology (BIO), Dept. of MNS, Brac University,
meer.zeshanul.wazid@g.bracu.ac.bd

Abstract
Nanotechnology has emerged as a game-changer in medicine, providing novel solutions in medication delivery, diagnostics, and treatments. This mini-research article investigates the revolutionary influence of nanotechnology on healthcare, emphasizing current advances and discoveries in the use of nanoscale materials and technologies. Nanotechnology is altering the healthcare scene, offering more effective therapies and better patient outcomes. It ranges from tailored drug delivery systems to sensitive diagnostic instruments and cutting-edge therapeutic techniques. The article highlights recent applications of nanotechnology in medicine, including drug transport, diagnostics, and therapeutics, current interests, discoveries, advantages, challenges, and future prospects. All the research and information gathered are based on online and offline valid sources.

Keywords: Nanotechnology, Medicine, Nanomedicine, Drug Delivery, Diagnostics, Therapeutics, Cancer Therapy, Heart Disease, Tissue Engineering, Protein Detection, Nanoparticle-Based Vaccines, Cell Manipulation, Antibacterial Treatment, Metallic Nano Dendrites, Molecular Medicine, Nanobiotechnology, SNA-NCs (Self-Navigating Nanocarriers), Nanotechnology-Enabled Constructs.

Introduction
Nanotechnology is the contrivance and engineering of materials at the nanoscale, which is generally less than 100 nanometers in diameter. This technique has opened up interesting prospects in the fields of medication delivery, diagnostics, and therapies in medicine. The capacity to manipulate matter at the atomic and molecular levels has resulted in the creation of revolutionary disease-fighting tactics with previously inconceivable accuracy and efficiency.

As stated by Rizzo et al. (2013), understanding the field of medicine has appeared to be a life-changing choice. It has provided new ways of detecting target diseases and altering the therapeutic outcome. With the combination of nanotechnology and medicine, a new term, "nanomedicine," has achieved prominence and is applied to applications of nanotechnology in medicine surrounding both therapeutics and diagnostics.

Current applications

The implementation of nanotechnology in medicine comprises the use of specially tailored chemicals to provide novel medicines and technologies that may lower toxicity while also improving therapeutic efficacy and delivery. According to Anjum et al. (2021), nanomaterials are progressively utilized for diagnostic, visualization, and targeted medicine delivery purposes. Nanotechnology facilitates the advancement of customized medicine, in which patient medication is prepared to the patient's genetics along with illness profile. Many functional nanotechnological applications in cancer research have been found so far, including technology for tumor detection and cancer biomarkers.
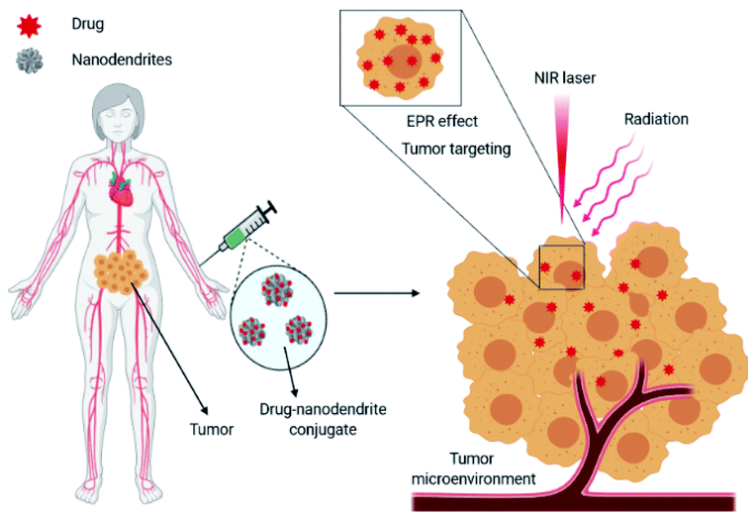

Figure 1: Source: Metallic nano dendrites as therapeutic agents in cancer treatment.: Oladipo, A. O., Nkambule, T. T., Mamba, B. B., & Msagati, T. A. (2020). Therapeutic nanodendrites: current applications and prospects. *Nanoscale Advances*, *2*(11), 5152–5165. https://doi.org/10.1039/d0na00672f)

Application involves representation techniques to make therapeutic approaches and devices that may lower risk while improving the power and execution of medications is one example of nanotechnology's utilization in medicine.

- ❖ **Cancer Therapy:** The concept is to engage nanoparticles to supply medications directly to cancer cells, keeping healthy tissues and organs unhurt. (Chitkara et al., 2019)
- ❖ **Nanotechnology and Heart Disease:** In the case of heart diseases, nanotechnology is used to transport drugs to the damaged area with the help of certain nanoparticles known as a Tissue plasminogen activator (TPA). These nanoparticles break clots and increase blood flow. (Zdrojewicz et al., 2015)
- ❖ **Tissue engineering:** Artificial implants (reconstructed joints, vascular discs, and bolts) are one of the most compelling advances in tissue engineering.
- ❖ **Protein detection:** To detect protein-protein interactions (PPIs) researchers are engaging nanotechnology to remove proteins that let cancer cells grow in the body.
- ❖ **Cell manipulation:** By changing the structure of biological cells, nanoparticles recruit capsules to distribute and transport components in a specific location of the body.
- ❖ **Antibacterial Treatment:** Nanocrystalline silver was first used as an anti-inflammatory drug for chronic wounds, becoming the first nanomedicine application of nanotechnology in medicine.
- ❖ **Nanomedicine:** Though nanomedicine practices are relatively new in pharmaceuticals, this industry is growing rapidly. According to Zdrojewicz et al. (2015),
  - ➢ Nanomedicine can target and destroy cancer cells successfully and accurately, without harming other cells like chemotherapy or other traditional cancer therapy
  - ➢ Nanomedicine can be used to diagnose and treat atherosclerosis and lower risks of cardiovascular diseases.
  - ➢ Nano-particle-based vaccines are a huge achievement against SARS-COV-1 & SARS-COV-2.
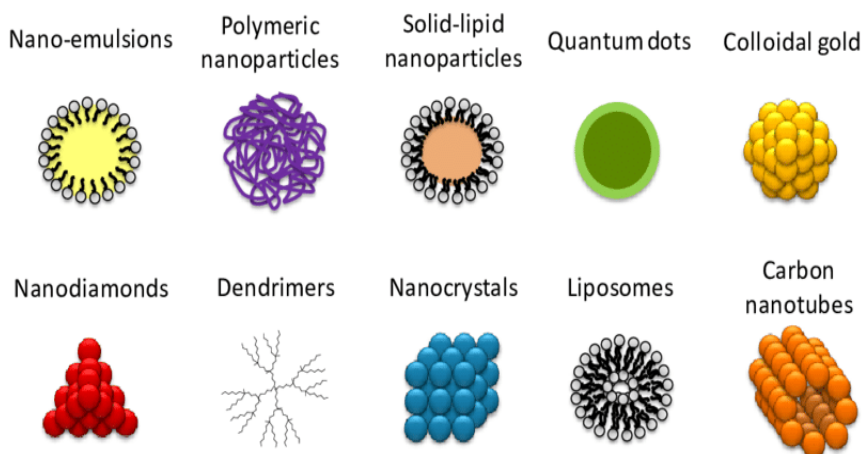
Figure 3: Source Some common Nanomedicines: *Schematic-representation-of-the-most-commonly-used-nanomedicine-types-composed-of.png(850×387).* (n.d.). https://www.researchgate.net/publication/313022151/figure/fig2/AS:614265513844758@1523463719674/Schematic-representation-of-the-most-commonly-used-nanomedicine-types-composed-of.png)

❖ **Metallic Nano dendrites (NDs):** When contrasted with nanorods, nanostars, and nanoshells, sophisticated structures such as Nano dendrites can significantly improve photo absorption.

Nano dendrites (NDs)	Composition	Applications
AUNDS	Gold	Imaging and photo thermal therapy
PINDs	Platinum	Radiotherapy
AuNDs	Gold	Photo thermal and chemotherapy
PdAuNDs	Gold-over branched palladium	Photo thermal therapy
Au@PtNDs	Gold-core platinum shell	Imaging and photo thermal therapy
PtRuNDs	Alloyed platinum-ruthenium	Imaging, photo thermal, and radiotherapy
Au@PdNDs	Gold-core palladium shell	Stimuli-responsive drug delivery

Table 1: A summary of the Various metallic Nano Dendrites and Their Applications

Interest in this application

According to the article of Intelligence (2022), Some pharmaceutical/biotech companies researching the medicine sector using nanotechnology:

- ❖ **AlfaSigma SpA (Italy):** This corporation discovers drugs for different therapies and Clinical trials are used in hospitals, universities, and public and commercial health institutes to conduct medication research and development. It operates on the basis of plant production in Alanno, Pomezia, and Sermoneta. The FDA has recorded nanomedicines such as Adagen, Abelcet, and DepoCyt.
- ❖ **Dompe Farmaceutici SpA (Italy):** A company bringing innovative therapeutic solutions for the treatment of unusual diseases. Respiratory illnesses, cancer, diabetology, ophthalmology, organ transplantation, chronic obstructive pulmonary disease, and pulmonary arterial hypertension are among the research topics of this organization. Lumason is one of the FDA-approved nanomedicines.
- ❖ **GE Healthcare LLC (USA):** It is a multinational healthcare company that develops, produces, and manufactures diagnostic imaging and clinical equipment, as well as starting drug development, biopharmaceutical production, and cellular technologies.
- ❖ **Horizon Pharmaceuticals Inc (US):** This is a CDMO company. Its commodities are utilized in the pharmaceutical sector. Nanomedicines recognized by the FDA include Krystexxa.
- ❖ **Janssen Pharmaceuticals Inc (US):** It is an initiative of Johnson & Johnson which is a drug development company that provides treatments for acid reflux disease, infectious diseases, bipolar I disorder, schizophrenia, Alzheimer's disease, epilepsy, as well as migraine prevention and treatment. It also works in different sectors including, cardiovascular and metabolism, immunology, infectious diseases, vaccines, neuroscience, oncology, and other therapeutic areas. Janssen is based in Titusvi.

Discoveries in this application

According to Comprehensive Cancer Information (n.d.),

- ❖ The first nanotechnology-based cancer treatments have passed a regulatory examination and are now available on the market. Doxil and Abraxane are two examples of such medications.
- ❖ Nanotechnology has made it possible to create very sensitive biosensors and diagnostic instruments for detecting biomarkers, infections, and disease-related chemicals.
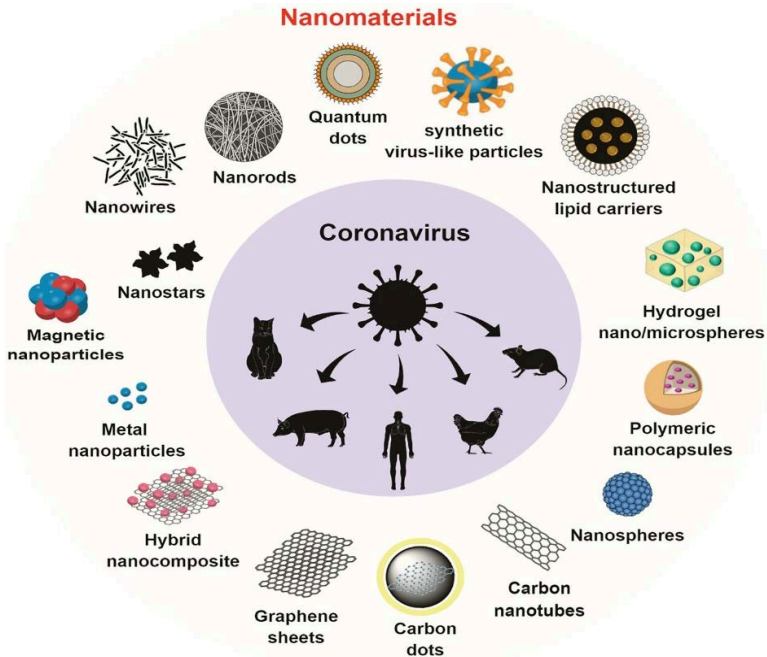
Figure 4: Source: Discovered advances in nanotechnology in Medicine since the pandemic): Anjum, S., Ishaque, S., Fatima, H., Farooq, W., Hano, C., Abbasi, B. H., & Anjum, I. (2021). Emerging applications of nanotechnology in healthcare Systems: grand challenges and perspectives. *Pharmaceuticals*, *14*(8), 707. https://doi.org/10.3390/ph14080707)

- ❖ Nanoscale tools and devices have been investigated for use in minimally invasive surgery and targeted tissue ablation, with the goal of minimizing the invasiveness and recovery time associated with typical surgical techniques.

- ❖ Several nanocarrier-based medications are already on the market, including Doxil, Dauno-Xome emend, Myocel, Oncaspar, and Combidex.
- ❖ Theranostic nanoparticles combine diagnostics and therapies in a single nanosystem, enabling real-time monitoring of treatment efficacy and therapy modification as needed. This method is very promising in cancer therapy.
- ❖ According to a September 2021 update, nanotechnology-based medication formulations for several forms of cancer were really in clinical trials and had acquired FDA Investigational New Drug (IND) authorization.

Advantages
- ❖ Nanomedicine enhances drug activity against pathogens.
- ❖ Nanomedicine is used to regulate trained immunity against various diseases
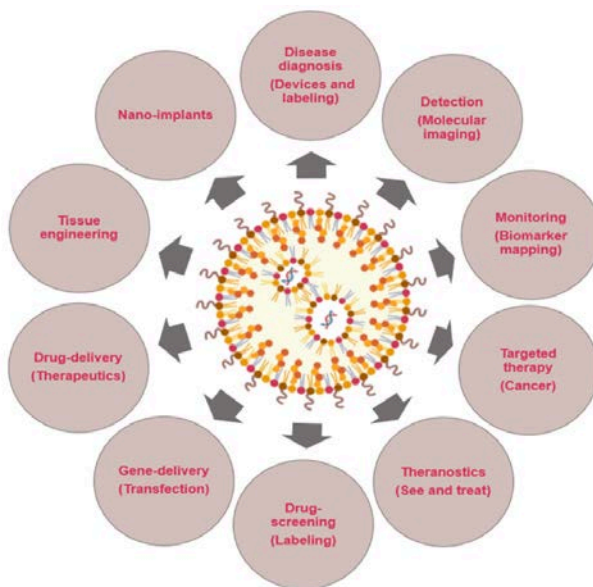

Figure 5: Source : Benefits of Nanotechnology in Medicine):*Diagram-displaying-multiple-applications-of-Nanotechnology-in-Medicine.tif (850×870)*.(n.d.).
https://www.researchgate.net/publication/342538665/figure/fig1/AS:907937220395011@1593480510987/Diagram-displaying-multiple-applications-of-nanotechnology-in-Medicine.png)

- ❖ It can be used to treat targeted cells in cancer, without risking damage to the rest of the body.
- ❖ It also improves bioavailability.
- ❖ Nanotechnology is also used for cost saving and to fasten DNA sequencing & to supply scaffolding for tissue regeneration or wound treatment.
- ❖ Researchers at the Naval Research Laboratory (NRL) are evolving nanotechnology-enabled constructs that coherently combine biological molecules, i.e. proteins and DNA, with nanoparticles.
- ❖ To ensure that we can use nanotechnology properly, scientists are investigating how nanomaterials affect animal cells and tissues as well as those of plants like soybeans. They are also developing recommendations.

Limitations

For drug delivery:
- ❖ Nanomedicine is a new branch of research so a lot of things are unclear. There's a huge amount of investment and funding that goes into nanomedicine. Thus, they are often not very affordable to those who need it the most. (Anderson et al., 2016)
- ❖ Nanomedicine tends to have a very short shelf life and is easily destructible. Because of their instability, it is difficult to preserve nanomedicine for a long time.
- ❖ Manufacturing, storing, and administering nanomedicine is too expensive and takes a lot of skill.

For Diagnosis:
- ❖ Perfusion scan has low sensitivity, is strenuous in younger patients & technically demanding
- ❖ Magnetic resonance imaging takes a long duration of examination, can skip small peripheral emboli, and has less availability (Laroui et al., 2013).
- ❖ CT pulmonary angiogram can skip small peripheral emboli, radiation exposure, specifically in young females & renal insufficiency is neurologically contraindicated

For Therapy.

❖ Unfractionated heparin (UFH) has a risk of bleeding, unable to be administered outside of a medical setting & frequent monitoring is needed (Laroui et al., 2013).

❖ The low molecular weight of heparin makes it difficult to achieve therapeutic levels in infants.

❖ Direct oral anticoagulants cannot be monitored, are not permitted for use in individuals under the age of 18, and carry a risk of bleeding.

Future Prospects

❖ Nanomedicine is predicted to be crucial in customized medicine. Healthcare practitioners can enhance treatment results and prevent unwanted effects by customizing therapies to an individual's unique genetic and molecular profile. Nanotechnology will allow for the creation of patient-specific tailored medicines and diagnostics.

❖ Uses for imaging, i.e. quantum dot technology, are currently being licensed, and soon there will be applications for tracking cellular activity in tissue. (Anjum et al., 2021)

❖ The creation of very precise and sensitive equipment for detecting nucleic acids and proteins is currently being researched.

❖ Nanostructured catalytic systems or artificial motors, maybe used for cancer diagnosis to neutralize chemical weapons.

❖ SNA-NCs are very hopeful devices for skin gene therapy, treatment of various rare hereditary skin diseases, i.e. Pachyonychia congenita, and for treatment of diabetes-related ulcers. (Anjum et al., 2021)

Conclusion

Nanotechnology is a relatively young branch of research that focuses on manipulating things at the atomic and molecular levels. From the perspective of Fakruddin et al. (2012), It is undeniable that nanomedicine has the potential to dramatically enhance modern medicine, making it one of the primary areas of nanotechnological research. Nanotechnology is often utilized to manufacture formulations with dimensions smaller than 100 nm. On the other hand, concurrent innovations in the field of molecular medicines, which deal with medical treatments focused on molecular structures and disease

progression mechanisms, necessitate the creation of new technologies to achieve their therapeutic goals.

References:

1. Anderson, DS, Sydor, MJ, Fletcher, P., Holian A. (2016). Nanotechnology: The Risks and Benefits for Medical Diagnosis and Treatment. *Journal of Nanomedicine & Nanotechnology*, Missoula, MT, USA. https://www.walshmedicalmedia.com/open-access/nanotechno logy-the-risks-and-benefits-for-medical-diagnosis-andtreatmen t-2157-7439-1000e143.pdf

2. Anjum, S., Ishaque, S., Fatima, H., Farooq, W., Hano, C., Abbasi, B. H., & Anjum, I. (2021). Emerging applications of nanotechnology in healthcare Systems: grand challenges and perspectives. *Pharmaceuticals*, *14*(8), 707. https://doi.org/10.3390/ph14080707

3. Chitkara, Deepak, Mittal, Anupama, Mahato, Ram, I. (2019). *Molecular Medicine for Cancer: Concept and Application of Nanotechnology*, NW, Florida 33487-2742, USA, Publisher: CRC Press.

4. *Comprehensive cancer information*. (n.d.). National Cancer Institute. https://www.cancer.gov/

5. Fakruddin, Hossain, Z., & Afroz, H. (2012). Prospects and applications of nanobiotechnology: a medical perspective. *Journal of Nanobiotechnology*, *10*(1), 31. https://doi.org/10.1186/1477-3155-10-31

6. Intelligence, G. T. (2022, October 10). Nanotechnology in medicine: Who are the leading private companies? *Medical Device Network*. https://www.medicaldevice-network.com/comment/nanotechn ology-in-medicine-who-are-the-leading-private-companies/?cf -view

7. Laroui, H., Rakhya, P., Xiao, B., Viennois, E., & Merlin, D. (2013). Nanotechnology in diagnostics and therapeutics for gastrointestinal disorders. *Digestive and Liver Disease*, *45*(12), 995–1002. https://doi.org/10.1016/j.dld.2013.03.019

8. Rizzo, L. Y., Theek, B., Storm, G., Kiessling, F., & Lammers, T. (2013). Recent progress in nanomedicine: therapeutic, diagnostic, and theranostic applications. *Current Opinion in Biotechnology*, *24*(6), 1159–1166. https://doi.org/10.1016/j.copbio.2013.02.020
9. Zdrojewicz, Z., Waracki, M., Bugaj, B., Pypno, D., & Cabała, K. (2015). Medical applications of nanotechnology https://doi.org/10.5604/17322693.1177169

Authors' Biography:

Meer Zeshanul Wazid, an ambitious undergraduate biotechnology student, currently studying at BRAC University. His ultimate goal is to contribute to revolutionary biotech research and discoveries by combining his academic knowledge, laboratory skills, and love of creativity. Moreover, he has the potential and experience to coordinate events, Trustworthy, Enthusiastic, Punctual, Self-motivated, Critical Thinking, Organizational Behavior, Adaptable, Compassionate to teamwork, time management, enthusiasm for biotechnology, and proactive and growing leadership qualities as well.

The Influence of Artificial Intelligence on the Progress of Humanity

Muhtasim Sanaan Novo[1] , Nujhat Tabassum Mithi[2] , Maisha Hossain[3], Moontaka Nasit[4]

[1]Department of Economics and Social Sciences, Brac University,
muhtasim.sanaan.novo@g.bracu.ac.bd

[2]Department of Biotechnology, Brac University
nujhat.tabassum.mithi@g.bracu.ac.bd

[3]Department of Electric and Electronic Engineering, Brac University,
maisha.hossain2@g.bracu.ac.bd

[4]Department of Computer Science and Engineering, Brac University,
moontaka.nasit@g.bracu.ac.bd

Abstract

The examination of how artificial intelligence affects people's daily lives is the main topic of this essay. The world began to significantly shift after technology was created. This advancement has received a new impetus from artificial intelligence. Artificial intelligence is somewhat entirely necessary for survival. This essay will examine our use of artificial intelligence and the extent to which we rely on it. Additionally, this essay will touch on the ongoing discussion about the employment issue and how it relates to artificial intelligence.

Keywords: Artificial intelligence, Impacts of artificial intelligence, progressiveness, employment and unemployment.

Introduction

Since the very beginning of artificial intelligence, it has greatly enhanced human life in innumerable ways. From finding the fastest and

most convenient route to discovering cures everywhere there is the impact of AI. Maximum people start the day by unlocking their phones using Face Id or fingerprint. According to a survey from the infographic, a person unlocks his/her phone 150 times a day on average. ("44 Smartphone Addiction Statistics for 2023, 2023). Then they scroll through social media applications or check emails. All of these are the blessings of artificial intelligence. Not only personal activities but major economic activities are also maintained by artificial intelligence. How the stock market would behave or how the weather will change everything is determined by AI. Certainly, the blessings AI has given humanity cannot be denied. But within these blessings there remain specific concerns that cannot be neglected. The biggest question is whether one has privacy or is always being watched.

Everyone has experienced some events at least once in their life. Opinions are frequently posted about a particular product, and later that day the exact product appears in a newsfeed. Similarly, one might mention that someone has visited a specific location or done research on it. Within hours, the news feed will be overrun with information on the location. Tech firms like Google, Facebook, and Tiktok gather data to enhance their capabilities and provide a better user experience. Unfortunately, TikTok has come under fire for allegedly giving the Chinese authorities access to client data that was stolen from them. (Touma, 2022). Many countries banned TikTok and several national military personnel are restricted from using the app. Allegations against Facebook's misuse of information and using data in the US general election are also other concerns. (*Facebook Sued Over Cambridge Analytica Data Scandal*, n.d.) The unemployment rate generated by artificial intelligence is currently the hottest topic. People are legitimately worried that artificial intelligence would eventually replace them and cast them on the streets, and it has emerged as the most contentious issue. In a broad sense, that could sound feasible, but one cannot predict the future with certainty. People worried about going bankrupt when the industrial revolution began. But in reality, the industrial revolution brought about so many work opportunities that it completely changed the way the world was. This might also apply to artificial intelligence. Some people also think AI has the knowledge to rule humans. These are merely exaggerations made by uneducated individuals.

Literature review

In recent years Artificial intelligence has become the most famous topic in the world. Artificial intelligence has already started to change the world and the very recent industrial revolution (IR 4) is an example of artificial intelligence. Almost every sector in the present world uses ai technology for the convenience of collecting and managing data as well as to operate faster and smoother. According to a report, almost 35% of the leading companies directly use AI and 91.5% of them have already invested in AI technology (Watters, 2023). This section briefly shares the literature review on the sectors that use artificial intelligence and also gives a glimpse into the future of AI as well as employment opportunities and the loss of employment for different positions.

➢ **AI in the healthcare sector:**

The healthcare sector is perhaps the most important since it benefits the overall health of individuals through a variety of means. Through using AI robots many difficult microsurgeries are becoming risk-free and easier. Besides, it has become easier to keep track of the database of a patient. Recently Forbes published an article on how ai is making the health sector better and more efficient. (Gordon, 2022).

➢ **AI in the Education sector:**

Nowadays besides textbooks, students are also getting the opportunity to visualize what they are learning with the blessing of AI. Also, there is huge data of playlists that are available on different platforms which are maintained using the help of AI.

➢ **AI and the future:**

The future looks completely different than it is now. AI has been positively welcomed by almost every industry and the application of AI is a continuous process. From self-driving cars to weather forecasting everything is a product of ai. AI is moving slowly towards machine learning which means that machines are slowly learning tasks without any external assistance. The industry of machine learning is estimated to reach about $153 billion by the year 2027. (*What Is the Future of Machine Learning?*, 2022). The industry of ML now stands at an estimated $1.41 billion. (Oncology, 2022).

➢ **AI and employment and unemployment:**

Since the introduction of AI one question has been very common and that is how will AI affect the job market. Many believe that a huge amount of people will be unemployed. Already many of the jobs are eliminated. The job of a writer, transcriptor, and data clerk is on the verge of dying. Even the founder of OpenAI fears many of the jobs may become eliminated. (Sharma, 2023). But there is a huge positive

side as well. Many new jobs are opening every now and then thanks to artificial intelligence. Data scientists, programmers, statisticians, and fintech analysts are getting many opportunities to show their skills. Many white-collar jobs are also being exposed due to artificial intelligence.(Felten et al., 2019). Therefore, AI has both advantages and disadvantages in the existing work environment.

Conclusion

AI is influencing almost every sphere of one's life nowadays. Artificial intelligence is making individual lives easier in terms of communication, making tough tasks to solve in a jiffy but also creating an unpleasant situation regarding employment as AI takes up all the work that humans once did. By 2030, it is estimated by the World Economic Forum that over 85 million occupations would be replaced by artificial intelligence. (Konovalov, n.d.). So it has both benefits and some demerits. AI is already taking a big leap in auto-generating data loads and the automation industry. Overall AI is the new language of this world and through this many, more revolutions are going to come.

References:

1. Can We Trust Artificial Intelligence? (n.d.). Caltech Science Exchange.
https://scienceexchange.caltech.edu/topics/artificial-intelligenc e-research/trustworthy-ai

2. Criddle, B. C. (2020, October 28). Facebook sued over Cambridge Analytica data scandal. BBC News. https://www.bbc.com/news/technology-54722362

3. Felten, E. W., Raj, M., & Seamans, R. (2019). The Variable Impact of Artificial Intelligence on Labor: The Role of Complementary Skills and Technologies. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.3368605

4. Gordon, C. (2022, October 31). AI In HealthCare Is Making Our World Healthier. Forbes. https://www.forbes.com/sites/cindygordon/2022/10/31/ai-in-he althcare-is-making-our-world-healthier/?sh=38f0a65613ea

5. Konovalov, A. (n.d.). Council Post: AI Will Impact The Labor Market, But Workers Should Embrace The Technology, Not Fear It. Forbes. https://www.forbes.com/sites/forbestechcouncil/2022/10/31/ai-will-impact-the-labor-market-but-workers-should-embrace-the -technology-not-fear-it/?sh=48b8e44669ce

6. Oncology, P. (2022, January 4). The Machine Learning Future Is Now: How AI is Disrupting Entire Industries. Nasdaq. https://www.nasdaq.com/articles/the-machine-learning-future-i s-now%3A-how-ai-is-disrupting-entire-industries

7. Sharma, A. (Ed.). (2023, March 18). OpenAI CEO Worried That ChatGPT May "Eliminate Lot Of Current Jobs.".NDTV. https://www.ndtv.com/feature/openai-ceo-worried-that-chatgpt -may-eliminate-lot-of-current-jobs-3872789

8. Touma, R. (2022, July 20). TikTok has been accused of 'aggressive' data harvesting. Is your information at risk? The Guardian.
https://www.theguardian.com/technology/2022/jul/19/tiktok-h as-been-accused-of-aggressive-data-harvesting-is-your-inform ation-at-risk

9. Watters, A. (2023, January 13). 30+ Artificial Intelligence Statistics and Facts for 2023. Default. https://connect.comptia.org/blog/artificial-intelligence-statistic s-facts#:~:text=97%25%20of%20mobile%20users%20are

10. 44 Smartphone Addiction Statistics for 2023 [INFOGRAPHIC]. (2019, October 28). SlickText. https://www.slicktext.com/blog/2019/10/smartphone-addiction -statistics/#:~:text=On%20average%2C%20smartphone%20o wners%20unlock

Authors' Biography:

Muhtasim Sanaan Novo, a student at Brac University who is presently pursuing a bachelor's degree in economics. He believes it has been a pleasure to write this piece, and he is grateful to have learnt a lot of new things while writing the essay, and he appreciates the excellent group members who supported him along the way.

Nujhat Tabassum Mithi is pursuing my bachelor of science in Biotechnology at Brac University. Many of her participation include the national biology olympiad, science fests, debate competitions, and working as a campus ambassador for a youth organization.

Maisha Hossain is pursuing her Bachelors in the EEE department. She is interested in working on projects that aim to be beneficial and innovative. She works on digital marketing and communication management programs in addition to technical projects.

Moontaka Nasit. Currently is a student of CS at Brac University. She believes this project to be a great deal.

Impacts of the Pandemic on our Physical and Mental Health

Faria Alam[1], MD Abrar Jahin Adib[2] , Muhtasim Sanaan Novo[3] , Risat Jamil Chowdhury[4] , Jamimur Rahman Patwary[5]

[1]Electronics and Electrical Engineering, School of Engineering, BRAC University, faria.alam@g.bracu.ac.bd

[2]Computer Science and Engineering, School of Data Science, BRAC University, abrar.jahin.adib@bracu.ac.bd

[3]Department of Economics and Social Sciences, Brac University, muhtasim.sanaan.novo@g.bracu.ac.bd

[4]Computer Science and Engineering, School of Data Science, BRAC University, risat.jamil.chowdhury@bracu.ac.bd

[5]Electrical and Electronics Engineering , School of Engineering, BRAC University, jamimur.rahman.patwary@g.bracu.ac.bd

Abstract

A thorough examination and discussion of the COVID-19 pandemic's complex effects on medical facilities and the general well-being of the population, including mental health, access to care, and socioeconomic disparities, are necessary due to the significant global effects it has had on various facets of public health. This paper highlights all those adverse effects and suggests a brief discussion on how to overcome these negative impacts.

Keywords: Impacts of covid-19, mental health issues, physical problems, depression.

Prelude: Obesity - Getting fat or inviting death?

The Covid-19 not only took lives, it changed our lives forever. It brought in other diseases and effects of lockdown. Let's see some of what happened.

Obesity was always a problem long before the pandemic. Approximately 70 percent of Americans are either obese or overweight. According to (Donald Hensrud, 2020), from the Healthy Living Program, Mayo Clinic answered a question about "Why has obesity occurred more during this pandemic?" He stated that it increased even more because of gyms shutting down and people working from home resulting in an overall decrease in movement. Why is it scary? According to DW news 2020, Obesity nearly doubles the risk of dying from COVID by 400,000 individuals, based on a report from The University of North Carolina that analyzed 75 research from around the globe. The World Health Organization has gone as far as to call this an epidemic in and of itself."

Depression - Too less space to be happy

A limited space. No wonder there has been 25% of depression cases during the Covid-19 pandemic, as stated by the World Health Organization - WHO (2022). Now, why did it happen? Because we were isolated from the outside world, suffering from the death of loved ones and facing perpetual risk of infection. Work was not being done as there was less encouragement. Even many health workers became suicidal with all this negative energy around them. CNBC (2021) reported that rate tripled from 8 to 28% to 32% by 2021 according to The Largest Regional Health, a Boston University journal. Online counseling was not possible due to lack of resources. Mental health services were disrupted. So next time we see someone feeling a lack of pleasure and worthiness, sleep issues and suicidal, let's not ignore it.

Figure 1: ADHD: A Curse towards children and Adolescents due to Covid-19 pandemic**.**

Attention deficit hyperactivity disorder (ADHD) is a mental illness that is mostly suffered by children and adolescents. An ADHD patient finds it difficult to concentrate for a long period of time, reacts impulsively and becomes restless. There are a lot of causes behind ADHD and unfortunately, the overuse of social media is one of them (Ra, et al., 2018). Research states that almost 84% of teens use social media and 62% of them use social media everyday (Monroe).

Due to Covid-19 teens and even young children spent more time on the internet than ever. As a result the number of ADHD patients within the age of 10-18 increased by 27.5% due to the pandemic (Werling et al.,2021).

Figure 2: Source: Image taken from Children's Health Council)

Was it all bad?

Despite all the negativity of the pandemic, lifestyle has improved for many others. People got their chances to take a break from their monotonous life and discovered or even   got   back   to recreational activities. Hence, It caused drastic popularity of music, drawing and other forms of art. Hygiene practice was also introduced among many underprivileged people and widely practiced among the greater mass. As much as pandemic has caused unemployment issues, it also created many e-business and start-up opportunities as well. It proved work becomes efficient when done in familiar places. Also proving that mental health is a much needed asset in your professional life. Mental and physical health improved somewhat for the mass population. Improved family bonding due to being home more. The massive outbreak of post-pandemic disorders and the negligence towards it. (Werling,2021).

WHAT TO DO?

Somehow, the world is getting fat, upset and agitated. Everyone plays a role. We are responsible because we make our own diet and lifestyle choices. However, sales and research show it is the focus on taste, convenience and cost; that's what drives us. The sellers use that. And the result? We are obese. We are spending time inside walls and now? We are depressed. What we need is the industry providing us with honest product information. We need the government to promote counseling and activities to bring us back to who we were before a word changed our life. (Gramlich,2023).

Reference :

1. Blackburn, G. L., & Walker, W. A. (2005). Science-based solutions to obesity: what are the roles of academia, government, industry, and health care? *The American Journal of Clinical Nutrition*, *82*(1), 207S210S. https://doi.org/10.1093/ajcn/82.1.207S

2. DW News. (2020, September 3). *Experts identify obesity as major factor in COVID complications | COVID19 - Special* [Video]. YouTube. https://www.youtube.com/watch?v=sqZC1T8OPk4

3. Gramlich, J. (2023, March 2). *Mental health and the pandemic: What U.S. surveys have found*. Pew Research Center. https://www.pewresearch.org/fact-tank/2023/03/02/mental-health-and-the-pandemic-what-u-s-surveys-have-found/

4. Haider, I. I., Tiwana, F., & Tahir, S. M. (2020). Impact of the COVID-19 Pandemic on Adult Mental Health. *Pakistan Journal of Medical Sciences*, *36*(COVID19-S4). https://doi.org/10.12669/pjms.36.covid19-s4.2756

5. Hensrud, D. (2020, September 3).How the COVID-19 pandemic has affected issues of obesityhttps://www.youtube.com/watch?v=sqZC1T8OPk4&list=PLj_vJXLRPeMy4SxFbQg42u7i6iTxIhYpT&index=4&t=153s

6. jagonews24.com. (2023, March 19). *Study shows pandemic stress had more impact on pregnant women.* Jagonews24.com. https://www.jagonews24.com/en/feature/news/67441

7. Park, A. H., Zhong, S., Yang, H., Jeong, J., & Lee, C. (2022). Impact of COVID-19 on physical activity: A rapid review. Journal of Global Health, 12. https://doi.org/10.7189/jogh.12.05003

8. Ra, C. K., et.al.(2018). Association of Digital Media Use With Subsequent Symptoms of Attention-Deficit/Hyperactivity Disorder Among Adolescents. *JAMA*, *320*(3), 255. https://doi.org/10.1001/jama.2018.8931

9. Roxby, P. (2023, March 9). Mental-health crisis from Covid pandemic was minimal - study. *BBC News*. https://www.bbc.com/news/health-64890952

10. Silvia. (27 October 2020). Pandemic measures had a strong impact on mental and physical health.

Www.medicalnewstoday.com
https://www.medicalnewstoday.com/articles/pandemic-measur es-had-a-strong-impact-on-mental-and-physical-health

11. Staff, N. A. (2022, April 20). *Looking for Likes: Teen Social Media Addiction*. Newport Academy. http://www.newportacademy.com/resources/mental-health/tee ns-social-media-addiction/?fbclid=IwAR3esclcX5KLL7UEoU j3wJfBo28i2l2b6-FeOiLGBHyoS8m3qc_J-SUV_Ao

12. Stieg, C. (2021, October 10). Depression rates have tripled during the pandemic — how to recognize the signs and respond to them. CNBC. https://www.cnbc.com/2021/10/10/depression-increased-durin g-covid-pandemic-how-to-feel-better-cope.html

13. Werling, A. M., et.al.(2021). Media use before, during and after COVID-19 lockdown according to parents in a clinically referred sample in child and adolescent psychiatry: Results of an online survey in Switzerland. *Comprehensive Psychiatry*, 152260. https://doi.org/10.1016/j.comppsych.2021.152260

14. World Health Organization. (2022, March 2). COVID-19 pandemic triggers 25% increase in prevalence of anxiety and depression worldwide. World Health Organization. https://www.who.int/news/item/02-03-2022-covid-19-pandemi c-triggers-25-increase-in-prevalence-of-anxiety-and-depressio n-worldwide

Authors' Biography:

Faria Alam is majoring in Electrical and Electronics Engineering from the BRAC University. A girl-next-door who is passionate about reading, writing and dancing, she has always dreamt of being a teacher. Writing this piece came from a personal interest about the whole COVID-19 lockdown situation.

Abrar Jahin Adib is majoring in Computer Science and Engineering from the BRAC University. A simple guy who loves playing video games, reading thrillers and comics and watching movies and series, his goal in life has always been to be a software engineer. Getting involved in the paper evolved from his love of writing and the curiosity of knowing how life was then.

Muhtasim Sanaan Novo, a student at Brac University who is presently pursuing a bachelor's degree in economics. He believes it has been a pleasure to write this piece, and he is grateful to have learnt a lot of new things while writing the essay, and he appreciates the excellent group members who supported him along the way.

Risat Jamil Chowdhury is currently pursuing Computer Science Engineering at Brac University. A person with hobbies like debating, cricket and football he is currently studying to live his dream of being a software engineer. A man driven by emotions and passion, he has thoroughly enjoyed his experience of researching and writing on something everyone went through to some extent.

Jamimur Rahman Patwary is doing his Bachelor's in the EEE department of BRAC University. A man with interesting interests such as biomedical engineering, documentary production, and telling really great stories, he chose his field to help people on a larger scale both directly and indirectly. With his past achievements of winning science fairs and doing start-up competitions, he is now dreaming to be a successful engineer.

Exploring the Symbiotic Relationship: Organizational Culture's Influence on Leadership and Vice Versa

Md.Shakibur Rahman Shifat[1]

[1]BRAC Business School, BRAC University,
md.shakibur.rahman.shifat@g.bracu.ac.bd

Organizational Culture

Leadership and organizational culture are closely related since a leader's actions and behavior can greatly affect the culture of the organization. The beliefs, practices, and behaviors that are promoted within an organization are mostly shaped by the leaders, and they can utilize their position of power to support a healthy and productive culture.

Organizational culture and leadership

The culture of an organization is directly affected by how management and leadership are combined. The majority of researchers agree that leadership and management are intertwined. Managers need to be paid, but management doesn't see them as capable or good leaders. The majority of professionals believe that leadership is distinct from management. In addition, managers in any firm might recognize their leadership potential. In contrast, leadership requires defining a new course for a group of individuals. Management comprises leading and supervising individuals in accordance with predetermined guidelines. In addition, if someone emerges as the group's orientation leader, they might act as a symbolic leader. The author also contends that leadership is actually a form of cultural expression. Hence, Successful cultural expression depends on the organization's mission, objectives, workplace culture, administrative techniques, institutional processes

and norms, employment, professional advancement, rewards, and privileges. Different organizations have distinct cultures, as is common knowledge. A team's core principles revolve around organizational culture. It's all about the common culture; the way people perceive things and their collective assumptions and attitudes have a significant impact on employee behavior. It depends on how well the leader is able to adapt to this culture and exploit it to increase staff engagement and work quality. (Tohidi and Jabbari, 2012)

Richard Hendrickson found in his studies on culture and leadership in 1989 that (Henrickson, R. L. 1989).
- Culture has an impact on leadership style.
- Leadership is fundamentally a means of cultural exchange.
- The only way to define leadership is through processes.

In 1986, Smith and Peterson wrote a book called "Leadership and Organizational Culture." In it, they said that to be successful in an organization, you have to understand its culture. Each organization has a collection of unwritten rules, customs, values, beliefs, and methods that are distinct from the organization's stated regulations. (Smith et. al, 1988). In underdeveloped nations, employees believe there are no distinctions between managers and leaders. New research, on the other hand, shows that management and leadership are similar in some ways but different in the vast majority of other ways. The leaders of a society should have influence over their social environment and their values. Thus, leaders are more generalists than managers throughout a broader spectrum of a company. In conclusion, Employee performance and happiness at work are positively impacted by business culture and leadership. In some fairly new companies, the executives set the organizational culture and make sure that all of the employees follow it. On the other hand, large companies already have a culture that a leader must follow and change to keep employees happy and keep them working there.

On the relation between organizational culture and leadership: An empirical analysis

People think that there are two main factors for businesses to compete in the market and hold a competitive advantage: leadership and organizational culture. Because of corporate culture and leadership style, there is a strong link between leadership and organizational

culture.According to complex system leadership theory, a phenomenon that emerges and interacts with other factors is leadership. such as culture, norms, and trends. (Hazy et.al, 2007). Leadership and organizational culture are interconnected, as culture influences leadership by emphasizing that cultural values determine leadership styles. Schein (1990) accepts the notion that leaders understand and appreciate the firm's culture while trying to create a culture that is desirable and good for business. Additionally, (Ogbonna and Harris, 2000) showed that organizational culture mediates the leadership's impact on organizational performance. Cultural perceptions of workers are strongly correlated with leadership by direct supervisors, whereas transformational and transactional leadership are not linked to specific cultural aspects. (Block, 2003). The most recent agreement between the two countries about how leadership and culture affect each other went into effect. The study's primary emphasis was on the interactions between organizational components including job satisfaction, knowledge management, and continuous learning, and culture and leadership.

Reference:

1. Hazy, J. K., Goldstein, J., & Lichtenstein, B. B. (Eds.). (2007). Complex systems leadership theory: New perspectives from complexity science on social and organizational effectiveness. *ISCE Pub.*.

2. Henrickson, R. L. (1989). *Leadership and culture.* University of San Diego.

3. Schein, E. H. (1990). Organizational culture. *American Psychologist, 45*(2), 109–119. https://doi.org/10.1037/0003-066X.45.2.109

4. Smith, Peter & Peterson, Mark. (1988). *Leadership, organizations and culture: An event management model.*.

5. Tohidi, H., & Jabbari, M. M. (2012). Organizational culture and leadership. *Procedia - Social and Behavioral Sciences*, *31*, 856–860. https://doi.org/10.1016/j.sbspro.2011.12.156

6. Ogbonna, E., & Harris, L. C. (2000). Leadership style, organizational culture and performance: empirical evidence from UK companies. *International Journal of human resource management, 11*(4), 766-788.

Authors' Biography:

Md. Shakibur Rahman Shifat, a distinguished final-year student is pursuing a rigorous course of study in Human Resource Management at the esteemed Brac Business School, housed within the renowned Brac University. His academic journey thus far has been characterized by unwavering dedication and exceptional aptitude.Presently, Shifat stands as a pivotal figure within the academic landscape, engaged in an enlightening field placement endeavor with "Skills Lab Limited." In this capacity, he serves as a Recruitment Associate. Shifat's intellectual pursuits are underscored by a profound interest in the Development and Education sectors. His conviction lies in the potential of these sectors to shape a more enlightened future—one characterized by skillful human capital development, transformative educational paradigms, astute leadership cultivation, civic engagement fostering, and harmonious community empowerment.

RTP110

Understanding procrastination: The deadliest nemesis of productivity across all generations and how to overcome it.

Sanjeeda Afroz Meem[1], Kibo Mahojenin Khan[2], Shahriar Khandoker[3]

[1]English and Humanities department, Brac University,
sanjeeda.afroz.meem@g.bracu.ac.bd

[2] Microbiology Department , Brac University,
kibo.mahojenin.khan@g.bracu.ac.bd

[3] Department of Computer Science and Engineering, Brac University,
shahriar.khandoker@g.bracu.ac.bd

Abstract

Contrary to popular belief, the advent of social Media is not solely responsible for triggering a spike in procrastination. Since the beginning of early history, humanity has already had trouble overcoming their innate tendency to hesitate and put off work for later. When we put off making a choice or taking an action until later, we are engaging in the behavior known as procrastination. For example, a person is procrastinating if they put off starting a task until the very last moment, despite knowing that it would be wiser and preferable to begin ahead of schedule. Numerous procrastinators are aware of the negative effects of their conduct yet fail to alter it despite their best intentions. In light of this, if you're a procrastinator, perhaps you might well have pondered, "Why do I postpone so much?" or "Why do I continue postponing even though I understand that it's harmful for me?" There are deeper and far more nuanced psychological explanations of procrastination than merely a dearth of time management capabilities. Fear of rejection, inferiority, or having one's own identity called into question causes us to ignore important tasks and put them off for later. And as a result, progression is slowed because we avoid pushing our limits from fear of criticism. What, therefore, is the magical cure that would enable us to finally put an end to our procrastination?

Keywords : Procrastination, procrastinate, perfectionism, cognitive factors, time management, fear of failure, perfectionism, stress, anxiety, academic validation, emotion, motivation, self-efficacy.

Introduction

Procrastination is a widespread habit . The vast majority of us are guilty of putting things off till later. Despite having many duties to complete, chronic procrastinators often find themselves in a position to put off critical activities until the last possible minute and often end up indulging in time-wasting pursuits that provide them pleasure. They always have a tendency to come up with some reason not to begin their task, even though they have everything else that is required to begin their work. Despite the fact that there are occasionally justifiable reasons for putting things off, doing it frequently can be detrimental to one's scholastic success, professional advancement, and many other dimensions of one's life. In this article, we will delve into the psychology of procrastination and look at methods for combating it or at the very least, decrease its impact to some degree.

Literature Review

We find that most studies have focused on student data and have covered procrastination's description, designation, background information, repercussions, and interventions. Yet, procrastination in diverse circumstances and among different groups has not yet been considered. Therefore, answering these questions is important because it helps to understand what causes procrastination in the first place in order to overcome it. Many researchers (Solomon and Rothblum 1984; Eerde, 2003; Pychyl, et al. 2000) in the last few decades, have claimed procrastination to be associated with depression, guilt, and anxiety. In the essay that follows, you will read more about the psychology of procrastination, its causes, and how this information can help to quit doing it in the real world.

What triggers procrastination ?

One of the very common struggles that people of all ages suffer from is procrastination. There are several factors that trigger procrastination. Procrastination involves behavioral, cognitive, and emotional factors, not merely poor study habits or time management skills (Reynold, 2015). One might be able to lessen it if they can pinpoint its causes and trigger points.

- The overwhelming complexity of the task is a major contributor. One might easily feel discouraged when confronted with an insurmountable amount of labor or a job that seems impossible to finish. People procrastinate because they anticipate that doing such tasks would be very challenging, which causes them stress, worry, and a lack of confidence in their abilities (Jaffe, 2013).
- Fear of failing is another crucial trigger and the majority of the claimed reasons for procrastinating were fear of failure. Procrastination is driven by a fear of failure. Individuals who are anxious about failing could act ineffectively, such as postponing as a way to avoid unpleasant consequences (Gustavson & Miyake, 2017).
- Perfectionism and procrastination are closely interconnected. The likelihood of procrastination is higher in those who spend more time dwelling on their flaws and ways to improve (Yosopov, 2020). Procrastination and perfectionism go hand in hand. People who ruminate on their shortcomings and potential improvements are more likely to procrastinate . Perfectionists have greater standards of oneself and frequently worry they won't reach them. Therefore, students often put off doing their job until later, and procrastination is on the rise.
- Procrastination may set in when the path toward your goals is clouded by doubt. Individuals are more inclined to postpone activities until later whenever they lack confidence in their time management or organizing skills. Therefore, setting goals and planning the activity in advance are crucial to avoiding procrastination (Gustavson & Miyake, 2017).

Long term effects of procrastination
Procrastination can be thought of as a harmless habit but it has its far reaching consequences. It can affect both our personal and professional life for a long time.

- You cannot perform to your full ability when you procrastinate, which is one of its devastating consequences. When someone puts off doing their work, they might not have enough time to finish it. They work quickly and are unable to perform to the best of their abilities.(Reynold, 2015)
- You risk missing opportunities that could have changed your life if you procrastinate. One risks missing possibilities that will be taken away by those who are more active than them if

they frequently miss deadlines and postpone their task (Pychyl et al. 2000).

- One of the most hazardous effects is that it lowers our self-esteem. People who procrastinate frequently have low self-esteem, which has additional detrimental effects (Flett et al. 1991). They believe they are not capable or productive enough when they postpone their task and are unable to complete it effectively. Because of this, people experience severe low self-esteem.

- Procrastination can cause health hazards as it can lead to severe stress and that can lead to other mental and physical problems. According to author Eric Jaffe (2015), people who procrastinate experience higher stress levels and worse levels of wellbeing. Stress and unhappiness are magnified in the lives of procrastinators. Procrastinators suffer emotional distress because they rush to finish their work at the last possible moment. Furthermore, people's existing high levels of stress are heightened by their concern about the potential repercussions of failing to complete the task.

Ways to Control Procrastination

Despite the fact that procrastination-related guilt or self-criticism is extremely common, we nevertheless put things off without understanding the basic principle behind why we are doing it. People who procrastinate often attribute their failures to their own character flaws, such as laziness, carelessness, or a lack of organizational skills. There are still unresolved questions that need to be discovered about the fundamental and sustaining mechanisms of procrastination. (Katz et al., 2014; Visser et al., 2018). Burka and Yuen (1982, p. 32) reported that people who struggle with procrastination frequently blame personality defects such as being lazy, disorganized, or incapable of managing their time for their problems. Even the more nuanced interaction of mental, emotional, and behavioral components may be taken into consideration. The only way to overcome procrastination is to learn what drives it and what reinforces it in the first place.

- Making proper management of time

According to Macan, TH (1994), Time management is the ability to control how a person chooses to use time as skillfully as possible through organizing, arranging and managing time, always prioritizing tasks based on importance and the desire to be organized which can be

expressed by actions like organizing workspaces and avoiding procrastination. Time Management skills are crucial factors to control procrastination. Setting realistic deadlines, for instance, if you want to start learning a programming language, an appropriate objective might be "being capable to build a program that prints 'hello world' in the first trial and learn all the basics of that language by the end of the month". These techniques may assist people in planning, prioritizing, and organizing their work, giving them a sense of control and decreasing their propensity to procrastinate.

- Getting rid of distractions

It's easy to become sidetracked in today's high-tech world, what with all the pinging and beeping of cellphones, the allure of checking social media feeds repeatedly, and all the other fun and entertaining things that surround us. Making a to-do list, controlling internal triggers by identifying the origin of distraction, breaking tasks down into smaller pieces, or taking short breaks in between (also known as the Pomodoro Technique, which allows 25-minute sprints interspersed by 5-minute pauses, as recommended by a neuroscientist and senior lecturer at Rensselaer Polytechnic Institute in New York, Alicia Walf, are some of the vital keys to stay keenly focused, minimize real interruptions and deal with procrastination throughout your work-hour (Gustavson & Miyake, 2017).

- Self-rewarding upon completion of a task

Rewarding oneself (even at least with a small Alpenliebe candy) after accomplishing a task is undeniably motivational and an effective way to positive reinforcement. It can also be done prevailingly with others' participation. For instance, after finishing a term paper, you might offer yourself some refreshments by giving a tour of exciting and entertaining places with your friends or family members. Self-rewarding practices can help one stay inspired, energized, and out of negative thoughts to surpass procrastination. In addition, making a reward promise to yourself could be a great kick start for your job refraining from distractions until it's done. (Flett et al., 1991)

Conclusion

Procrastination is a common and sometimes fatal habit that causes us to squander valuable time. Understanding the causes of delays is the first step in eliminating them and developing more effective time management techniques and might increase self-awareness. Even if

procrastination is one's deadliest adversary, it is still possible to win the battle against it.

References:
1. Burka, J. B., & Yuen, L. M. (1983). Procrastination: Why You Do It What to Do about It. Cambridge, *MA: Da Capo Press.*
2. Flett, G. L., Hewitt, P. L., Blankstein K, O'Brien S. (1991) Perfectionism and learned resourcefulness in depression and self-esteem. *Pers Indiv Differ. 12*(1). 61–8.
3. Gustavson, D. E and Miyake. A. (2017) . Academic Procrastination and Goal Accomplishment: A Combined Experimental and Individual Differences Investigation. 10.1016/j.lindif.2017.01.010
4. Jaffe, E. (2013, March 29). *Why wait? The science behind procrastination*. Association for Psychological Science - APS. http://www.psychologicalscience.org/index.php/publications/o bserver/2013/april-13/why-wait-the-science-behind-procrastin ation.html
5. Katz, I., Eilot, K., & Nevo, N. (2014). "I'll do it later": Type of motivation, self-efficacy and homework procrastination. *Motivation and Emotion, 38*(1), 111–119.
6. Macan, T. H. (1994). Time management: Test of a process model. *Journal of Applied Psychology, 79(3*), 381–391. https://doi.org/10.1037/0021-9010.79.3.381
7. Pychyl, T. A., J. M. Lee, R. Thibodeau, and A. Blunt. (2000). "Five Days of Emotion: An Experience Sampling Study of Undergraduate Student Procrastination." *Journal of Social Behavior and Personality,* 15, 239–254
8. Reynolds, J. P. (n.d.). *Factors affecting academic procrastination*. TopSCHOLAR®. http://digitalcommons.wku.edu/theses/1511
9. Solomon, L. J., & Rothblum, E. D. (1984). Academic procrastination: Frequency and cognitive-behavioral correlates. *Journal of Counseling Psychology, 31*(4), 503-509.
10. Van Eerde, W. (2003). "A Meta-analytically Derived Nomological Network of Procrastination." Personality and Individual Differences, 35, 1401–1418.
11. Visser, L., Korthagen, F. A., & Schoonenboom, J. (2018). Differences in learning characteristics between students with high, average, and low levels of academic procrastination:

students' views on factors influencing their learning. *Frontiers in Psychology,* 9, 808.

12. Yosopov, Lital. (2020) The Relationship between Perfectionism and Procrastination: Examining Trait and Cognitive Conceptualizations, and the Mediating Roles of Fear of Failure and Overgeneralization of Failure" . *Electronic Thesis and Dissertation Repository.* 7267. https://ir.lib.uwo.ca/etd/7267

Authors' Biography:

Kibo Mahojenin Khan , an enthusiast in the field of research. She's also a social activist, and a bookish content creator. Kibo's interest in science and research led them to pursue a degree in Microbiology at Brac University. Kibo is currently in their fourth semester.

Shahriar Khandoker is a young and ambitious individual who is currently pursuing his higher education at Brac University as a freshman. He was born and raised in Dhaka, Bangladesh. In his academic and research pursuits, Shahriar is known for his work ethic and determination. Being committed to lifelong learning and personal growth, he is poised to make a significant impact and apply his knowledge to real-world situations with dedication, passion, and drive.

RTP111

An Overview of E-commerce Businesses in Developing Countries: A Comparative Study Between Uganda and Bangladesh.

Mwebaza Sylivia Samalie[1], Mukwaya Kasimu[2]

[1]Business Administration (BBA), Brac University,
mwebaza.sylivia.samalie@g.bracu.ac.bd

[2]Business Administration (BBA), Brac University,
mukwaya.kasimu@g.bracu.ac.bd

Abstract
E-commerce platforms are growing rapidly as a result of the spread of information technology all over the world, resulting in a significant impact on the business sector. This article compares Uganda and Bangladesh to provide an analysis of the state of e-commerce platforms in developing nations. It mainly describes various e-commerce platforms in both countries and how they have responded to the pre and post-Covid situations. E-commerce has greatly contributed in the development of both countries given its fewer requirements like buildings, storage space, insurance and many others. Using the literature review approach, this study concludes that there is a high demand for high-quality imported products mainly from the US and the UK as well as China, and the major consumers are middle-income earners as well as youths aged 18-30 years. However, the lack of thorough study that addresses topics outside situational imperatives limits our knowledge of what motivates e-Commerce among several other enterprises in emerging economies. This study, therefore, suggests that further research should be done to cover more aspects in line with e-commerce platforms mainly for developing countries.

Keywords*:* Bangladesh, Developing countries, E-commerce, Uganda.

Introduction

"E-commerce" or "electronic commerce" refers to any type of commercial or industrial transaction that entails the exchange of services on the internet. It's possibly one of the most important internet advancements right now (Mohiuddin, 2014). Essentially, it entails executing business online. It can be characterized as "carrying out transactions via the Internet," which encompasses the actions of advertising products or services for purchase, taking orders for services or goods electronically through the internet, such as through email or digital forms, and/or not always requiring online payment (Ibrahim Et al, 2019). It has swiftly expanded around the world to encompass developing nations in Africa and Asia that are characterized by technical laggards, rigidity, and conservatism, as well as widespread poverty, high levels of unemployment, and underemployment (Enotesworld, 2021). The B2B e-commerce market in emerging nations, which strives to increase the effectiveness of electronic business processes, reporting, T-systems, etc., is still being driven by social media. E-commerce is increasingly viewed as a distinct and lucrative business sector, and intermediate actors are modernizing their B2B business models while including social media elements. This quick growth is connected to a significant potential for the local and global trade and investment of LDCs like Bangladesh and Uganda (Mohiuddin, 2014).

Methodology

This research is based on a literature review methodology, in which secondary data from the internet has been used to achieve the study's main objective. It specifically poised and explored articles, journals, and different write-ups on e-commerce firms operating in developing countries, and it has examined how e-commerce businesses in Bangladesh and Uganda differ from one another in terms of conduct. It has also covered a wide range of topics relating to Bangladesh and Uganda.

Literature review analyzing the e-commerce businesses in both Uganda and Bangladesh

- **Uganda**

Currently, Uganda and its neighbors in East Africa, especially Kenya and Tanzania, have a greater understanding of the necessity of trading

as one large village. This has inspired fresh ideas and curiosity that have led to increased resource extraction with the goal of giving each country more to offer in its commerce with other nations (Kakooza, 2008). Among other documents, the National Development Plan 2040, National ICT Policy, and Strategic Investment Plan for ICT 2015 all outline the nation's commitment to the expansion of the ICT industry in the midst of an economic transition (ict.go.ug, 2021). The Ugandan government is fully aware that using communication and information technologies, like e-commerce, offers a way to advance the growth of the nation and, especially, the assets to generate revenue. Ugandan e-commerce companies include; (i) Jumia Uganda: It was founded in 2012 with the goal to become an all-in-one retail destination for Africa with the introduction of the most competitive prices respectively on- and offline with commodity markets ranging from individual to personal attributes, a 24/7 call center, after-sales services, and other features. It is the largest e-commerce store in Uganda, (ii) Masikini: When it comes to offering satisfying eCommerce services, this beats out all the competition. With the quickest payment methods including MTN and Airtel money, plus VISA, it allows users to access items from anywhere in the globe, such as the USA and the UK. Customers who want to import things that are unavailable in Uganda tend to prefer it, (iii) Kikuu: This is known further as Hangzhou Jiku Information Technology Company Limited, a renowned business with unmatched expertise in the broadest range of high-quality items from China and other Chinese producers. Among others include (iv) Jumia food which makes it easier for customers to get their food delivered on time, (v) Dondolo market which delivers cell phones and gadgets from a brick-and-mortar store in Kampala, (vi) Eyetrade which is the oldest, with a focus on helping individuals purchase and sell anything they wish, including property investment, agribusiness, mobiles and equipment, and other items. Others include Jiji Uganda, Paple Rayn, Safeboda, and UGAKart (Ashaba, 2021). The International Trade Administration (2022) concludes that, although "mobile money" is widely used and mobile phone usage is increasing quickly in Uganda, eCommerce is still unregulated and casual with just 19 million checking accounts and 32 million mobile payment accounts. According to UNCTAD, 2020, the Ugandan government, as part of its response to the economic repercussions of the pandemic, has operated with mobile phone companies to cut digital service charges and supply free of charge internet data bundles to clients. Digital media is also being used to spread health information and combat misleading info.

Moreover, the authority is boosting public-private sector cooperation to expand the provision of technical services and improve corporate operations in links as per UNCTAD's recommendations. The government of Uganda is encouraging entrepreneurship through encouraging new ideas and start-up-driven initiatives. By expanding infrastructure, the nation has also increased internet connection by enabling businesses to reduce the cost of providing services. Uganda is also enhancing electronic transfer confidence. To further the safety of these transactions, a data protection and privacy law were passed in 2020. To equalize the playing field for suppliers, the nation's government recently enacted an e-payments law that is anticipated to go into force shortly. Additionally, with assistance from the United Nations Development (UNDP), Uganda intends to create a nationwide e-commerce program (UNDP Uganda, 2020). Despite being a relatively recent phenomenon in Uganda, online shopping is rapidly spreading because of the country's burgeoning middle class of young people (18 to 30 years old) who are developing a preference for imported consumer goods.

- **Bangladesh**

Bangladesh has excellent e-commerce prospects, thanks to the rising trust, e-commerce infrastructure, security, public awareness, and the shift from conventional to online buying. Online purchasing is popular because it is convenient, secure, and time-saving. (Hossin, et al, 2020). Bangladesh's low adoption rate has prevented it from fully using the merits and perks of e-commerce, notwithstanding its continuous expansion in a wide range of online services (Azam, 2021). In order for Bangladesh to be capable of coping with a large e-commerce industry, it is necessary for India to adopt policies that link it with the Bangladeshi people and transcend party politics driven by regime objectives while participating in a mutually beneficial partnership with its neighbors (Pattanaik, 2011). The major e-commerce platforms in Bangladesh include, (i) Daraz.com.bd, one of the top online retailers at the moment, it began operating in 2015 with a range of consumer goods including décor, apparel, and cosmetic items, among others, (ii) Rokimari, a website that sells books online together with additional services and products, such as DVDs, video lessons, sports equipment, calculators, watches, Pen Drives, computer equipment, and much more. Other platforms include Bagdoom, Othoba, ClickBD, Priyoshop, and Shwapno extra (Maria, 2022). According to The Financial Express report (2023), in order to ease and maintain transparency in online

retail operational processes, the government of Bangladesh is getting ready to implement Unique Business Identification (UBID), which will be necessary for all e-commerce operating enterprises within the country. This initiative aims to maintain restraint in the online sales sector. Additionally, by utilizing ICT platforms, e-commerce companies will be able to win back clients' confidence and improve the legitimacy and transparency of online trade.

The Bangladeshi government also employs other support measures, including (i) A coordinated attempt to unify vendors, payment processors, and delivery companies under one platform are the central logistical tracking platform. (ii) the National Consumer Rights Protection Directorate and the Central Complaint Management Method, a centralized system for handling complaints (iii) Binimoy, the collaborative digital exchange (The Daily Star, 2023).

Discussion and comparative analysis
Based on the available literature, both countries have experienced e-commerce inception since the early 2000s. Despite having unfavorable facilities, internet incapabilities, and unfavorable government policies, it was more well-liked by customers. Both countries have support from their government in form of regulations and support in terms of reduced fees, and internet access among others. The bracket of consumers also does not differ between both countries whereby the demand is high with middle-income earners as well as the youths aged between 18-30 years who are mostly in favor of imported products from Europe and Western countries. However, Bangladesh's e-commerce platforms have less support from their neighboring countries due to security reasons for example with India, unlike Uganda with Kenya and Tanzania (Enotes World, 2021).

Conclusion and scope for future research
In conclusion, e-commerce developing countries are comparatively on the same pace in terms of coverage, customer behavior and beliefs, and government support (response). However, further research should be done to cover more aspects in line with e-commerce platforms mainly for developing countries. This will provide rigorous data that covers issues beyond contextual imperatives.

References:

1. Ashaba, R. (2020, April 18). *Top 10 Ugandan domestic e-commerce platforms recommended during this lockdown.* Guide 2 Uganda. https://guide2uganda.ug/top-10-ugandan-domestic-e-commerce-platforms-recommended-during-this-lockdown/

2. Azam, S., Morsalin, M., Rakib, M. R. H. K., & Pramanik, S. a. K. (2021). Adoption of electronic commerce by individuals in Bangladesh. *Information Development*, 026666692110525. https://doi.org/10.1177/02666669211052523

3. Enotes World. (2022). Characteristics of developing countries. *eNotes World*. https://enotesworld.com/characteristics-of-developing-countries/

4. Hossin, M. A., Sarker, M. N. I., Xiaohua, Y., & Frimpong, A. N. K. (2018). Development dimensions of e-commerce in Bangladesh: Scope, challenges and threats. *Proceedings of the 2018 International Conference on Information Management & Management Science - IMMS '18.* https://dl.acm.org/doi/abs/10.1145/3277139.3277152

5. Ibrahim, W., Katumba, P. M. & Turyakira, P. (2018). E-commerce adoption and growth of SMEs in Uganda. *International Journal of Business and Management, 14*(1), 46. https://doi.org/10.5539/ijbm.v14n1p46

6. Kakooza, A. C. (2008). Embracing E-commerce in Uganda: Prospects and challenges. *SSRN Electronic Journal.* https://doi.org/10.2139/ssrn.1658659

7. Maria, A. (2020, December 2). *Top 10 E-commerce websites in Bangladesh.* MyBangla24. https://mybangla24.com/ecommerce-websites-bangladesh

8. Partnerships driving e-commerce development for the informal sector. (n.d.). *UNDP*. https://www.undp.org/uganda/blog/partnerships-driving-e-commerce-development-informal-sector

9. Pattanaik, S. S. (2010). *India's neighbourhood policy: Perceptions from Bangladesh. Strategic Analysis, 35*(1), 71–87. https://doi.org/10.1080/09700161.2011.530985

10. The Financial Express. (n.d.). Bangladesh govt to launch unique ID for e-commerce entities. *The Financial Express.* https://thefinancialexpress.com.bd/trade/bangladesh-govt-to-launch-unique-id-for-ecommerce-entities-1642646408

11. Toggle Desk. (2022, January 19). Govt finalises four new initiatives to bring back trust in the e-commerce industry. *The Daily Star.* https://www.thedailystar.net/tech-startup/news/govt-finalises-four-new-initiatives-bring-back-trust-e-commerce-industry-2942731

12. Uganda - eCommerce. (n.d.). *International Trade Administration | Trade.gov.* https://www.trade.gov/country-commercial-guides/uganda-ecommerce

13. Ugandan e-commerce platforms power recovery from COVID-19 crisis. (2020, July 28). *UNCTAD.* https://unctad.org/news/ugandan-e-commerce-platforms-power-recovery-covid-19-crisi s

14. (N.d.-a). Ict.Go.Ug. Retrieved February 4, 2023, from https://ict.go.ug/wp-content/uploads/2021/07/E-Commerce-Strategy-Formulation.pdf

15. (N.d.-b). Cloudfront.net. Retrieved February 5, 2023, from https://d1wqtxts1xzle7.cloudfront.net/46796765/A016720106-libre.pdf?1466922244=&response-content-disposition=inline%3B+filename%3DOverview_the_E_Commerce_in_Banglad esh.pdf&Expire

Authors' Biography:

Mukwaya Kasimu is a tremendously inventive, practical global scholar, student leader, Human Rights advocate, Mental Health activist, and community philanthropist. He was born and raised in Uganda, pursuing his first degree at Brac university. Kasimu stands to empower vulnerable marginalized groups of people not only through fostering mental stability but also through capacity building and economic empowerment. His goal is to help marginalized people gain mental peace and stability and equip them with skills that guarantee their financial freedom. areas of research interest include Leadership, Investment law, and Market growth and sustainability. He hopes to collaborate with different organizations with shared goals and incorporate his innovativeness to altogether create a "Community for All."
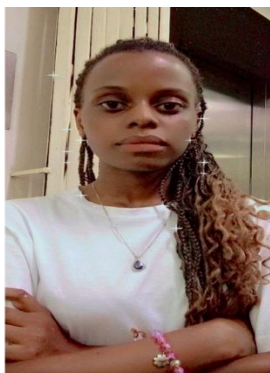
Sylivia is a researcher and an undergraduate student pursuing at Brac University, Dhaka, Bangladesh. She is a Ugandan and is pursuing a bachelor's degree in Business Administration. Sylivia is interested in showing a need for community issues to be addressed purposely concerning unemployment, violence, democracy, pandemics and business continuity. Her desire is to serve others through research, especially in developing economies, and to set a positive example for those who will come after her.

RTP112

The societal and economical impact of virtual reality

Maliha Tabassum[1], Hriday Paul[2], Safwan Bin Mahbub[3], Nusrat Fariha[4]

[1]Biotechnology (BIO), Dept. of MNS, Brac University,
maliha.tabassum5@g.bracu.ac.bd

[2]Business Administration (BBA), Brac University,
hriday.paul@g.bracu.ac.bd

[3]Biotechnology (BIO), Dept. of MNS, Brac University,
safwan.bin.mahbub@g.bracu.ac.bd

[4]BRAC Business School (BBS) , BRAC University,
nusrat.alam.fariha@g.bracu.ac.bd

Abstract

Immersive VR advances researchers' goal of investigating human perception in a controlled and ethical manner while using incredibly realistic stimuli that test subjects may actively explore.

VR is also contributing in every sector as well. The most common application fields of virtual reality are in the entertainment industry that includes video games, 3D motion pictures, gloomy rides in amusement parks, and communal virtual environments. In the early to mid-1990s, video game firms firstly introduced virtual reality headsets for patrons. According to Marr (2021), Alzheimer's disease, schizophrenia, and glaucoma are currently detected via virtual reality. It has also started to define itself as a helpful tool for treating dementia, autism, PTSD and anxiety-related conditions. PTSD and anxiety are known to react well to VR exposure treatment. Numerous more benefits may result from time spent in virtual reality. A teaching and evaluation tool for surgery is offered by Osso VR. More companies are utilizing VR experiences as they become more reasonably priced to teach staff members on business practices and help them hone the soft skills needed for jobs like customer service and public speaking. Virtual reality (VR) aids banks in producing engaging user experiences. For instance, companies may use interactive VR apps to teach clients about the stock market and investing also improve several areas of their customer experience.

Modern virtual reality headgear visuals are constructed on technology from smartphones, including compact HD screens, lightweight, small and quick computer processors and motion sensors for detecting the locations of the head, torso, and hands. Reality-Based Experience; When you put on a headset, it seems as though you are actually in another place and having a realistic involvement. Fighting zombies in VR games becomes a lot more realistic experience because your character can move. This is the contribution of VR in a nutshell.

Keywords: Virtual reality (VR), Immersive technology, Virtual environments, VR headsets, VR treatment, VR and education, VR impact on society, Virtual experiences, VR gaming addiction.

Introduction
A virtual reality (VR) environment creates the illusion that the user is completely submerged in a world full of objects and images that look realistic. Seeing this environment requires a virtual reality headset, helmet, or additional equipment.
The rapid advancements in virtual reality technology have paved the way for its widespread application in various domains. Initially popularized in the gaming and entertainment industries, VR has transcended the boundaries of mere leisure and has found its way into numerous other fields, including education, healthcare, training, and even therapy. According to Bao (2022), Noteworthy developments have been observed in the students' overall quality evaluation of the VR technology group, where 75%, 61%, and 81% of students, respectively, are satisfied with the classroom atmosphere, teaching style, and teaching facilities. As a result, the potential applications of VR are continually expanding, and its impact on human experiences and perceptions is ever-growing.

Methodology
According to Jayaraman (2022), "about 53 million US adults currently own a VR system, and more than a quarter of teens (26%) own a VR device". An additional 14 million US adults will likely purchase one in the next six months. This indicates that there will be 14 million more users of the VR system in 2022 hence, increasing the market's growth rate in the US by 21%. (p. 2) Which clearly shows that it is a famous device among people of the modern world**.**

Arguments and Counter arguments

Every technology has both positive and negative aspects, and virtual reality (VR) is no exception. According to Sahas (2019), Virtual reality can be remarkable and enlightening. Moreover, it can also aid people feel less stressed by allowing them to experience a different environment through virtual means. On the contrary, Virtual reality is extremely expensive and some people can quickly develop an addiction to it.

- In the above, it has been written that the amount of time spent connecting with people and other things in the real world may gradually decline as a consequence of increased social media use. But through using VR our young generation can see the outside world and they can get more knowledge about the outside world.
- In the above it is also seen that it creates social problems-relationship issues, antisocial behavior, disrespect, unnecessary mood swings and so on. Through the use of VR, people are not limited to communicating only within their own country; they can now interact and communicate with people outside their country as well.
- On the other hand, VR can be used to train people for their particular job and skilled them up in graphics and technologies. But it can reduce the physical job place because through the VR process one person can do the work of many people at home very easily and more efficiently.

Mental Health and Social Problems

According to Ryan (2017), the rapid indulgence created by cellphones and social media has condensed people's attention spans. Well the modern world is completely based on technology. But sometimes this blessing becomes a curse. Many of our intelligences and several examples of modern technology are tricked by VR. Virtual reality is one of them. Well excessive use of virtual reality may distort users' personality of reality. They become obsessed with virtual social life which often leads to escape from reality. This is highly likely to result in mental disorder. People are more inclined to lose themselves in between reality and daydream as they get more and more obsessed and addicted to the virtual world. Furthermore, they don't want to enter the real world because the virtual world has already become their actual

world. Consequently, it creates social problems- relationship issues, antisocial behavior, disrespect, unnecessary mood swings and so on.

Although with the help of VR, many risky sports, like bungee jumping, can be made , the technology still has certain drawbacks. According to Shields (2023), after using VR headsets, many people reportedly felt nausea, headaches, eye strain, and dizziness. Several users of VR headsets have reportedly experienced discomfort, vomiting, blurred vision, and disorientation after using them. These symptoms are brought on by the VR illusion, which allows the eyes to focus on objects that are actually only a few centimeters away on the screen but appear to be far away.Constant fatigue of the eyes will eventually result in more severe eye problems in the future (para. 3). It affects students directly. It is not only killing their time but also it engages their mind always in virtual thought.

Hidden creative benefit of Virtual reality in Bangladesh

Mulgan (n.d.) stated that The difference between reality and virtual reality is becoming more and more unclear as the Internet of Things expands which can sometimes be in interesting ways.mA method to automate the construction of the artificial world using software is virtual reality. VR is used to make someone feel that person is now in a unique universe beyond imagination. This procedure allows humans to encounter human senses like(hear,touch,sight). VR has many purposes where it can be used in medical, architecture,robotics, education and many more. First In Bangladesh recently 4 out of 5 people suffer from chronic disease and it's too difficult to treat these patients effectively. VR was able to show what their unique feature is .We can see that in America they have appeared with treatment where they use VR as a medium and they found positive results of their therapy where 33% have felt that this technology has reduced their chronic pain at 100%. According to Wetsman (2021), the FDA has accepted virtual reality therapy as an approved treatment for chronic back pain. Moreover, our youngsters most likely play games using VR. In Europe many countries encourage their youngsters to participate in VR related gaming platforms because through this they can earn money as well as they can use their creative imagination to build new projects. But in Bangladesh most families think VR is a waste of time and it will hinder their children's creativity and academic results. Moreover, VR can be used to train people for their particular job and skilled them up in graphics and technologies.

Potential to Impact the Economy

VR has the possibility to significantly influence regional and worldwide economies, particularly in the field of e-commerce as well as other industries. An immersive shopping experience can boost customer engagement and sales by allowing shoppers to sample and experience things before purchasing them. Using augmented reality to try on eyeglasses and see how they fit is one example of this. Another example is the tourism and real estate industry. Without actually visiting, people can digitally experience the retail and residential spaces. This way real estate agents can show and grant access to a larger number of potential buyers. Another major field where VR can largely affect the economy is how people are trained. Since it provides a training environment that is significantly safer and more time-effective, it can be implemented to train workforce in a range of industries, such as healthcare, manufacturing, and construction. This not only cuts costs but also provides a deeper understanding of a topic to visual learners. As visual learning can help you understand more than just reading guides and manuals. According to Program-Ace (2021), VR training can help professionals learn how to work with heavy equipment like cranes and excavators. It can actually show what you are dealing with like specific heavy machinery. The crane simulator from Industrial Training International allows learners to practice their operating abilities, such as turning booms, keeping weights level while moving goods, and catching the swing. The local economy can benefit immensely from this as it will pave the way for a more skilled workforce.

Solution

Virtual reality is integral to both our society and day-to-day living. In the current world, it has become so intertwined with our life that we cannot live without it. According to Omega Recovery Treatment Center (2021), spending hours playing VR games can lead to severe mental health issues like anxiety, depression, attention deficit disorder, and in many cases, autism spectrum disorder, as well as weight gain, insomnia, and more violent behavior. People, especially our younger generation, are becoming addicted to VR, such as video gaming, video playing, online communication, social media, and many more things, even though they are moving away from real-life activities. They are forgetting to engage in real-life communication and make connections with their family, friends, relatives, and other people. They are spending most of their time online, which is really harmful to their

health as well as their sociability. Now, this is the time to raise awareness; otherwise, our next generation will be destroyed. We can take various steps. Firstly, when young people are using technology, parents should set a fixed time. Secondly, in urban areas, due to the lack of enough playgrounds, young people are passing their time using VR, playing virtual games. In that case, we have to ensure enough playgrounds in urban areas for playing various types of physical games like cricket, football, basketball, and so on. Sometimes, we can see that our parents are so strict with their children that they do not allow them to go outside the house. According to ISWSA.ORG (2019), individuals obsessed with video games, ignore their lives outside of the virtual world by spending between 20 and 40 hours each week (and some even more) in front of a console. This can be one of the reasons for getting addicted to VR. Every parent should allow their children to go outside to play. As a result, they can make real-life connections with their friends, relatives, and also their family.

Conclusion

In this fast-paced world, humans are evolving their way of living. However, with the excessive usage of technology, we have forgotten what reality truly is. Reality is often harsh, leading people to seek refuge in imaginary worlds, and VR has now become one of those mediums. Nevertheless, in the end, we must return to reality because, one day, we may feel disconnected from the real world within the virtual realm.

References:

1. Bao, Y. (2022). Application of Virtual Reality Technology in Film and Television Animation Based on Artificial Intelligence Background. *Scientific Programming*, *2022*, 1–8. https://doi.org/10.1155/2022/2604408

2. Genomind. (2021, March 6). The Social Media Dilemma: Effects on Children. *Genomind.* https://genomind.com/patients/the-social-media-dilemma-how-childrens-mental-health-may-be-affected/?fbclid=IwAR28RTX-4SD24QFlfZLkfcUJpeCskJrFNTjK5q4O7OXyDJR84ZLSvWRob70

3. Jayaraman, S. (2022, December 19). 90+ Powerful Virtual Reality Statistics to Know in 2023. G2. *Shipra Publications.* https://www.g2.com/articles/virtual-reality-statistics

4. Marr, B. (2021, December 31). *The Effects Of Virtual Reality (VR) On Society.* Bernard Marr. https://bernardmarr.com/the-effects-of-virtual-reality-vr-on-society/

5. Omega Recovery Treatment Center. (2021, July 5). *VR Gaming Addiction: How Virtual Reality Can Make Video Game Addiction even More Addicting.* Omega Recovery. https://omegarecovery.org/vr-gaming-addiction-how-virtual-reality-can-make-video-game-addiction-even-more-addicting/

6. Sahas. (2019, September 23). *Pros and Cons of Virtual Reality. Honest Pros & Cons*. Honest Pros & Cons. https://honestproscons.com/pros-and-cons-of-virtual-reality/

7. ServReality. (2023, April 18). Can Virtual Reality cause brain damage? https://servreality.com/blog/can-virtual-reality-cause-brain-damage/?fbclid=IwAR2GX2LeWjpPQ2GZ-K0VvjFKaCNuGtc6fYyFCBLjLXiPk8foBE9zdew3tTg

8. Shields, J. (2023). Are VR headsets bad for your health? *BBC Science Focus Magazine.* https://www.sciencefocus.com/future-technology/are-vr-headsets-bad-for-your-health

9. Wetsman, N. (2021, November 16). VR treatment for chronic pain gets FDA authorization. *The Verge.* https://www.theverge.com/2021/11/16/22785609/vr-chronic-pain-fda

Authors' Biography:

Maliha Tabassum is currently doing a Bachelors From Brac University. She is majoring in Microbiology. Her hobbies are Traveling,Cooking and singing. Her future goal is to travel the world and explore new cultures and learn new languages.

Hridoy Paul is now pursuing my Bachelors Degree in BBA From Brac University. His hobbies are writing, reading and traveling. His future goal is to study abroad to pursue Masters and Phd .

Nusrat Alam Fariha is currently pursuing Bachelors Degree in Human resource Management In Brac University. She has an interest in learning ancient history and tourism, reading and traveling.

Safwan Bin Mahbub is currently a second year student majoring in Biotechnology at BRAC University. He is studying to get a basic understanding of the different fields of biotechnology to later research in a particular field. He is interested in life sciences, architecture, international relations and foreign policy.

RTP113

Metrorail, The New Era of Bangladesh's Transportation

Ronodeep Bhowmik[1], Nuzat Tasnim Lamia[2], Shajedul Arefin1[3], Anwesha Roy[4]

[1]Department of Computer Science and Engineering, BRAC University, Dhaka- Bangladesh, ronodeep.bhowmik@g.bracu.ac.bd

[2]Department of Computer Science and Engineering, BRAC University, Dhaka- Bangladesh, anwesha.roy@g.bracu.ac.bd

[3]Department of Computer Science and Engineering, BRAC University, Dhaka-Bangladesh, shajedul.arefin@g.bracu.ac.bd

[4]Department of Computer Science and Engineering, BRAC University, Dhaka-Bangladesh, nuzat.tasnim.lamia@g.bracu.ac.bd

Abstract
Once, the people of Bangladesh used to ponder regarding the modernization of Bangladesh. Many intellectuals would criticize if Bangladesh would ever be a modern country or not, will it ever be technologically flourished or not. However, now Bangladesh is developed enough by technology as well as the other development projects. For example, The dream of the Padma bridge project has already been successfully done. Additionally, the long-awaited metro rail has just come into reality. The Bangladeshi people are so delighted by getting the first metro rail in their capital city of this country. Moreover, the first ever underwater tunnel project named Karnaphuli tunnel will be finished in Bangladesh very soon. This tunnel will improve the network and transportation system between Dhaka and Cox's bazar. In this way, Bangladesh will be included on the list of the world's most technologically progressive nations.

Keywords: Bangladesh, Padma Bridge, Dhaka, Government, Metro rail, Growth.

Introduction: For all Bangladeshis, the name of their dream was Padma Bridge. But now it is not a dream anymore. all Bangladeshis' dreams have come into reality. On 25 June 22, the Honorable Prime Minister of Bangladesh, Sheikh Hasina inaugurated the Padma Bridge (CPA News, 2022). Many experts think that this bridge will increase the country's GDP, particularly the GDP of the south and south-west areas. Additionally, the bridge will help aid the growth of regional communication. The present government took the initiative for the project of Padma Bridge for the overall progress of this country.

Background checks: Given its positive effects on our GDP, the Padma Bridge will truly enable our economy to expand more quickly than it did in the past. First of all, this bridge will make a convenient network system as well as transportation system with 21 districts of southern part of Bangladesh (Ahmed,2022). Now coming to Dhaka for the people of the south will not be that difficult like before. Secondly, this easier transportation system will create plenty of new business opportunities. Moreover, the patients who used to come to Dhaka for their treatment will get a hassle free journey as they don't have to use Feri anymore. Finally, it will make the Agriculture and industry sector more potential since there is a high possibility to establish new industries (Ahmed,2022). That is how new job possibilities will also be increased.

Demerits: However, everything has its demerits too. Now, all the southern people will use this padma bridge so that the Feri workers will be jobless. It will make their life harder. But this problem can easily be solved by the Government providing them with new jobs. Therefore, it is clear that the Padma bridge has plenty of advantages compared to the drawbacks. In this evolving stage of Bangladesh, traffic congestion is a big problem mostly in the capital of Bangladesh. But to reduce this major problem, to put an end to people's sufferings, the Bangladeshi government came up with a vision of "Metro Rail" project.

Although the world's first metro rail system was introduced in 1890 in London, for Bangladesh it was a whole new concept. As Bangladesh was facing a very major problem of traffic every day and it was not only a problem of road or time. It was affecting the economy of Bangladesh. So the Bangladesh government started to seek new plans to get rid of this problem by modernizing and expanding the road plan. So, in 2008 a non-rural transportation, the idea was sanctioned, where

the Bangladesh government laid out an extensive transportation plan naming it STP for the betterment of Dhaka and also other nearby areas. From many different policies, 10 were evaluated, and after a revised and new adopted plan 5 Metro Rail line ideas got selected for construction. (The daily star, 2022). Moreover, in 2013 (DMTCL) was built by the Bangladesh government to make our vision of Metro Rail come true. A bill of 2.8 billion USD was sanctioned by the government of Bangladesh for this project. However, no good comes without any sacrifice. About 15 million inhabitants had to move to get this project done. So the Bangladesh government sanctioned another 737.5 million USD for them. (Chen, 2022) However, on December 29, 2022, Metro Rail started its journey. (Railway Technology, 2022)

Economic growth: Moreover, according to the experts, The Metro Rail project will help the GDP by 1.5%, which is almost tk200 billion a year and also, almost 17% of the total tax. Also, not to forget, the metro project was mainly made to get rid of the traffic jam problem, which will decrease, and also not to mention, this will reduce the travel time.(CNN travel,2022). In developing nations like Bangladesh, where traffic jams are a daily source of difficulties, Metro Rail offers a perfect answer to this significant issue. Additionally, it will support Bangladesh's economic expansion. Economically speaking, Dhaka has a high demand for Metro Rail because people seek a safe, convenient way to travel that will also make their lives easier than they were previously.Finally, after all the sacrifice and hard work, the dream of residence of Dhaka came true. Metro Rail's dream was mainly to better the life of people of Bangladesh. So, The government of Bangladesh and the organization should try to understand the customer needs and provide them what is best for them. Most importantly security and air conditioning, also CCTV camera and smart card facility will make the consumers daily life easier and faster, as they will not need to wait in line. For a growing economical country connectivity from one part to another plays a great role, especially at the industrialized area.with the initiatives to solve the problems which will occur in building smart Bangladesh our honorable prime minister took the decision of making a underwater tunnel named as Karnaphuli tunnel or Bangabondhu sheik mujibur rahman tunnel. At this time one must travel 36.4 km just to go to Anwara upazila from Chittagong airport using Cox's bazar Chittagong highway that will eventually take 2-3 hours. On the other hand it is only 2 km from Airport to Karnaphuli tunnel. Once the tunnel is fully usable then the time will come down to 30 minutes to arrive at

Anwara upazila and eventually decrease 15 km and Our honorable prime minister inaugurated the Karnaphuli tunnel on 14th oct, 2016. The working of it started on 24th Feb 2019. Its estimated budget is almost 1.1 billion USD, half of its(around 5931.19 cr) funding is happening by Exim bank of China (The daily star, 2022) . And The project is operated by the Bangladesh roads and highway ministry. The length of this underwater port city is almost 3.32 km and the significance of this tunnel is huge. It is the 1st underwater tunnel in the whole of South Asia and the dream scheme after the Padma bridge in our country. Height and width of this tunnel is 10.74m and 3.4m. There are 3-cross passages. Economists are telling that it'll make 0.166 percent G.D.P jump by the help of it Chittagong city will become a one city two town model. Some intensive industrial spots Chittagong airport, Chittagong-port, Potenga-Anwara connection, Cox's bazar, coal factory, Karnaphuli fertilizer company etc for reaching these places the use of Karnaphuli tunnel is inhabitable. Some large companies are planning to set up their factories near the Anwara and Karnaphuli area: Akij group, Four H group, diamond cement group, S.alam Group and even Partex. First G2G economic zone and Chinese economic zone will be established in Anwara upazila on 781 Acr land which will provide 0.2 million jobs to over 60 national and multinational companies proposed to invest 280 million in the economic zone(Azad, 2022).

Conclusion: Though it's a great initiative of the government of BD. But there will be some damage in nature by establishing industrialized areas. But there are flaws in its design, the bottleneck is not planned properly which can cause congestion at the entrance and the exits of the tunnel. Though they are redesigning the bottlenecks, Karnaphuli tunnel is helping Bangladesh to become a developed one by helping tourists and industry work through shortening the distance and helping to get fast communication.For a developing country like Bangladesh, projects like Metro Rail, Padma Bridge and Karnaphuli Tunnel may not look like too much, but it will create a positive impact on GDP as well as create a path to achieve the vision of creating a developed Bangladesh. Although, currently Bangladesh is facing some challenges economically due to these mega projects, but because of these mega projects, Bangladesh is starting its journey to the future. This is the beginning of a new era for Bangladesh.

Reference :

1. Ahmed, M. T. (2022, August 11). Economic impact of Padma Bridge. *The Daily Star.*

https://www.thedailystar.net/business/economy/news/economic-impact-padma-bridge-3092311?amp

2. Alam, Z. (2022, July 1). A dream comes true: The long-cherished Padma Bridge. *CPA News.*https://cpanewsbd.com/2022/07/01/a-dream-comes-true-the-long-cherished-padma-bridge/?fbclid=IwAR3tVoPKGQXwddtIZBIWfeAv744OsJx7nBmuraM0yldse7C_0K1XO1HXyHI

3. Azad, (02 july,2022) Karnaphuli tunnel: A potential harbinger of growth, *The Business Standard.*https://www.tbsnews.net/bangladesh/infrastructure/karnaphuli-tunnel-potential-harbinger-growth-451374

4. Chen, H. (2022, December 29). One of the world's most congested cities just opened its firstmetroline.*CNN.*https://edition.cnn.com/travel/article/dhaka-bangladesh-public-transport-metro-intl-hnk/index.html

5. Dewaipayan B. (Nov 26, 2022) Karnaphuli tunnel to bring new dimension to connectivity.*TheDailyStar.*https://www.thedailystar.net/news/bangladesh/development/news/karnaphuli-tunnel-bring-new-dimension-connectivity-ccci-president-3179756

6. Haider, A. Q. (2021, February 19). Padma Bridge Its huge impact on economy. *The Financial-Express.*https://thefinancialexpress.com.bd/views/analysis/padma-bridge-its-huge-impact-on-economy-1613752119?amp=true

7. Report, S. D. (2022, December 28). PM opens country's first metro rail. *The Daily Star.* https://www.thedailystar.net/special-events/dhaka-metro-rail-opening/news/pm-opens-countrys-first-metro-rail-3207081

8. Risingbd (n.d.). *'Metrorail is unique milestone in Bangladesh`s transport system.* RisingbdOnlineBanglaNewsPortal.https://www.risingbd.com/english/national/news/92228

9. S. (2022, December 29). *Bangladesh opens first metro rail service with Japanese aid*. RailwayTechnology.https://www.railway-technology.com/news/bangladesh-metro-rail-serv

Authors' Biography:

Ronodeep Bhowmik was born in Bangladesh on july 28, 2003 and is currently pursuing B.Sc in Computer Science and Engineering at Brac University, Dhaka. Since his childhood, he has been fascinated by computers and robots, and has always been interested in exploring all the possibilities that this extraordinary field has to offer. His aim is to help the world through technology, make life simpler. He is serving as a Vice President of the Research for Development club

Anwesha Roy was born in Sylhet, Bangladesh on January 20,2002. She has completed her S.S.C and H.S.C from Viqarunnisa Noon School And College and is currently doing a B.Sc at BRAC UNIVERSITY. She is serving as the Financial Secretary of Research for the Development club at Brac University.

Shajedul Arefin was born in Noakhali, Bangladesh on 3rd August 2002. He has completed his secondary education from St. Andre high school, Noakhali and higher secondary from Dhaka commerce college currently studying computer science at BRAC UNIVERSITY. He has been working at the Research for Development club under the HR department at Brac University.

Nuzat was born in Gaibandha, Bangladesh on January 8,2000. She has completed her S.S.C from Ahmed Uddin Shah Shishu Niketan School and college, Gaibandha and H.S.C from Viqarunnisa Noon School and College and is currently doing her BBA from BRAC UNIVERSITY. She has been working at the Research for Development club under the HR department at Brac Universi

RTP114

SWIFT vs. Ripple: The Present and Future of Global Banking

Mahin Tasnim[1]

[1]BRAC University.

mahin.tasnim@g.bracu.ac.bd

Remitting money from the bank is now a piece of cake. Thanks to technology, today we can swiftly move funds across countries and continents. To be more precise, the adoption of SWIFT in the banking industry has markedly accelerated secure global transactions.

"SWIFT", the abbreviation of the Society for Worldwide Interbank Financial Telecommunication, is a global network for financial institutions around the world to send and receive secured transaction messages. To better understand its impact, consider that in 2021 alone, 11 thousand institutions used SWIFT to send an average of 42 million messages per day (Swift FIN Traffic & Figures | Swift, n.d.).
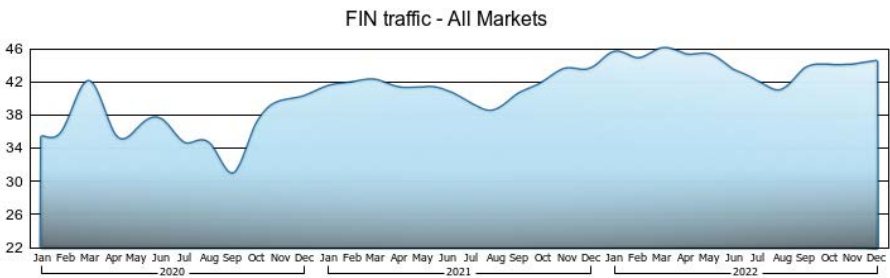

Figure 1: SWIFT's increasing traffic 2020-2022 (Swift FIN Traffic & Figures | Swift, n.d.)

What is SWIFT?

SWIFT is the communication network between banks and other intermediary institutions involved in a financial transaction process. Each financial institution is assigned a SWIFT code of 8 to 11 characters.

XXXX XX XX XXX

The first 4 characters are the institute code, the next 2 are the country code, the next 2 are the location or city code, and the last 3 are the branch code, which is optional (Business Identifier Code (BIC) | Swift, n.d.).

An amazing specialty of SWIFT is that even if the sender and the receiver are different bank account holders, SWIFT still works. There are six levels of intermediaries in this process: sender, sender's bank, sender bank's correspondent, receiver bank's correspondent, receiver's bank, and receiver (Ripple vs SWIFT: payment (r)evolution, n.d.). A sender can just go to his local bank with the receiver's bank account number and the bank-specific SWIFT code. The sender's bank will then send a transfer message to the receiver's bank via SWIFT. Upon receiving the transfer-incoming message, the receiver's bank will clear out the payment for the receiver.

In the context of Bangladesh, the banks use SWIFT network for remittance transactions, travel, minor-value payments, online payment gateway services, mobile wallets to repatriate service income from ITES or remote services, freelance earnings, etc. The local banks are wary of using messaging services other than SWIFT, including Fedwire, Ripple, and CHIPS (the Clearing House Interbank Payments System) (Hossain, 2022). (Seth, 2022).

Nevertheless, SWIFT has some significant drawbacks. The primary issue is that the typical transfer process moves so slowly that clearing several financial checkpoints might take hours or even days. Furthermore, international payments are expensive and difficult. (Shome, 2019).

Ripple to the rescue!

Chris Larsen and Jed McCaleb co-founded Ripple, which made its debut in 2012. RippleNet is a digital payment network protocol built on the blockchain that has its own coin, called XRP. It makes it possible to transfer money easily in any currency, including digital and fiat currencies like bitcoin and litecoin as well as fiat currencies like dollars, yen, and euros. It even allows sending money in fiat currency and receiving it in bitcoin. The digital currency XRP serves as a medium of exchange and speeds up currency conversion (Shome, 2019). The California-based startup is entering the banking sector with three solutions: xRapid, xCurrent, and xVia.

- xCurrent: allows banks to settle international payments instantly with end-to-end tracking
- xRapid: focuses on sending international remittances
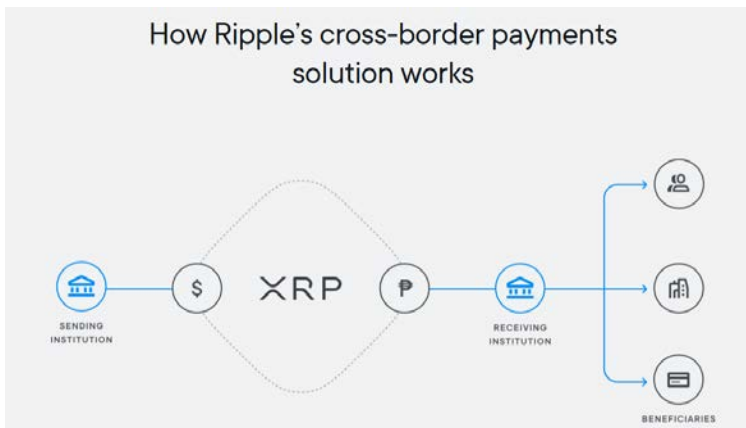- xVia: the default payment interface (Frankenfield, 2022)

Figure 2: How Ripple works (Solutions – Cross-Border Payments, n.d.)
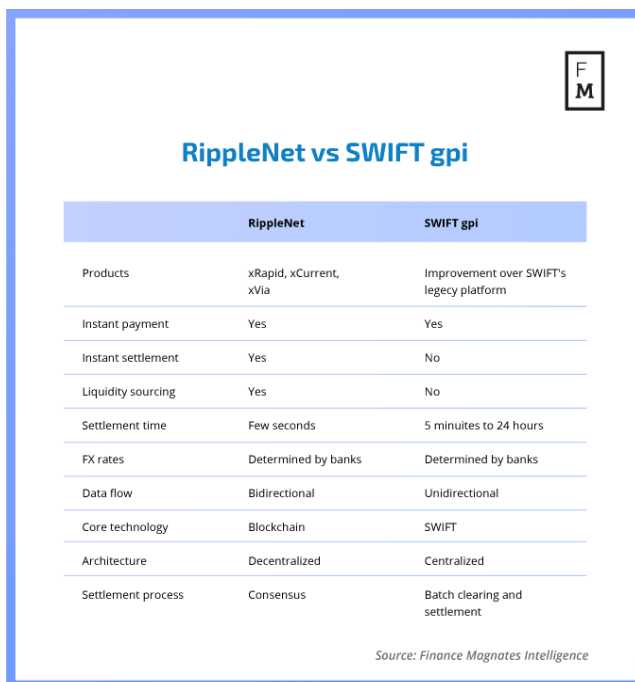
How is Ripple a reflection of blockchain in banking?

Ripple runs on an open-source, distributed ledger technology (DLT) based peer-to-peer platform. The transactions rely on a shared agreement process, similar to blockchain.

Another intriguing feature is Ripple's ability to prevent double-spending in order to ensure system integrity. For instance, if a Ripple user opens a transaction with numerous gateways to send the same $100, only one payment transaction will be completed, and the others will eventually be erased. As a blockchain-based platform, all transactions made in the Ripple wallet are tracked on the Ripple consensus ledger (Frankenfield, 2022).

Simply put, Ripple's main goal is to save time and money by providing client institutions with access to a decentralized secured ledger record system while preventing double spending and other issues associated with traditional banking transfer methods. Despite its digital currency-based services in more than 50 countries, it is still not widely used in most developing countries, including Bangladesh, due to advanced technology requirements.

Let us take a quick look at the differences in settlement times and technologies between Ripple and SWIFT.

RippleNet vs SWIFT gpi

	RippleNet	SWIFT gpi
Products	xRapid, xCurrent, xVia	Improvement over SWIFT's legecy platform
Instant payment	Yes	Yes
Instant settlement	Yes	No
Liquidity sourcing	Yes	No
Settlement time	Few seconds	5 miniutes to 24 hours
FX rates	Determined by banks	Determined by banks
Data flow	Bidirectional	Unidirectional
Core technology	Blockchain	SWIFT
Architecture	Decentralized	Centralized
Settlement process	Consensus	Batch clearing and settlement

Source: Finance Magnates Intelligence

Figure 3: Comparison between Ripple & Swift (Shome, 2019)

SWIFT's Response?

In response to emerging blockchain technology, SWIFT has introduced Global Payment Innovations (GPI). The enhanced service was designed with increased efficiency, traceability, and transparency in order to streamline transactions. It also improves predictability and forecasting for the Treasury. Given that over 3,500 banks have already shown interest in implementing GPI, the initiative was a resounding success for the organization. There are currently about 55 payment market infrastructures that exchange GPI, according to SWIFT. However, SWIFT acknowledged that the recently established GPI link still needs to be sufficiently developed for cross-border payments (Shome, 2019).

All things considered, the current situation implies that SWIFT has entered the fray with a new weapon, assessing the potential threat posed by Ripple's DLT technology taking over the banking industry. The good news is that the two revolutionary innovations will incredibly, if not unimaginably, benefit the future of international banking transactions for us.

References

1. Business Identifier Code (BIC) | Swift. (n.d.). Retrieved from Swift: https://www.swift.com/standards/data-standards/bic-business-identifier-code
2. Frankenfield, J. (2022, October 4). Ripple. Retrieved from Investopedia: https://www.investopedia.com/terms/r/ripple-cryptocurrency.asp
3. Hossain, S. (2022, March 27). Bypassing SWIFT messaging system. Retrieved from The Financial Express: https://thefinancialexpress.com.bd/views/columns/bypassing-swift-messaging-system-1648393282
4. Ripple vs SWIFT: payment (r)evolution. (n.d.). Retrieved from Treasury Today: https://treasurytoday.com/perspectives/opinions/ripple-vs-swift-payment-r-evolution-ttpv
5. Seth, S. (2022, July 7). What Is the SWIFT Banking System? Retrieved from Investopedia:

https://www.investopedia.com/articles/personal-finance/05051
5/how-swift-system-works.asp

6. Shome, A. (2019, April 9). Ripple vs SWIFT: Who is Going to Dominate Inter-Bank Money Transfers? Retrieved from Finance Magnates: https://www.financemagnates.com/cryptocurrency/news/ripple -vs-swift-who-is-going-to-dominate-inter-bank-money-transfe rs/

7. Solutions – Cross-Border Payments. (n.d.). Retrieved from Ripple: https://ripple.com/solutions/cross-border-payments/

8. Swift FIN Traffic & Figures | Swift. (n.d.). Retrieved from Swift: https://www.swift.com/about-us/discover-swift/fin-traffic-figu res

Author Biography:

Mahin Tasnim has completed her studies with specializations in Computer Information Management and Finance. She is passionate about learning and sharing how FinTech and data analytics are changing the dynamics of today's world. Apart from academics, She enjoys exploring new travel destinations and sharing her insights through content writing.

RTP115

Impact of Machine Learning and Deep Learning on Biomedical Applications and Healthcare Industry

Mr. Md Saif Kabir[1], Mr. Shahed Alam[2]

[1]Lecturer, Office of Academic Advising (OAA), Adjunct Lecturer, Department of Electrical and Electronic Engineering (EEE), BRAC University
saif.kabir@bracu.ac.bd

[2]Senior Lecturer, Office of Academic advising (OAA), BRAC University
shahed.alam@bracu.ac.bd

Abstract

A new era of innovation and change in healthcare and medical diagnostics has started as a result of the advancements in Machine Learning (ML) and Deep Learning (DL). Machine learning and deep learning are not just supplemental tools. They are also the catalysts for a paradigm shift in healthcare industry that promises more efficient and individualized healthcare solutions in the nearby future. The substantial impacts of these cutting-edge algorithms on the biomedical applications have been explored in this research paper. With the help of Artificial Intelligence (AI) and its related field, researchers and healthcare professionals now have access to technologies that can analyze large and complicated datasets, extract insightful knowledge, diagnose medical conditions and make incredibly precise predictions.

Keywords

Biomedical Engineering, Machine Learning, Deep Learning, Healthcare, Data-driven Insights, Medical Diagnostics, Artificial Intelligence

Introduction

The fusion of technology and healthcare has led to huge developments in biomedical engineering. It is revolutionizing how doctors comprehend, identify, and treat medical diseases. The two domains of artificial intelligence (AI) - deep learning and machine learning, have risen to unparalleled prominence and have proved to be revolutionary. Slowly and steadily, Machine learning and deep learning algorithms are fundamentally altering how we approach medical research, clinical practice, and establishing cutting-edge healthcare solutions. These technologies can analyze enormous amounts of complex data, extract insightful conclusions, and make predictions with astounding accuracy in a very short time.

This paper explores all the specific applications of the integration of AI in the biomedical field, such as customized medicine, drug discovery acceleration, medical imaging for better diagnostics, and predictive analytics for disease prevention. It also emphasizes the difficulties and moral issues surrounding the application of these technologies in the healthcare industry.
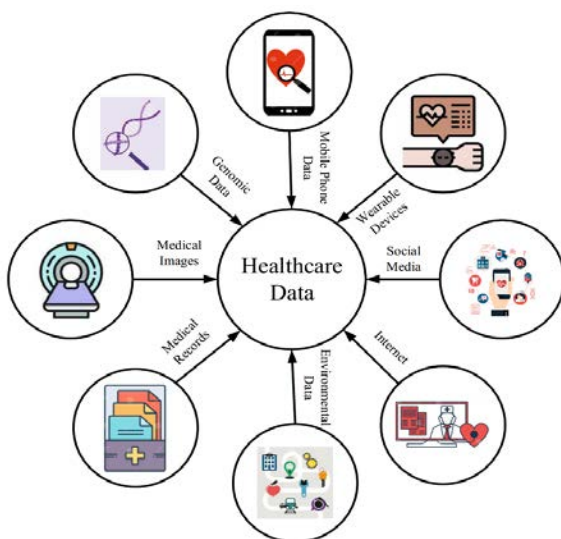

FIGURE 1: Use of machine learning (ML) and deep learning in healthcare
Source: Rahmani et al (2021). Machine Learning (ML) in Medicine: review, applications, and challenges.

Literature Review

In the field of biomedical engineering, artificial intelligence (AI) has a substantial impact. It is now used in several aspects starting from medical diagnostics to disease detection and personalized treatment. Figure 1 shows how the integration of ML have expanded over the years, starting from 1992.
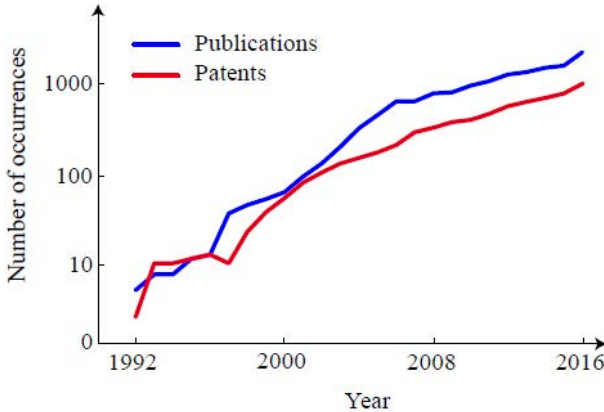

FIGURE 2: Trends in use of machine learning (ML) for biomedical sciences, 1992–2016. Source: Kording, K. P. (n.d.-b). FIGURE 1, Trends in use of machine learning (ML) for biomedical sciences, 1992–2016 - Frontiers of Engineering - NCBI Bookshelf.

Diagnostic and medical imaging: Medical imaging has been one of ML and DL's first and most significant applications in biomedical engineering. Convolutional neural networks (CNNs), in particular, have shown astounding accuracy in tasks like segmentation, object detection, and imagine classification. Rajpurkar et al. (2017) demonstrated how DL has the potential to improve diagnostic precision by presenting a model for identifying a variety of disorders in chest X-rays. Olaf Ronneberger et al. (2015) wrote a paper on U-net Convolutional Neural Network which is an extremely efficient image segmentation algorithm. Yan et al. (2018) presented a model to detect and identify lesions efficiently from images using deep learning.

Drug Discovery and Development: The speeding up of drug discovery and development has been made possible imperatively by machine learning. The application of ML algorithms to anticipate drug-target

interactions, expedite drug screening procedures, and more effectively identify possible therapeutic candidates has been emphasized in studies by Stokes et al. (2020). The paper discussed how DL models can accelerate the process of discovering antibiotics. Cai et al. (2020) mentioned how transfer learning can leverage existing data to improve predictive models.

Personalized Medicine: With the use of ML and DL, personalized medicine, which is catered to a person's genetic make-up and medical background, has gained popularity. According to Miotto et al. (2018), deep learning can be used to anticipate how patients will react to particular therapies, allowing for personalized therapeutic interventions and minimizing side effects. Jared L. Katzman et al. (2018) introduced DeepSurv, a DL model to suggest tailor-made treatment plans, based on patients' data.

Early Disease Prediction and Prevention: Using predictive analytics powered by ML algorithms, disease outbreaks and personal health concerns can be predicted. In order to improve patient care and resource allocation, Obermeyer et al. (2016) investigated the potential of ML to forecast patient deterioration in healthcare settings. Ryan Poplin et al. (2018) focused on the possibility for extensive screening and proposed deep learning model for the identification of diabetic retinopathy. Kangrok Oh et al. (2021) focused on the early detection techniques of diabetic retinopathy, which is even more effective in saving a patient suffering from glucoma.
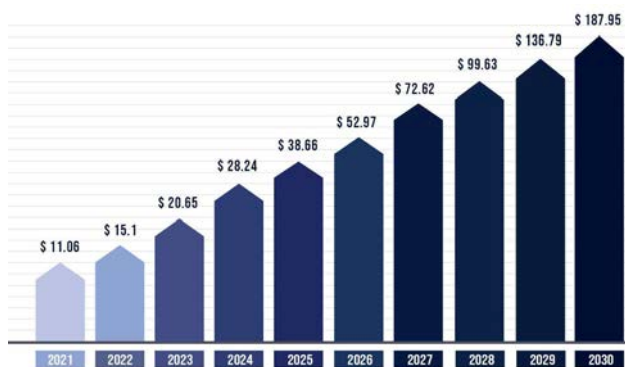

FIGURE 3: Artificial Intelligence in global healthcare market (USD BILLION)
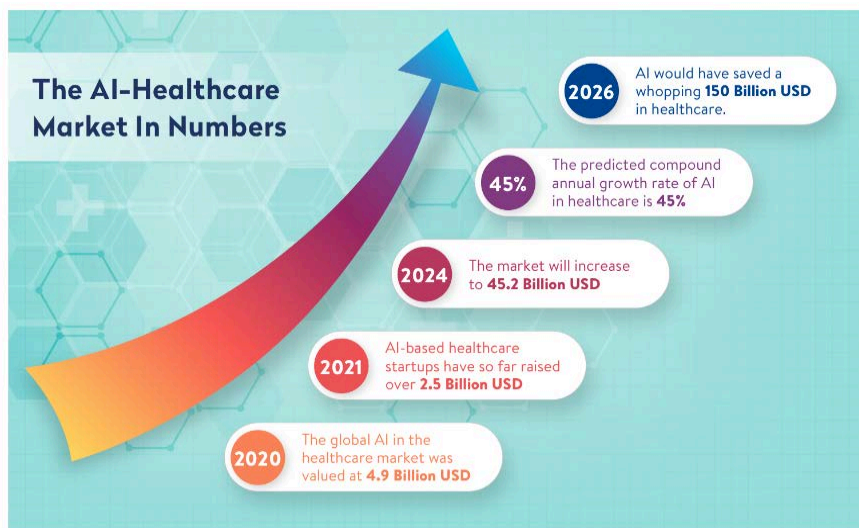Source: Artificial Intelligence (AI) in healthcare market size 2022-2030. (n.d.).
https://www.precedenceresearch.com/artificial-intelligence-in-healthcare-market

FIGURE 4: The evolution of AI in healthcare. Source: Shivaswamy, S. (2023). The evolution of AI in healthcare. CodeGlo Journal

.

Figure 2 and 3 shows the current global market and its projection. It is undeniable that AI is revolutionizing the healthcare industry. Other than the avoid mentioned applications, AI is employed in several other applications – Wearable health monitoring devices, robot assisted surgery, bioinformatics, virtual health assistants and so on.

Challenges and Future Directions

Ethical and regulatory issues have surfaced as ML and DL applications in biomedical engineering grow more widespread. The current challenges include protecting the patient privacy, accountability of new ML and DL models and ensuring proper data quality bias mitigation. To overcome these difficulties and make sure that AI technologies offer the desired advantages while preserving ethical norms and patient rights, the researchers, healthcare practitioners, and AI developers must collaborate.

Although ML and DL have a lot of potential, there are still issues with scalability, interpretability, and data quality. To overcome these difficulties and make sure that AI technologies offer the desired advantages while preserving ethical norms and patient rights, the researchers, healthcare practitioners, and AI developers must

collaborate. For secure and accessible health data management, research is also being done to combine AI methods with other cutting-edge technologies, such as blockchain (Chang et al., 2021).

Conclusion

It is clear that machine learning and deep learning have a significant impact on biomedical engineering. These technologies are at the forefront of medical innovation, advancing everything from diagnostics to individualized treatment plans and redefining the study of medicines. But as we proceed on this revolutionary journey, addressing ethical issues and overcoming technical difficulties are also crucial.

References:

1. Artificial Intelligence (AI) in healthcare market size 2022-2030. (n.d.). https://www.precedenceresearch.com/artificial-intelligence-in-hea lthcare-market

2. Cai, C., Wang, S., Xu, Y., Zhang, W., Tang, K., Ouyang, Q., Lai, L., & Pei, J. (2020). Transfer learning for drug discovery. *Journal of Medicinal Chemistry*, *63*(16), 8683–8694. https://doi.org/10.1021/acs.jmedchem.9b02147

3. Chang, Y., Chen, F., & Sun, W. (2021). A Blockchain-Based federated learning method for smart healthcare. *Computational Intelligence and Neuroscience*, *2021*, 1–12. https://doi.org/10.1155/2021/4376418

4. Doshi‑Velez, F., Kortz, M., Budish, R., Bavitz, C., Gershman, S., O'Brien, D. P., Scott, K. M., Schieber, S., Waldo, J., Weinberger, D., Weller, A., & Wood, A. (2017). Accountability of AI under the Law: The role of explanation. *arXiv (Cornell University)*. https://doi.org/10.48550/arxiv.1711.01134

5. Katzman, J., Shaham, U., Cloninger, A., Bates, J., Jiang, T., & Kluger, Y. (2018). DeepSurv: personalized treatment recommender system using a Cox proportional hazards deep neural network. *BMC Medical Research Methodology*, *18*(1). https://doi.org/10.1186/s12874-018-0482-1

6. Kording, K. P. (n.d.-b). FIGURE 1, Trends in use of machine learning (ML) for biomedical sciences, 1992–2016 - Frontiers of Engineering - NCBI Bookshelf. https://www.ncbi.nlm.nih.gov/books/NBK481619/figure/fig_ch11

-1/?fbclid=IwAR0k9BDknlBWcD5-3rkK5QeQ-a4O7QGgu_KpJ
3fI37wobUXw0taWohQMrQY

7. Miotto, R., Li, L., & Dudley, J. T. (2016). Deep Learning to Predict Patient Future Diseases from the Electronic Health Records. In *Lecture Notes in Computer Science* (pp. 768–774). https://doi.org/10.1007/978-3-319-30671-1_66

8. Miotto, R., Li, L., & Dudley, J. T. (2016). Deep Learning to Predict Patient Future Diseases from the Electronic Health Records. In *Lecture Notes in Computer Science* (pp. 768–774). https://doi.org/10.1007/978-3-319-30671-1_66

9. Obermeyer, Z., & Emanuel, E. J. (2016). Predicting the future — big data, machine learning, and clinical medicine. *The New England Journal of Medicine*, *375*(13), 1216–1219. https://doi.org/10.1056/nejmp1606181

10. Oh, K., Kang, H. M., Leem, D., Lee, H., Seo, K. Y., & Yoon, S. (2021). Early detection of diabetic retinopathy based on deep learning and ultra-wide-field fundus images. *Scientific Reports*, *11*(1). https://doi.org/10.1038/s41598-021-81539-3

11. Poplin, R., Varadarajan, A. V., Blumer, K., Liu, Y., McConnell, M. V., Corrado, G. S., Peng, L., & Webster, D. R. (2018). Prediction of cardiovascular risk factors from retinal fundus photographs via deep learning. *Nature Biomedical Engineering*, *2*(3), 158–164. https://doi.org/10.1038/s41551-018-0195-0

12. Rahmani, A. M., Yousefpoor, E., Yousefpoor, M. S., Mehmood, Z., Haider, A., Hosseinzadeh, M., & Naqvi, R. A. (2021). Machine Learning (ML) in Medicine: review, applications, and challenges. Mathematics, 9(22), 2970. https://doi.org/10.3390/math9222970

13. Rajpurkar, P., Irvin, J., Zhu, K., Yang, B., Mehta, H., Duan, T., Ding, D. Y., Bagul, A., Langlotz, C. P., Shpanskaya, K., Lungren, M. P., & Ng, A. Y. (2017). CheXNet: Radiologist-Level Pneumonia Detection on Chest X-Rays with Deep Learning. *arXiv (Cornell University)*. https://doi.org/10.48550/arxiv.1711.05225

14. Ronneberger, O., Fischer, P., & Brox, T. (2015). U-NET: Convolutional Networks for Biomedical Image Segmentation. *arXiv (Cornell University)*. https://doi.org/10.48550/arxiv.1505.04597

15. Shivaswamy, S. (2023). The evolution of AI in healthcare. CodeGlo Journal. https://www.codeglo.com/blog/the-evolution-of-ai-in-healthcare/

16. Stokes, J., Yang, K., Swanson, K., Jin, W., Cubillos-Ruiz, A., Donghia, N. M., MacNair, C. R., French, S., Carfrae, L. A., Bloom-Ackermann, Z., Tran, V. M., Chiappino-Pepe, A., Badran,

A. H., Andrews, I. W., Chory, E. J., Church, G. M., Brown, E. D., Jaakkola, T. S., Barzilay, R., & Collins, J. J. (2020). A deep learning approach to antibiotic discovery. *Cell*, *180*(4), 688-702.e13. https://doi.org/10.1016/j.cell.2020.01.021

17. Yan, K., Wang, X., & Lü, L. (2018). DeepLesion: automated mining of large-scale lesion annotations and universal lesion detection with deep learning. *Journal of Medical Imaging*, *5*(03), 1. https://doi.org/10.1117/1.jmi.5.3.0365

Authors' Biography

Mr. Md Saif Kabir is currently working as a lecturer in BRAC University. He completed his M.Sc. in Nuclear Engineering and Thermal Physics from National Research Nuclear University (NRNU)- Moscow Engineering Physics Institute (MEPhI), Russia. Prior to that, he obtained his BSc. degree in Electrical and Electronics from Islamic University of Technology (IUT). His current research interest involves deep learning, machine learning, neural networks, biomedical imaging, power electronics and renewable energy.

Mr. Shahed Alam is currently working as a senior lecturer in BRAC University. He did his Master of Science from Tampere University of Technology on Electrical Engineering, Finland. The major of his M.Sc. was on Radio Frequency Electronics focusing on Antennas and Minor was on Wireless Communication. His current research interest involves wireless communication, deep learning, machine learning, and internet of things.

RTP116

A research investigation into the impact of ensuring workplace safety and worker protection among staff at Square Pharmaceuticals PLC, Bangladesh.

Md. Shahriar Alam[1], Mushfiq Mahmud Majumder[2], Samiha Ibnat Barna[3], Chowdhury Shafin Sahil Yshan[4], Ahsanul Islam[5], Mahima Akther[6]

[1]BRAC Business School (BBS) , BRAC University, md.shahriar.alam1@g.bracu.ac.bd

[2]BRAC Business School (BBS) , BRAC University, mushfiq.mahmud.majumder@g.bracu.ac.bd

[3]BRAC Business School (BBS), Brac University, samiha.ibnat.barna@g.bracu.ac.bd

[4]BRAC Business School (BBS), BRAC University, shafin.sahil.yshan@g.bracu.ac.bd

[5]BRAC Business School (BBS) , BRAC University, ahsanul.islam1@g.bracu.ac.bd

[6]BRAC Business School (BBS) , BRAC University, mahima.akther@g.bracu.ac.bd

Abstract:

The goal of this study is to protect employees and provide workplace security at Square Pharmaceuticals. It goes beyond that to encompass relationships within an organization, both internal and external. The internal dynamics are typically crucial to boosting productivity. The working atmosphere at a company affects how productive the employees are. A safe workplace is one where there is a favorable environment for the workers. Furthermore, a place where there are no

injuries can be considered safe. Such a setting makes certain the staff members have the right instructions and alerts.

In recent years, increased concern about health, safety, and environmental issues in industries has resulted in the development of integrated health, safety, and environment management Systems in many organizations. The purpose of this study was to assess the HRM management system in pharmaceutical organizations. Understanding the significance of workplace safety and protection, this study used ten questionnaires to collect data from a Square Pharmaceutical respondent. To test the hypotheses, his opinions and responses were evaluated.

What safety a company provides to make sure that all (customers and employees) are safe, safety during regular risk management, how the emergency events are handled, we are directly taking information from the employees of our chosen company. All the information and research are given below.

Key words: Pharmaceutical Organization, Management, Safety, Health, Risk

Introduction:
Maintaining a safe and secure workplace is essential to employee health and productivity. Establishing and upholding safety standards requires cooperation between employers, workers, and regulatory agencies. Since 1985, Square Pharmaceuticals PLC., Bangladesh's largest pharmaceutical business, has been ranked first among both domestic and international competitors. The corporation established the Natural Care Unit in 2004 to cater to the growing interest in alternative therapies including Ayurveda and herbal medicine. (SQUARE Pharmaceuticals PLC. (n.d.). To provide individuals with products and services that enhance their quality of life was the inspiration for the creation of Square. The conglomerate has expanded to include several enterprises across numerous industries, including healthcare, textiles, consumer products, media, and IT.

Background:
A safe and healthy workplace not only protects workers from injury and illness, a well-maintained workplace may also have positive effects on productivity, quality of work, employee retention, and morale. Comprehensive safety policies, regular risk assessments, training, PPE,

health and wellness programs, clear reporting systems, regular inspections and audits, safety committees, regulatory compliance, incentives and recognition, and a culture of continuous improvement are just a few of the many effective methods. Employers may make significant improvements to worker safety, lower the likelihood of workplace accidents, and increase productivity by adopting and promoting these measures. Employee morale is boosted, which in turn improves productivity and the bottom line. Employers may establish a workplace that prioritizes worker protection, minimizes the chance of accidents and injuries, and ultimately leads to higher productivity and better business performance by applying these methods and cultivating a culture of safety.

Objectives:
We think that workplace safety and worker protection, such as making sure workers have a safe place to work and safe tools, rules, and processes, protects their health and safety. staff at Bangladesh's Square. More specifically, we think: The more productive a place of work is, the safer it is. Safety at work is good for the health of both workers and companies. When safety is better, health is better. When workers are healthy, they do their jobs better and are happy in general.
In a safe place to work, accidents don't happen very often. This means that safety reviews take less time and costs for worker's compensation go down. This also cuts down on the time it takes for staff to get better after getting hurt.

Employees are inclined to seek employment in environments that prioritize their safety and minimize the risk of accidents or injuries. In this particular context, it may be observed that employees experience a higher level of satisfaction and demonstrate increased productivity. Ensuring a secure working environment has significant importance for both employees and employers alike. All individuals employed have the entitlement to have a sense of security inside their workplace. Irrespective of the size of a corporation, ensuring workplace safety is of paramount significance. Ensuring safety is an essential component of all occupational endeavors, regardless of their scale or magnitude. According to Ahmed (2023), the effective implementation of safety measures not only ensures the safety of people but also safeguards industrial equipment. Ensuring the safety and well-being of employees is within the purview of corporate responsibility. The objective of this study is to examine the extent to which workplace safety and worker

protection measures in Square, Bangladesh, effectively safeguard the health and well-being of workers.

Literature Review:

LR Table:

| Author's Name and Year	Factors	Description
Makin, A. M., & Winder, C. (2008)	Occupational Health and Safety Management Systems	This analysis looks at the efficiency of occupational health and safety management systems (OHSMS) across different sectors. It emphasizes how an OHSMS that is properly implemented may greatly lower occupational injuries and accidents.
Ramsay, H. (1977)	Worker Participation	This review investigates the significance of worker engagement in improving workplace safety. It highlights the need of including workers in safety-related decision- making and hazard detection in order to promote compliance with safety regulations and build a better safety culture.

Wilkins, J. R. (2011)	Safety Training	This research review focuses on the results of occupational safety training programs. According to the research, good safety training results in fewer accidents and incidents as well as increased employee knowledge of safety issues.
Moir, S., & Buchholz, B. (1996)	Ergonomic Interventions	This evaluation assesses several ergonomic measures intended to safeguard employees from musculoskeletal problems and other physical stresses. It shows that incorporating ergonomic solutions, such appropriate workstation design and equipment, might lessen the risk of work-related accidents.

Kalimo, R., El Batawi, M. A., & Cooper, C. L. (1987)	Psychosocial Factors	This meta-analysis looks at how workplace safety is related to psychosocial elements including job stress and organizational support. According to this, addressing psychological variables can improve safety performance and lower the risk of accidents.
Harrisson, D., & Legendre, C. (2003)	Technological Innovations	This review investigates how technology might enhance worker safety. It goes through ways to monitor safety conditions, stop accidents, and improve worker protection using technologies like wearable technology, sensors, and artificial intelligence.

Yule, S., Flin, R., & Murdy, A. (2007)	Safety Climate and its Impact	The shared views of safety among personnel inside the business are referred to as the "safety climate," and this review summarizes empirical studies in this area. The results show a good safety atmosphere is linked to lower accident rates and greater levels of adherence to safety regulations.
Dodoo, J. E., Surienty, L., & Al-Samarraie, H. (2023)	Leadership	In fostering a safety culture Inside businesses, this research review emphasizes the crucial role of leadership. It emphasizes how Encouraging and accessible leadership has a big impact on how employees behave when it comes to safety, as well as how well safety is performed overall.

Methodology:

A qualitative research approach was used for the purpose of this study so that the experiences and points of view of employees on a specific topic could be investigated. Utilizing qualitative research as a methodology is appropriate when the purpose of the study is to investigate the individual experiences, meanings, and interpretations of individuals. We followed the flow chart presented below and allowed us to maintain our forward momentum and keep our work in an orderly fashion.
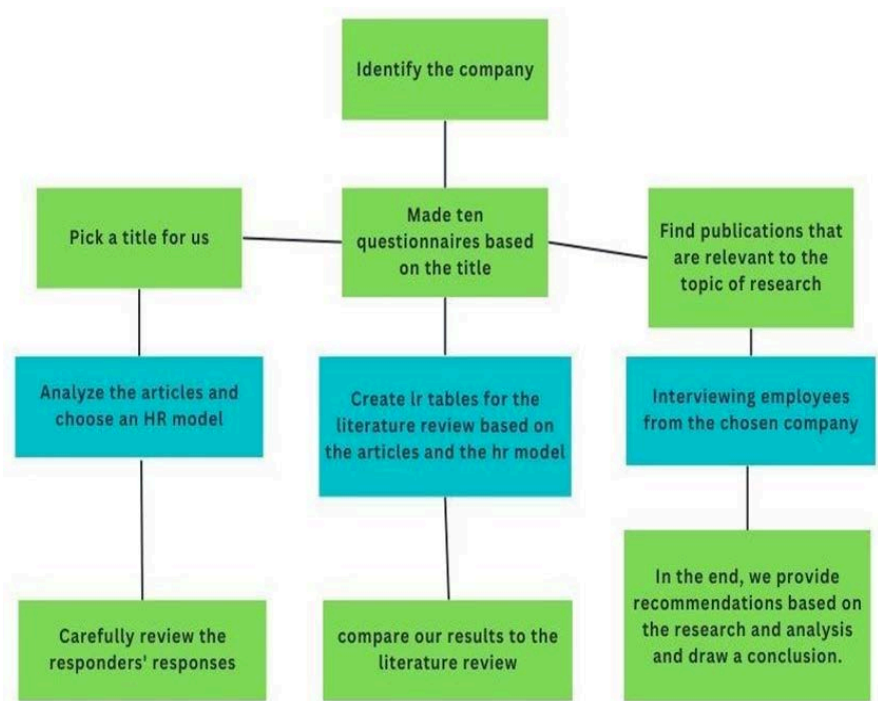
Sample:

Purposive sampling was used to choose the sample from Square Pharmaceuticals, and one employee was chosen for the study based on availability and willingness to participate. In order to guarantee a range of viewpoints, the participant was chosen from several disciplines. **Participant: Name:** Nayem Shihab Uddin Noor

Designation: Senior Associate Marketing & Business Development

Email: nayem.shihab.uddin.noor@squarepharma.com.bd

- **Data Collection:**

The data collected for this case study has been taken from interviews from the participant. The interview questions were open-ended, giving the participant the chance to elaborate his experience. The interviews were audio recorded and transcribed for further analysis. The questionnaire table and the summarized responses of the participant are given below.

Questionnaire and Response:

Questions	Participant
What safety rules and measures does Square have in place to make sure that workers and customers are safe?	Square probably performs regular risk analyses to find possible workplace dangers. Safety audits are performed to assess and validate the effectiveness of current safety measures and practices. As a result of these analyses and investigations, Square is able to make the required adjustments to keep a secure environment.
How does Square make sure that the workplace is safe by doing regular risk assessments and safety audits?	Square certainly performs frequent risk assessments and safety audits to uncover workplace dangers. Safety audits evaluate and verify existing safety practices. These examinations and audits help Square enhance safety.

What kinds of safety training classes are there for workers to make sure they know how to do things safely?	Square may hold safety training seminars for its personnel to make sure they are knowledgeable about safety procedures and practices. These seminars can address subjects including fire safety, workplace ergonomics, emergency response, and general safety awareness.
How does Square follow local, state, and federal laws and rules for safety?	Regulations and standards for safety must be followed by Square at the local, state, and federal levels. This entails routinely examining and upgrading safety procedures and regulations to comply with the most recent legislative requirements.
How do emergency events get handled at Square, and what plans are in place for getting people out of the building and getting the word out?	We have well-defined emergency response plans in place to deal with a variety of scenarios. We have defined evacuation routes, assembly places, and trained emergency response teams in the case of an emergency. Furthermore, we deploy an effective communication system to quickly alert all personnel, ensuring that everyone is aware of the situation and can safely leave.

Is there anything in place to protect workers who do a lot of remote work or who regularly travel for work?	Yes, Square looks after all of its employees, including those who work remotely or frequently travel. To maintain data security, we provide remote workers with cybersecurity rules and tools. Travelers receive assistance, resources, and travel safety advice to ensure their safety.
How has Square responded to the potential health and safety risks posed by the COVID-19 pandemic? How are programs promoting hygiene, immunization, and social isolation being carried out?	Square's response to the pandemic was prompt and comprehensive. We quickly transitioned to remote work, delivered hygiene supplies, and assisted with immunization efforts. To preserve our employees' health, educational campaigns and frequent updates stress hygienic standards and social distancing.
What protocols exist for analyzing and handling situations involving injuries or near-misses in the workplace?	Square takes a proactive approach to injury and near- misses. We have a well-defined incident reporting system in place so staff can swiftly report any issues. A dedicated safety team thoroughly investigates each incidence, identifying core causes and adopting corrective actions to avoid future mishaps.

How does Square track the success of its safety initiatives in the office and adjust course as needed?	At Square, we take ongoing improvement very seriously! The success of our safety programs is measured by frequent safety audits, performance indicators, and employee feedback. This data-driven approach allows us to identify areas for improvement and alter our safety policies to create a safer workplace.
Are workers actively contributing to safety measures through participation in safety committees or meetings?	Yes, employee involvement is actively encouraged. Employees can express their safety concerns and suggestions through safety committees and meetings. Square values customer feedback, and their active participation assists us in creating a safer workplace for everyone.

- **Data Analysis:**

The data were examined using a technique known as thematic analysis, which includes extracting recurring themes and patterns from the data using a methodical approach that involves transcribing and classifying the data. A number of times were spent reading and re-reading the transcribed interviews in order to isolate the important ideas and themes. After that, the data were transcribed, organized, and carefully examined using statistical methods.

Results and Findings:

This study investigated methods for ensuring workplace safety and workers protection at Bangladesh's Square Pharmaceutical. A Questionnaire was presented to a participant who worked as a senior associate marketing & business development for Square PLC in Dhaka.Safety rules and measures: The results suggest that Square prioritizes workers and customers safety. The respondent agreed that the safety briefings and training are held in a secure environment. This

finding supports that everyone has a wide range of safety policies and is aware of the practices like emergency responses, fire safety and correct equipment usage that keep the workplace safe and secure.

Risk assessments and safety audits: Square performs on frequent assessments and safety audits by uncovering workplace danger and preventing safety. They take examinations like safety training seminars for its personnel knowledgeable on risk assessments and audits to verify safety practices on a regular basis to identify and mitigate potential danger.

Measures to avoid Violence: Square takes workplace safety seriously and has measures in place to avoid violence. The workplace is a primary issue and Square has strict anti-violence measures. The responder reported that the employees receive extensive training in conflict resolution and de-escalation strategies to ensure handling difficult situations calmly and professionally.

Health and safety risks during COVID-19: The responder stated that during COVID-19 pandemic, they transitioned to remote work and delivered hygiene supplies, assisted with immunization efforts to preserve employees' health, educational campaigns and regular communication and social distancing.

Laws and rules: Regulations and standards for safety must be followed at the local, state and federal levels by routinely examining and upgrading safety procedures.

Safety and Health issues at work: Square emphasizes safety and health officials in charge of ensuring a safe working environment. They maintain the safety policies by doing routine reviews and practices to ensure compliance with legislative standards (SQUARE Pharmaceuticals PLC. (n.d.)).Safety training classes: Safety training seminars for the employees to make sure they are knowledgeable. Seminars like: hazard identifications, customer safety and workplace ergonomics to emphasize safety in their daily tasks (SQUARE Pharmaceuticals PLC. (n.d.)).

Protocols for analyzing and handling situations: Square takes a proactive approach to injury and near-misses. Responders have a well-defined incident reporting system in place so the staff can report any issues. Besides, the safety team investigates incidence, core causes and adopts corrective actions.

Safety Initiatives: The success of Squares safety initiatives is measured by safety audits, performance indicators and employee feedback. This data-driven approach allows to improve the areas and safety policies (SQUARE Pharmaceuticals PLC. (n.d.)).

Security for sensitive information and online transactions: Protecting sensitive information is unquestionably a major priority. The responder stated that they have a detailed set of laws and procedures like robust security and mechanisms in place to secure data and online transactions. They use cutting-edge technologies to ensure a secure work environment.

Participating in safety committees: Square has a safety committee for their employees. They can take safety concerns and suggestions through safety committees and meetings. Square values customer feedback and their participation promotes a solid safety culture and creates a safer workplace for everyone.

Comparative Analysis:
Based on the findings from the study investigating workplace safety and workers' protection at Square Pharmaceutical in Bangladesh, several key areas can be compared and analyzed to understand how the company prioritizes safety and implements measures to ensure a secure work environment.

Safety Rules and Measures:

The study found that Square places a high priority on workers' and customers' safety. The respondent agreed that safety briefings and training are conducted in a secure environment. This indicates that Square has established comprehensive safety policies and ensures that employees are aware of emergency responses, fire safety, and proper equipment usage. The company's commitment to safety training contributes to maintaining a safe and secure workplace (Pathak, 2023).

Risk Assessments and Safety Audits:
Square demonstrates a proactive approach to safety by conducting frequent risk assessments and safety audits. By regularly uncovering workplace dangers and preventing safety hazards, Square shows its dedication to identifying potential risks and taking appropriate measures to mitigate them. The emphasis on safety training seminars

for personnel on risk assessments and audits indicates a culture of continuous improvement in terms of safety practices (Pathak, 2023).

Measures to Avoid Violence:

The study highlights Square's serious approach to workplace safety by implementing measures to avoid violence. The company prioritizes workplace safety by having strict anti-violence measures in place. The fact that employees receive extensive training in conflict resolution and de-escalation strategies underscores Square's commitment to handling difficult situations calmly and professionally.

Health and Safety During COVID-19:

The responses indicate that Square took proactive measures to protect employees' health during the COVID-19 pandemic. Transitioning to remote work, providing hygiene supplies, assisting with immunization efforts, and maintaining regular communication and social distancing demonstrate Square's commitment to ensuring the well-being of its employees during challenging times.

Compliance with Regulations and Standards:

Square emphasizes compliance with safety regulations and standards at the local, state, and federal levels. By routinely examining and upgrading safety procedures, the company strives to meet or exceed the necessary safety requirements, ensuring a safe working environment for all employees.

Safety Training Classes:

Square's focus on safety is reinforced by providing employees with safety training seminars. Covering topics such as hazard identification, customer safety, and workplace ergonomics, these training sessions equip employees with the knowledge to prioritize safety in their daily tasks (Pathak, 2023).

Protocols for Analyzing and Handling Incidents:

Square adopts a proactive approach to dealing with injuries and near-misses. The well-defined incident reporting system and safety

team investigations help identify the root causes of incidents, leading to corrective actions and prevention measures.

Safety Initiatives and Data-Driven Approach:

The effectiveness of Square's safety programs is evaluated by means of safety audits, performance metrics, and solicited input from employees. The utilization of a data-driven strategy enables the organization to systematically identify areas that require enhancement and consistently enhance safety policies (Pathak, 2023).

Security for Sensitive Information and Online Transactions:

Square recognizes the importance of protecting sensitive information. By having robust security procedures and mechanisms in place, along with the use of cutting-edge technologies, the company ensures a secure work environment and safeguards sensitive data and online transactions.

Participating in Safety Committees:

Square values employee feedback and promotes a solid safety culture by having safety committees and meetings where employees can voice their safety concerns and suggestions. This participative approach fosters a safer workplace for everyone (Pathak, 2023).

Recommendations:

In this time of modern industry, safety and defense at work are of the utmost importance. Every worker wants to work in a place that is safe and protected. Over all these years, The Square Pharmaceuticals has kept its workers safe and protected because it has always been committed to doing so. During our study, however, we found that Square Pharmaceuticals was missing a few safety steps. The business should think about trying some new things to improve its reputation as a good workplace and make sure its workers are safe. These methods could include getting workers to participate and report, making sure they use their personal safety equipment (PPE) correctly, and making sure management and workers get along well. To build a strong safety culture, it is important to give workers the tools they need to participate in safety efforts. Because of this, Square Pharmaceuticals should

promote an atmosphere of open dialogue and participation. This can be done by setting up a system where workers can report safety worries, almost-missed accidents, or any other safety issue that isn't getting enough attention. This method of reporting will also help to look at safety practices on a daily basis. Square Pharmaceuticals must ensure that the workers have access to the right personal protective equipment (PPE), such as hats, gloves, and safety glasses, for their jobs. Also, there should be regular checks to make sure that the staff is using the required PPE correctly. Also, the company should set up training classes to teach workers how to use, keep, and get rid of PPE correctly. Square Pharmaceuticals should try to build and keep a good relationship between management and workers so that safety policies can be carried out well and safety measures are accepted and followed by everyone in the company. It can be done by ensuring open conversation, trust, and good ties between people. To put safety policies and practices into action, managers and workers must have a good relationship and work together. Square Pharmaceuticals should put trust, mutual respect, and open communication at the top of its list of priorities in order to make a safe atmosphere for safety efforts. When management and workers get together for regular safety talks and forums, it can be easier to have useful conversations and get feedback. When workers feel like they are important and are being listened to, they are more likely to take part in safety efforts and follow safety rules. By using these methods, Square Pharmaceuticals can improve its reputation as a good company and make the workplace better for its workers. Putting worker safety first not only keeps workers safe, but it also boosts output and creates a good company atmosphere. We think that if Square Pharmaceuticals follows these suggestions, it will be well on its way to protecting workers and making sure the workplace is safe in this age of modern industry.

Limitations:

Workplace safety and worker protection are crucial, but organizations face various restrictions and challenges. Human mistakes, resistance to change, and cost-effectiveness can hinder safety measures. Companies may struggle to afford safety equipment, training, and infrastructure, and comply with changing safety laws. High-risk sectors like construction, mining, and manufacturing require more complex safety standards. Language and cultural limitations can impair safety communication, and remote work and telecommuting can hinder safety

monitoring. Persistent enforcement and accountability are essential for maintaining a safe culture. Emergency and natural disasters may not be considered in workplace safety plans, and training and retention can lower safety awareness. Complacency can lead to complacency and risk-taking in accident-free settings. Despite these challenges, organizations must continue to prioritize worker safety by promoting safety, investing in training and infrastructure, and regularly assessing and upgrading safety standards.

Conclusion:

To conclude, workplace safety and worker protection in a company like Square Pharmaceuticals positively influence the quality of the working place, security of work, employee retention, morale, productivity, performance, and efficiency of the workers and employers-employees relationship. From the interview of the participant of this study, it has been known that Square is very sincere regarding ensuring a safe workplace and worker protection. They regularly arrange risk assessment programs and safety audits on emergency responses, fire safety, correct equipment usage, workplace ergonomics, and general safety awareness and seminars to evaluate all these measures taken into action. They have a safety committee and hold safety briefings and training sessions for the workers. Besides, Square has special policies to avoid violence in the workplace, ensure the security of sensitive information and online transactions, evaluate customers' and employee's feedback, and provide cyber security to distant workers and travel safety advice for the travelers. They also took prompt action to combat the hazardous situation that arose during the Covid-19 pandemic. Square can encourage worker participation and reporting, usage of PPE, and maintenance of cordial management-worker relationships. Despite having various limitations such as economic, language and cultural, working distance, and telecommunication barriers, Square Pharmaceuticals is trying its best to maintain continuous improvement of workplace safety and worker security.

References:
1. Dessler G. (2003). Human resource management: Gary Dessler (9th ed.). Prentice Hall.
2. SQUARE Pharmaceuticals PLC. | Square. (n.d.). https://squaregroup.com/bussiness/square-pharmaceuticals-ltd/
3. Harrisson, D., & Legendre, C. (2003). Technological innovations, organizational change and workplace accident prevention. Safety Science, 41(4), 319-338.
4. Kalimo, R., El Batawi, M. A., & Cooper, C. L. (1987). Psychosocial factors at work and their relation to health. World Health Organization.
5. Moir, S., & Buchholz, B. (1996). Emerging participatory approaches to ergonomic interventions in the construction industry. American Journal of Industrial Medicine, 29(4), 425-430.
6. Safety | Square. (n.d.). https://squaregroup.com/responsibility/healthandsafety/
7. Employee Wellbeing | Square. (n.d.). https://squaregroup.com/responsibility/employee-well-being/
8. Pathak, A. (2023). Workplace safety: importance, benefits and ways to create a safe workplace. Nurture an Engaged and Satisfied Workforce | Vantage Circle HR Blog. https://blog.vantagecircle.com/workplace-safety/?fbclid=IwA R14Q9y64AUi3z9EwY-SPCw0gkyp9WI_Hf0Qb10wTGOzpp 72EARTrUAHDn

Authors' Biography:

Md. Shahriar Alam is a student at BRAC University, currently pursuing a Bachelor of Business Administration (BBA) degree, majoring in Human Resource Management (HRM). He is passionate about helping people and organizations reach their full potential. He believes that HR professionals play a vital role in creating a positive and productive work environment. He is committed to developing the skills and knowledge necessary to be a successful HR professional.

Mushfiq Mahmud Majumder is a student at BRAC University, currently pursuing a Bachelor of Business Administration (BBA) degree with a major in Human Resource Management (HRM). Besides that, he runs his own business and enjoys photography in his spare time.

Samiha Ibnat Barna is currently completing a Bachelor of Economics and Human Resource Management (HRM) at BRAC University. Apart from this she is interested in sketching and painting.

Chowdhury Shafin Sahil Yshan is currently a junior pursuing a Bachelor's degree in Business Administration at BRAC University. His commitment to academic excellence is complemented by his interest as a writer for The Business Standard and various reputable publications.

Ahsanul Islam is pursuing an undergraduate degree in Bachelor of Business Administration at BRA University. In addition to his academic pursuits, he has fostered a love for physical fitness, teamwork, and competition deep passion for sports.

Mahima Akther is currently pursuing my Bachelor of Business Administration (BBA) at BRAC Business School under BRAC University. Her goal is to be a CA and she is interested in Accounting and Finance related to her academic pursuit. Apart from this, she is interested in arts and traveling.

Shylock's demand: Provoking Palestinian's fortune of torture

Tarnima Warda Andalib[1]

[1]Assistant Professor, Brac Business School, Brac University
tarnima.andalib@bracu.ac.bd

Abstract: Palestinians' sufferings are not just mere illusions or imaginations, but it is very much real and the core truth where humanity is trapped and human beings especially women and children are dying every day. The occupants' Israelis have tried to justify their actions against Palestine by the sufferings they endured during the holocaust created by the Nazis that is mentioned in Philip Roth's book. In this write up, the justification has been dissected to comprehend how and why the Palestinians' fall into this misery. Arab Muslims and Palestinians' have not only saved and helped the Israeli occupants from the Nazis during the holocaust but the Arab rescue efforts also crossed all boundaries to extend help to outside of Middle East as well during World War II and after the fall of France . Si Kaddour Ben Ghabrit, an Arab Muslim had arranged forged papers to protect for about 100 Jews to certify them as Muslim besides arranging the Jewish refugees hidden in the masjids at times of German roundups and also saved almost 500 Jews by disguising them as Muslims to avoid arrest and deportation. In this write up author has brought up the depiction of the Shakespearean Shylock's characteristics and mental state to understand Palestinians' fate of this sort. Nevertheless, all justifications seem to fall short while describing the sufferings of Palestinians.

Roth's prediction

Philip Roth's semi-autobiographical novel Operation Shylock in 1993 once put a great deal of effort into finding the appropriateness, comprehension and answers of Shylock's demand. His depiction was based on a Zionist perspective that described Palestinian's torture as the

avenge of the Holocaust. Shiham and Mahmoud in their article published in 2022 thoroughly dissected Philip Roth's arguments that tried to provoke the Israeli occupants by legitimizing the victimization of the Palestinians. The prediction of Philip Roth also mentioned that the sufferings of the Palestinians are their fate to be accepted since Hitler's xenophobic nationalism hurt the self-esteems' of the occupant Israelis. Philip Roth also justified the Palestinians' issue as a mere issue of Orientalism described by Edward Said in 1978. This entire contemptuous portrayal against the Palestinians and showing soft corners for the Israeli occupants should raise eye-brows of humanity. United Nations hold a pride for establishing UDHR (Universal Declaration of Human Rights) , the acknowledged and bestowed rights of every human being on earth. Then on the contrary, how come certain depiction of thoughtlessness, grave silence on the Palestinians' intolerable victimization are seen? How can their continual repression be neglected?

Elizabethan society's depiction
Awan (2023) described William Shakespeare's drama "The Merchant of Venice" and Shakespeare's analysis of relationships and strains between the Christian and Jewish Faith, where the author not only have tried to translate the tension in literary pieces but also focused in the themes of ethnicity, race, nationality and identity through deliberate orations in the drama. Awan also pointed out that the discrimination against the Jewish character Shylock and Jews, as a race in the drama named The Merchant of Venice is a prominent theme that reflects the prejudice and intolerance of the Elizabethan society. Meanwhile, Shakespeare portrays Shylock as a complex and controversial figure who is both a victim and a villain of the anti-Semitic attitudes of that era. The Shakespearean drama explores multiple perspectives where Shylock and Jews are discriminated and persecuted in parallel. Inspite of Shylock being the continual social victim of his time and inspite of his prolonged social trauma belonging in a particular race "The Jews", could not justify his absurd demand and it was not accepted by the mass too. Nevertheless, Philip Roth in 1993 argued with a statement as in the prolonged traumatic struggle before and after the Holocaust drained the self-esteem and tolerance meter of the Israeli occupants and as a result they have the right to ignore the Palestinian's rights. This argument reveals only one picture and that is the expectation of mercy and humanity are rare to be found in the Zionist ideologies because as per them that's what they have learnt in the process of time.

The monologue

From the novel, a monologue presented by Shylock puts a great impact and propels the deeper thought in a further notion that usually we avoid. The monologue says, "To bait fish withal. If it will feed nothing else, it will feed my revenge. He hath disgraced me and hindered me half a million; laughed at my losses, mocked at my gains, scorned my nation, thwarted my bargains, cooled my friends, heated mine enemies, and what's his reason? I am a Jew. Hath, not a Jew eyes? Hath not a Jew hands, organs, dimensions, senses, affections, passions? Fed with the same food, hurt with the same weapons, subject to the same diseases, healed by the same means, warmed and cooled by the same winter and summer, as a Christian is? If you prick us, do we not bleed? If you tickle us, do we not laugh? If you poison us, do we not die? And if you wrong us, shall we not revenge? If we are like you in the rest, we will resemble you in that. If a Jew wrongs a Christian, what is his humility? Revenge. If a Christian wrongs a Jew, what should his sufferance be by Christian example? Why revenge? The villainy you teach me, I will execute, and it shall go hard, but I will better the instruction." This monologue pointed out a lot of stress and discriminatory factors among the Jews and the Christians of that time.

For decades, Israeli occupants have not only cordoned off the Gaza Strip and have taken decisions of halting food, water and all supplies indispensable for human existence but also have promised themselves to give a life-lesson to the Palestinians. In the Palestinian locality the kind of torture, killings, destruction and misery scenes have repressed all of humanity but the Israeli occupants are not repentant in any sort for this, rather as per their belief system they are doing it because they have perceived themselves as the victims and they are doing it all because they deserve to do it. As per Shakespearean analysis and Shylock's monologue, this similar ideology is perceived by Shylock too, which indicates a deeper meaning behind this continual conflict.

Figure1 : Source : Tamimi (2017), Gulf news

In fine, the discrimination against Shylock and Jews in The Merchant of Venice reveals how Elizabethan society contained a supremacy belief and remained intolerant to other religions and cultural differences. Shakespeare presented Shylock as a complex character who has been both discriminated against and discriminated towards others but also through his character, the author questioned the prejudices and stereotypes against Jews and other minorities. Therefore, while symbolizing the drama with the Israel-Palestinian conflict, it discloses that human species act and react differently when the power dynamics and pattern change around them. Once, Israelis thrusted out of their homelands found shelter in a land of people besides care, honor and love, when they have been in their weakest phase. Nevertheless, those same group of people have been acting mercilessly, occupying more and more Palestinian lands by the efforts of wiping out the entire Palestinian race to establish their own region.

Shakespeare's Antonio versus Shylock

As per Muir (2005) the Shakespearean Shylock and the Jews race, once discriminated, mocked, insulted brutally for his religious believes and practices, social status by the Christian majority for instance Antonio, Gratiano, Bassanio and Portia respectively and also in the end was forced to convert to Christianity when his demand attempted to kill Antonio by demanding a pound of flesh from Antonio as a collateral

for Antonio's unpaid debt by not showing any sort of humanity or compassion for the other human being upon receiving the opportunity to claim "something" from Antonio. Shylock and Jews were discriminated against because of their religious beliefs and practices, which were seen as inferior and alien by the Christian majority. Shylock was constantly mocked and insulted for his faith, such as being called a "dog", a "misbeliever", a "cut-throat dog " and a "damned, execrable dog "by Antonio, Gratiano, Bassanio and Portia respectively. He was also forced to convert to Christianity at the end of the play as a punishment for his attempt to kill Antonio, which is a violation of his religious identity and freedom. Moreover, Jews are stereotyped as greedy, ruthless and vengeful moneylenders who exploit Christians with their usury, which is forbidden by the Christian doctrine. Shylock has been depicted as a typical example of this stereotype, who demands a pound of flesh from Antonio as collateral for his loan and refuses to show any mercy or compassion as per William (2009).

Shylock and Jews have been discriminated against because of their legal status and rights mentioned by Nashan in 2017 and Awan in 2023, which have remained very limited and unequal compared to those of Christians of that era. Shylock was subjected to the laws of Venice which was biased and unjust towards him as a foreigner and a Jew, where he was denied the justice he sought rather Portia, disguised as a lawyer, tricked him into forfeiting his bond by using a technicality which was taking Antonio's pound of flesh without shedding any blood and in lieu if failed his property would be snatched away but if converted to Christianity then would not have to face any charge. This shows how Jews were required to live in confined ghettos and had to wear red hats to distinguish themselves. The drama also depicted that Shylock and Jews were discriminated against because of their human dignity and emotions, which were disregarded and devalued by Christians as a result Shylock was treated as an inferior and subhuman being who did not deserve any respect or sympathy from his Christian counterparts and that is why his emotions and dignity had no importance to anyone and he was easily spat upon, kicked, cursed and abused by Antonio and others, who considered him as an enemy and an obstacle to their glee. Shylock mentioned a dialogue, "If you prick us, do we not bleed? If you tickle us, do we not laugh? If you poison us, do we not die?" . Here, he referred to his Jews race and ethnicity.

Figure 2: Source: Melvin and Khadder, CNN (2015)

Blind-eyed Zionism:

The irony is in today's world, the Zionists of Israel have remained a blinded-eye to their horrific, excruciating painful chapter of holocaust during the Nazis era of establishing Volksgemeinschaft, the purification of blood meaning the separation of Jews impure blood as per Britannica in 2023 and instead the Zionists as in the Israeli occupants are conducting continuous massacre, unbearable torture and genocide on the Muslims specially on the children and women of Palestine themselves in the most merciless manner anyone can imagine. Strangely, this country Palestine and their people gave shelter during and after the holocaust tragedy, which seem to be completely forgotten by the Israeli occupants. Not only forgotten but also the horrendous betrayal took place when the guests replaced their identities with the hosts and kicked out the hosts from their own home. Satloff (2006) and Aidi (2014) discussed about several incidents where Jews were saved by the Arab Muslims and Palestinians by disguising the Jews as Muslims to save them from arrest, by preparing forged certificates for the Jews indicating them as Muslims to save their lives, by hiding Jews people at different Masjids as Muslims to protect them.One of the popular Algerian singer Salim Halali was provided a false birth certificate as a Muslim to hide his true religion to protect him from deportation from Berlin and torture.Yad Vashem declared in 2013 that Mohammed Helmy, one Egyptian doctor , put his own life at risk for

three years and was involved in saving many Jews from being exterminated by the Nazis during holocaust and was recognized and honored as one of the righteous among the nations. Helmy helped and rescued Anna Gutman (boros) , her mother Julie, her grandmother Cecilie Rudnik, her stepfather Goerg Wehr to survive holocaust. Historical many such evidences are imprinted where today's Israeli occupants have been helped in many ways.Nevertheless, instead of being thankful, the brutality conducted by the Israeli occupants went inhuman to bizarre. The strange illusion of the Israeli occupants that wants a payback on the Nazis somehow are obstructing and hampering the lives and livelihoods of the Palestinians. If avenge could have been the only solution to all the problems then in what particular logic Israeli occupants have been torturing the Palestinian civilians? They should have chosen their previous home and the civilians of that home instead from where they have been pushed out. But, interestingly, that has not been the case.

However, at today's context various dimensional peace talks can ceasefire this invasion and aggression with an effort to create a win-win situation only if Israeli occupants are willing to have an open mind and intending to behave in the most humane way by not getting encouraged by the Shylock way. United nations with International Humanitarian Laws need to come forward to obstruct their audacity to kill humanity, Otherwise, history has its own ways to show repugnance, the faster it is comprehended the better the life circumstances of Palestinians can be ahead.

References:

1. Al Tamimi, Jumana (2017), Palestinian children not spared from Israeli brutality, Violations range from intimidation and harassment to physical violence and arrest, https://gulfnews.com/world/mena/palestinian-children-not-spared-from-israeli-brutality-1.2144644
2. Awan, Tariq Mahmood (2023), Merchant of Venice, Shylock and Israel-Palestine Conflict, Republic Policy
3. Don Melvin and Kareem Khadder (2015), Footage shows Israeli soldier aggressively handling boy, CNN
4. Muir, Kenneth (2005). "The Merchant of Venice". *Shakespeare's Sources: Comedies and Tragedies*. New York: Routledge. P. 49. ISBN 0-415-35269-X.
5. Nahshon E. Shylock and the Arab–Israeli Conflict. In: Nahshon E, Shapiro M, eds. *Wrestling with Shylock: Jewish Responses to The Merchant of Venice*. Cambridge: Cambridge University Press; 2017:413-423. Doi:10.1017/9780511845789.019
6. Roth, Philip (1993). Operation Shylock: A Confession, New York: Simon & Schuster, ISBN: 0671703765
7. The Editors of Encyclopaedia Britannica (2023), Shylock, Britannica
8. William, Shakespeare (2009). *The Merchant of Venice: Ignatius Critical Editions*. Ignatius Press. ISBN 978-1681495200

Authors' Biography:

Dr. Tarnima Warda Andalib is currently working as an Assistant Professor at BRAC Business School in BRAC University, Bangladesh and also as the Advisor of BuReD (Brac University's Research for Development Club). She was employed as a Postdoctoral Fellow (Entrepreneurial Bricolage, Innovation Management and Manufacturing smes Framework) and Lecturer in the School of Management at Universiti Sains Malaysia, Malaysia from 2019 to 2021. She earned her Doctor of Philosophy (phd) with Doctoral Scheme Scholarship (DSS) and PGRS grant from the Faculty of Industrial Management at University Malaysia Pahang, Malaysia focusing on the Organization behaviour, Human Resource Management and Assimilated Technology Framework development in 2018. She has earned few academic excellence awards like being 4th and 6th positions in the 3 mins competitions, Citrex Silver Medals in two different research competitions as well. She has been a Lecturer of Strategic Management (SM) and Management Information System (MIS) from 2013 till 2018. She also has Corporate skills and Experiences for 8 years, where she has worked as a Senior Executive in the Telecommunication company, Grameenphone Ltd., one of the group companies under Norwegian Telenor Group of Industries. She has more than 50 Academic Publications indexed in Scopus, Wos and others with 237 citations, h-index:8 and i-index:8. Her current interest areas are Block-chain Technology, Innovation Management, Entrepreneurial Bricolage, Organizational Psychology, Assimilation of Artificial Intelligence, Integrated Framework Development. Besides her academic works, she has nine poetry books, where four are in English and five of them are in her mother-tongue Bangla.

RTP118

Water pollution and wastewater management in Bangladesh: Membrane Bioreactor (MBR) technology.

Mubassir Rahman[1]

[1]Department of Computer Science & Engineering, Brac University,
mubassir.rahman@g.bracu.ac.bd

Abstract: One of the most vital resources on Earth is water. Efficient management of this valuable resource is necessary for developing nations like Bangladesh. This study focuses on the present water pollution situation of Bangladesh and how industrial waste is affecting the country's major rivers. The study also highlights the importance of advanced wastewater treatment technology, such Membrane Bioreactors (MBR). Additionally, the paper discusses the advantages and disadvantages of the Membrane Bioreactors technology in wastewater management.

Introduction:
Water is one of the most important elements of earth which is essential for life. Water makes up 71% of the Earth's surface, and only 3% of this water is freshwater, which can be found in rivers, ponds, lakes, and other water bodies. For a nation, among all the natural resources, freshwater is the most valuable one. Due to industrialization, this valuable resource is being polluted everyday causing environmental damages. Many developed countries like the USA, UK, and China have implemented measures to ensure the effective management of this valuable resource. As Bangladesh is going through industrialization, proper measures must be taken to reduce water pollution and manage wastewater. (Alam, 2009) Proper wastewater management will not only reduce the water pollution, it will allow us to reuse the treated water in the industries and household works.

Keywords: water pollution, Membrane bioreactor, wastewater, technology, industry, Bangladesh
Water pollution:

Bangladesh is known as a riverine country. There are 238 major rivers.(Uddin & Jeong, 2021) Traditionally, rivers were the most efficient mode of transportation. During the industrial revolution a lot of industries were built along the riverbanks. In modern times, a significant number of the industries remain situated along the banks of the rivers. And unfortunately due to the lack of proper waste management systems, everyday hundreds of tons of industrial waste materials are being thrown into the rivers polluting the water. There are around 7000 factories in Dhaka city, in the Tejgaon, Hazaribagh, Narayanganj, and Demra area, that dump waste materials into the Buriganga, Turag, and Dhaleshwari rivers. According to a Bangladesh Poribesh Andolon (BAPA) report, each day six thousand tons of liquid waste flows into the Buriganga River. The study also shows that the tanneries in the Hazaribagh area solely generate 3000 tons of liquid waste.(Uddin & Jeong, 2021) In a recent study, 13 elements of the Buriganga river's water were analyzed using various indexes such as the contamination factor (CF), heavy metal evaluation index (HEI), Nemerow index (NI), geoaccumulation index (Igeo), pollution load index (PLI), and heavy metal pollution index. The water of the Buriganga was found to be extensively contaminated with heavy metals. (Akbor et al., 2020) In order to save these rivers and protect the environment and public health, it is essential to implement proper waste management system
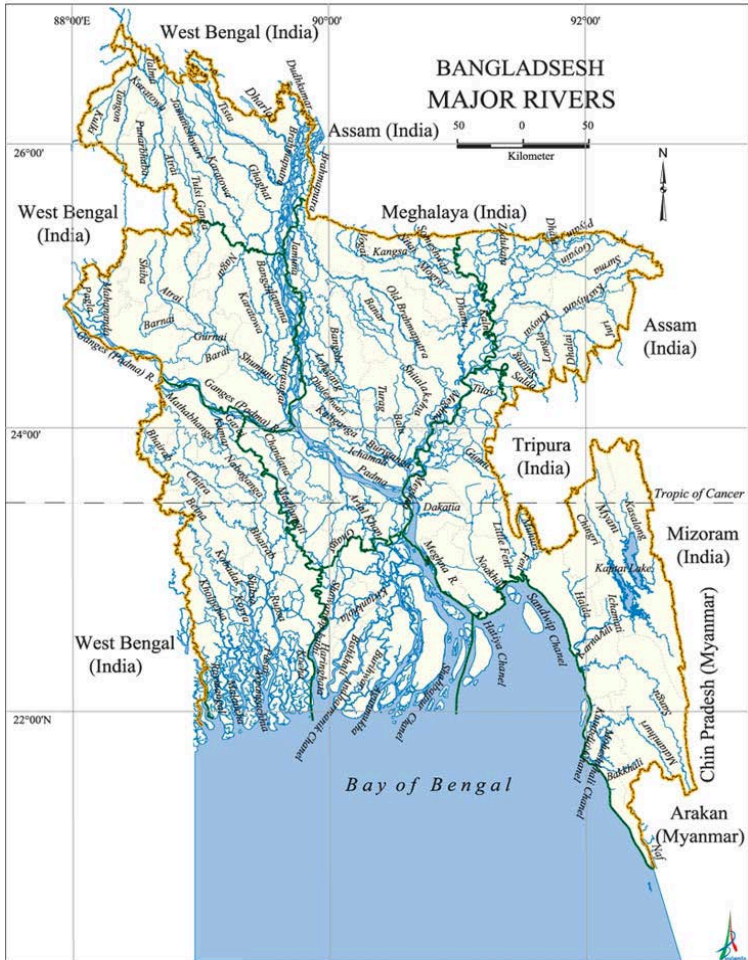

Figure 1: Buriganga river pollution .

Figure 2: Major rivers of Bangladesh

Membrane Bioreactor (MBR) technology: Membrane Bioreactors (MBR) are widely used in wastewater treatment in a variety of industries, including textiles, food & beverage, and pharmaceuticals. Membrane Bioreactors (MBR), combining bioreactor and membrane technologies, offer a sustainable solution for water reuse in various industries and meet environmental standards (Hoinkis et al., 2012)

Since the Textile industry in Dhaka heavily impacts groundwater levels and water quality, it is anticipated that by 2025, the groundwater level may decline significantly due to intensive textile processing. (Shamsudduha et al., 2009; Sarkara & Alia, 2009) Thus, the implementation of MBR is much needed.(Saha, 2014)
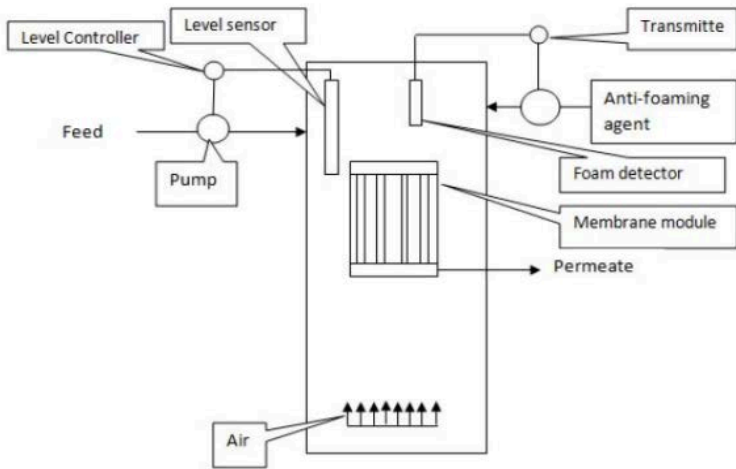

Figure 3: Schematic view of the MBR unit

MBR has several advantages over standard activated sludge systems for wastewater treatment, including:

- Compact Design: Traditional clarifiers have been replaced with more compact membrane modules.
- Clearer Treated Water: When compared to murky waters from typical clarifiers, water flowing through MBR membranes is clear and free of suspended particles and bacteria.
- High Clarification Performance: Unlike traditional systems that rely on sludge settling velocity, MBRs achieve nearly 100% separation efficiency with membranes, independent of sludge settling characteristics.
- High Biomass Concentration: MBRs maintain higher biomass concentrations (e.g., 20-30 g/L) compared to traditional systems (usually less than 5 g/L) (Islam, 2008)

Also, there are some limitations of MBR.
- The formation of a sludge layer resulting in membrane failure, due to lack of maintenance.
- Colloidal particle preferential adsorption on the membrane surface. (Islam, 2008)

Conclusion:

In conclusion, the implementation of Membrane Bioreactor (MBR) technology has the potential to be an important advance in the attempt to reduce water pollution and transform the textile industries and tanneries. Although MBR technology faces challenges like membrane fouling, ongoing research aims to improve cleaning methods and enhance membrane durability. Membrane Bioreactor (MBR) technology will help developing countries like Bangladesh to reduce their water pollution levels and ensure proper management of wastewater caused by industrialization. It will also help to create sustainable industries, maintain the ecological balance, and provide clean water for future generations.

References:

1. G.M.J. Alam, Environmental pollution of Bangladesh – it's effect and control, Int. Conf. Mech. Eng. (2009) 1–7. http://www.bangladeshenvironment.com/index.php/pollution-s/294-env ironmental-pollution-of-Bangladesh-it-s-effect-anD-control

2. Hoinkis, J., Deowan, S.A., Panten, V., Figoli, A., Huangr, R. and Drioli, E. (2012), "Membrane Bioreactor (MBR) Technology – A promising approach for industrial water reuse", Procedia Eng., 33(2012), 234- 241.

3. Saha, P., Hossain, M. Z., Mozumder, M. S. I., Uddin, M. T., Islam, M. A., Hoinkis, J., Deowan, S. A., Drioli, E., & Figoli, A. (2014). MBR technology for textile wastewater treatment: First experience in Bangladesh. *Membrane Water Treatment*, *5*(3), 197–205. https://doi.org/10.12989/mwt.2014.5.3.197

4. Sarkara, A.A. and Alia, M.H. (2009), "Water table dynamics of Dhaka city and its long-term trend analysis using the ― MAKESENS model", Water Int., 34(3), 373-382.

5. Shamsudduha, M., Chandler, R.E., Taylor, R.G. and Ahmed, K.M. (2009), "Recent trends in groundwater levels in a highly seasonal hydrological system: the Ganges-Brahmaputra-Meghna Delta Hydrol", Earth Syst. Sci., 13(12), 2373-2385.

6. Uddin, M. J., & Jeong, Y. (2021). Urban river pollution in Bangladesh during last 40 years: potential public health and ecological risk, present policy, and future prospects toward smart water management. *Heliyon*, *7*(2), e06107. https://doi.org/10.1016/j.heliyon.2021.e06107

Authors' Biography:

Mubassir Rahman, a tech and car enthusiast, currently pursuing Bachelor of Science degree in Computer Science at BRAC University. He is passionate about Motosports, Autonomous vehicles and computer graphics. Apart from that he enjoys traveling and photography, finding peace in the simplicity of nature.

Editors' Biography

Dr. Sang Hoon Lee, PhD

Dr. Sang Hoon Lee is a Finance Professor at Vin University, Hanoi, Vietnam. Joined Vin University in July 2023, his main academic motivation was to apply quality teaching and conduct research with an impact as a globally experienced faculty in a new university established four years ago. Dr. Lee previously worked for three and a half years as a professor of finance and dean of BRAC Business School, BRAC University in Dhaka, Bangladesh. His vision was to establish the business school on a new platform, a platform where quality research is as important as quality teaching. With that vision in mind and understanding the needs of the industry, Professor Lee pioneered the establishment of the Research and Professional Development Center (RPDC) within BRAC Business School. Based on the RPDC platform, he launched and successfully established the Women Entrepreneurship Training Program, Women Entrepreneurship Acceleration Program, Women Leadership Training Program, and Post Graduate Diploma Program for International Trade and Business.Before coming to BRAC University, Dr. Lee worked for fifteen years at KIMEP University, Almaty, Kazakhstan. Most of his tenure was dedicated as an academic administrator, including Dean of Bang College of Business (BCB), Associate Dean of BCB, DBA Program Director, and Advanced Management Program (AMP) Director. Dr. Lee previously worked as an executive in a self-regulatory organization, The Korea Securities Dealers Association. His main role included supervising International Affairs, Bond Market, and OTC Market divisions, and working as a delegation of government for Korea's OECD membership application process. Dr. Lee also operated his consulting firm advising corporate clients and financial regulators on regulatory conformity, international funding, and investor dispute resolution. He helped domestic and foreign clients to understand the local market and to expand their commercial and financial relationships with a wide range of entities in Korea and other Asian Markets. Before coming to Korea, Dr. Lee worked as a finance professor for five years at Nicholls State University and an economics professor for one year at Southeastern Louisiana University, Louisiana, USA. His main research interests include valuation, financial literacy, financial development, and regulatory impacts on financial markets, among others. Dr. Lee has been teaching finance and investment subjects for more than 30 years

in the U.S., Korea, Kazakhstan, and Bangladesh, and his main teaching subjects are Corporate Finance, Investment Banking, and Financial Derivatives. Dr. Lee graduated with a PhD in Financial Economics from the University of New Orleans, an MBA from the University of New Orleans, and a BA from Yon Sei University in Korea.
Email: sanglee894@gmail.com
Vin University, Ocean Park, Hanoi, Vietnam

Dr. Tarnima Warda Andalib, PhD, PDoc

Dr. Tarnima Warda Andalib is currently working as an Assistant Professor at BRAC Business School in BRAC University, Bangladesh. She was employed as a Postdoctoral Fellow (Entrepreneurial Bricolage, Innovation Management and Manufacturing smes Framework) and Lecturer in the School of Management at Universiti Sains Malaysia, Malaysia from 2019 to 2021. She earned her Doctor of Philosophy (phd) with Doctoral Scheme Scholarship (DSS) and PGRS grant from the Faculty of Industrial Management at University Malaysia Pahang, Malaysia focusing on the Organization behaviour, Human Resource Management and Assimilated Technology Framework development in 2018. She has earned few academic excellence awards like being 4th and 6th positions in the 3 mins competitions, Citrex Silver Medals in two different research competitions as well. She has been a Lecturer of Strategic Management (SM) and Management Information System (MIS) from 2013 till 2018. She also has Corporate skills and Experiences for 8 years, where she has worked as a Senior Executive in the Telecommunication company, Grameenphone Ltd., one of the group companies under Norwegian Telenor Group of Industries. She has more than 50 Academic Publications indexed in Scopus, Wos and others with 237 citations, h-index:8 and i-index:8. Her current interest areas are Block-chain Technology, Innovation Management, Entrepreneurial Bricolage, Organizational Psychology, Assimilation of Artificial Intelligence, Integrated Framework Development. Besides her academic works, she has nine poetry books, where four are in English and five of them are in her mother-tongue Bangla.
Email: tarnima.warda.andalib@gmail.com
BRAC University, Merul Badda, Bangladesh

Professor Dr. Charalabos (Haris) Doumanidis

Professor Dr. Charalabos (Haris) Doumanidis has a distinguished track record as an academic and an administrator in the US and international institutions. He has been a prolific researcher, able to attract research

funding and recognized for his excellence in teaching. He will initially focus on building Brac University's research infrastructure and helping grow its international and national profile. Before joining Brac University as Brac University's inaugural Vice President for Research, he was the Marie Curie Distinguished Professor and served as the Founding Dean of the College of Engineering and Computer Science at Vin University in Vietnam. Prior to that, he was Vice Provost for Research at Nazarbayev University in Kazakhstan. Professor Dr. Charalabos (Haris) Doumanidis started his career with Tufts University in the USA where he progressed from an assistant professor to a full professor and served as the Director of Thermal Manufacturing Laboratory. He subsequently served for more than a decade as the Founding Program Director of Nanomanufacturing Program at the prestigious National Science Foundation of USA. During that period, he also worked as a research engineer at Massachusetts Institute of Technology (MIT). His other experiences include senior academic and administrative positions at University of Nevada at Reno in the USA, Khalifa University of Science in the UAE, and University of Cyprus. Professor Dr. Charalabos (Haris) Doumanidis holds a PhD in Mechanical Engineering from MIT, an MS in Mechanical Engineering from Northwestern University, and a bachelor's degree from Aristotle University of Thessaloniki in Greece.

Email: hdoumani@gmail.com

Former Vice President for Research of BRAC University.

Mr. Md Saif Kabir

Mr. Md Saif Kabir is currently working as a Lecturer at Office of Academic Advising (OAA) and as an Adjunct Lecturer at Department of Electrical and Electronic Engineering (EEE) in BRAC University. He completed his Master of Science in Nuclear Engineering and Thermal Physics from National Research Nuclear University (NRNU)-Moscow Engineering Physics Institute (MEPhI), Russia. Prior to that, he obtained his Bachelor of Science degree in Electrical and Electronic Engineering (EEE) from Islamic University of Technology (IUT), Bangladesh. His current research interest involves deep learning, machine learning, neural networks, biomedical imaging, power electronics and renewable energy.

Email: kabirsaif62@gmail.com

BRAC University, Merul Badda, Bangladesh