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Editorial Notes

We take great pleasure in announcing the release of Jahangirnagar University Journal of Business Research (JUJBR), Volume 24, Number 02, scheduled for December, 2024. Going forward, we are publishing two journals annually, with releases in June and December. The successful culmination of JUJBR involved a distinguished Advisory Board, a robust Reviewer Board, and a supportive Editorial Board from renowned national and international business schools along with IBA-JU.

JUJBR is dedicated to showcasing high-quality, authentic, and invaluable research focused on contemporary aspects of business, commerce, and the economy. For this issue, out of a substantial pool of scholarly articles, only five have been chosen, each addressing different facets of business.

In the very first paper, the researcher compared the performance of Bangladeshi mutual funds between the period of Covid-19 and non-Covid-19 periods by using the data from 2016 to 2023. By using both univariate and multivariate panel data analysis methods and the 12-month rolling-window technique, the result indicates that the Covid-19 period exhibits statistically significantly higher risk and risk-adjusted returns than that of the non-Covid-19 period. The mutual fund managers, investors, and policymakers may get insight on how macroeconomic factors influenced mutual fund performance during economic disruptions, as well as, during the global turmoil.

The second paper investigated the influences of digital leadership on thriving digital innovation by analyzing the mediating effects of digital transformation by using the data from 403 employees at different levels within IT organizations in Bangladesh. This research is grounded in the dynamic capabilities view (DCV) and resources-based view (RBV) theories. The findings of this research highlighted that the dynamism of digital leadership can foster digital transformation which is conducive to innovation.

The third paper evaluated the prospects and challenges of the multivariate sectors within Bangladesh's Blue Economy, such as mariculture, metals and minerals, offshore oil/gas reserves, marine-derived pharmaceuticals, green energy, and tourism. The researchers also have recommended few pertinent policies which may integrate as national policies for effective sector-based blue economic growth, efficiency in blue economic diplomacy, enhancing public-private cooperation, and improving local, plus foreign investments to embolden the Blue Economy sectors of Bangladesh.

The fourth paper identified dimensions of smart tourism cities (STCs) and measured their impact on developing tourists' loyalty towards a specific location by collecting data from 300 individuals through convenience sampling method, and found four components, including smart tourist applications (apps), smart accommodations, innovative governance, and intelligent people (service providers) influence positively on the tourists' destination loyalty.

The fifth and final paper investigated the determinants of consumers' online purchase intention by collecting data from 522 Bangladeshi internet users. By using the SmartPLS software with structural equation modeling, the findings shows that behavioral intention is significantly predicted by performance expectancy, effort expectancy, social influence, and facilitating conditions with income significantly moderating these relationships. This study contributes to the body of existing research in the literature by analyzing particular components of the UTAUT framework in relation to online purchase intention in Bangladesh.

We have successfully been able to publish this journal with the grace of the Almighty. We extend our gratitude to all who supported us physically and intellectually, acknowledging the invaluable suggestions of reviewers that enhanced all the articles. Special thanks to the Advisory Board members who have provided their insightful suggestions for the enrichment of this Journal. In addition, I would like to express my thanks to Mr. Matiur Rahman Khan, and Mr. Delwar Hossain of IBA-JU for their administrative support.

Finally, we express heartfelt thanks to all esteemed members of the Editorial Board for their unwavering support throughout this journey.

Ireen Akhter, PhD
Professor, IBA-JU

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Comparative Performance of Bangladeshi Mutual Funds During Covid-19 and Non-Covid-19 Periods: An Empirical Analysis of Risk and Risk-Adjusted Returns

JUJBR

Shaikh Masrick Hasan*

Abstract: *Taking the perspectives of The Market Resilience Theory and Efficient Market Hypothesis (EMH), this study intends to compare the performance of Bangladeshi mutual funds between the Covid-19 and non-Covid-19 periods. The monthly data of twenty-seven mutual funds from January 2016 to December 2023 is used, and both univariate (paired samples t-test) and multivariate panel data analysis methods are performed. The 12-month rolling-window technique measures the risk parameters (beta and standard deviation) and risk-adjusted return parameters (Treynor and Sharpe ratios), which are used as the proxy for mutual fund performance measures. The result of the paired samples t-test indicates that the Covid-19 period exhibits statistically significantly higher risk and risk-adjusted returns than that of the non-Covid-19 period. Consequently, the results of the random effect model of panel data analysis show that Covid-19 epidemic appears to have a statistically significant impact on risk and risk-adjusted return metrics of mutual funds, where the effects of macroeconomic variables are controlled. These findings indicate that during the Covid-19 epidemic, mutual fund performance improved remarkably. This research helps mutual fund managers and investors understand performance shifts during Covid-19 and offers policymakers insights into how macroeconomic factors influenced mutual fund performance during economic disruptions. In addition, this empirical evidence extends the existing literature by highlighting the resilience of Bangladeshi mutual funds during the global turmoil.*

Keywords: *Covid-19, Mutual Funds, Performance, Risk-Adjusted Return, T-test, Risk, Bangladesh, Panel Data.*

1. Introduction

The worldwide Covid-19 epidemic has created economic anxiety in global financial markets. To prevent the virus's spread, most cities around the world enforced stay-at-home orders, resulting in substantial losses in most commercial sectors (Alqadhib et al., 2022). This pandemic has also affected the capital market as Covid-19 has impacted most commercial sectors globally (Zahoor et al., 2024). Mutual funds are one of the fundamental instruments of the capital market; thus, identifying the impact of Bangladeshi mutual funds' performance

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in response to Covid-19 is crucial. The mutual fund market has undergone substantial restructuring in response to the Covid-19 pandemic, accompanied by notable changes in investor behavior, which collectively have influenced mutual fund performance (Tampakoudis et al., 2023; Divya et al., 2023). The impact of Covid-19 on the capital market is one of the most significant concerns for long-term sustainability and economic and financial progress (Hossain et al., 2021).

Covid-19 caused a drastic drop in stock markets in Asia, America, Africa, and Europe (Bahrini & Filfila, 2020). The effects of Covid-19 on the capital market led to different investors' investment decisions across various industries and countries (Pokhrel & Chhetri, 2021). The revenue of business organizations was reduced significantly due to Covid-19, which adversely affected the stock market. The capital market is the core of every country's economic development and has been influenced by Covid-19, as the pandemic widely affects on the global economy (Hossain et al., 2021; Bahrini & Filfila, 2020; Wagner, 2020; Chowdhury et al., 2022; Anjorin, 2020).

Covid-19 case first identified in Bangladesh on March 8, 2020, and continued until September 2021, affecting 2 million individuals and resulting in 30,000 deaths (Golder et al., 2022; Lytton & Ghosh, 2024). Productivity was reduced, and people became unemployed in Bangladesh due to Covid-19 (Chowdhury et al., 2022), which resulted in lessening economic indicators like GDP. Hossain et al. (2021) and Chowdhury et al. (2024) opined that the capital market of Bangladesh was significantly affected by the Covid-19 pandemic. Since mutual funds in Bangladesh are a component of the capital market, they are susceptible to the effects of Covid-19.

Previous research (Ahamed, 2021; Quader et al., 2024; Kabir et al., 2023) examined the impact of Covid-19 on different commercial sectors of Bangladesh, including the banking, tourism, garments, power, and energy sectors. However, research on the effect of Covid-19 on the risk and risk-adjusted returns of mutual funds in Bangladesh is scarce. Therefore, the purpose of this study is to investigate how Covid-19 affected the mutual fund performance of Bangladesh. The research objectives are - (i) to quantify the risk and risk-adjusted returns of mutual funds in Bangladesh during the Covid-19 and non-Covid-19 periods; (ii) to compare the mean of risk and risk-adjusted return measures between Covid-19 and non-Covid-19 periods in a univariate context; and (iii) to assess the impact of Covid-19 on risk and risk-adjusted returns in a multivariate framework, taking macroeconomic factors into account.

The remaining parts are organized into four distinct sections. A review of the literature and the formulation of hypotheses are included in Section 2. Section 3 explains the methodology, including details of the sample, data sources, computations producer of risk and risk-adjusted return of mutual funds, and data analysis methods. Then, Section 4 shows the descriptive statistics, correlation matrix, results, and discussion of regression analysis. After that, Section 5 consists of the conclusion, implication, limitations, and future research opportunities.

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2. Literature Review

Researchers (Zahoor et al., 2024; Quader et al., 2024; Kabir et al., 2023; Kashem, 2022; Adenomon et al., 2022; Gherghina et al., 2021; Nugroho & Robiyanto, 2021; Golder et al., 2022; Miah et al., 2021; Ahamed, 2021; Hossain et al., 2021; Polemis & Soursou, 2020; Bash, 2020; Prabheesh et al., 2020) examined the potential impacts of Covid-19 on various aspects of financial markets across different countries, uncovering mixed evidence of its effects. The Covid-19 pandemic significantly affected the U.S. capital market, unlike previous infectious diseases, which had milder impacts (Yilmazkuday, 2020). Ashraf (2020) studied the impact of Covid-19 on 64 countries and found that the performance of the stock market and the Covid-19 pandemic are positively connected. Consequently, Yi et al. (2020) found that the Kenyan economy is facing a reduction in GDP, an increasing unemployment rate, and a destruction of the economy due to Covid-19. Additionally, Covid-19 epidemic and the volatility of gold returns have a positive relationship with the stock market (Nugroho & Robiyanto, 2021). Polemis and Soursou (2020) demonstrated that the Covid-19 epidemic positively impacts stock returns. Moreover, the risks of the capital market have increased due to Covid-19 (Chowdhury et al., 2022).

Conversely, Wagner (2020) identified that the S&P 500 and Dow Jones Industrial Average (DJIA) indices have flopped down significantly due to the coronavirus, resulting in a negative impact. Similarly, Kotishwar (2020) stated that there is a long-run adverse association of Covid-19 with the capital market indices. Thus, the stock return had a substantial adverse relationship with Covid-19 (Adenomon et al., 2022; Bash, 2020). Hasan et al. (2021) discovered an adverse correlation between Covid-19 and the stock return of energy sector companies. However, Gherghina et al. (2021) did not find any meaningful correlation between Covid-19 and the Bucharest Exchange Trading Index (BET) (Romanian capital market index).

Mutual fund performance depends on both company-specific factors and broad macroeconomic factors in addition to the effect of Covid-19. Hossain et al. (2021) stated that the activities of the capital market are also influenced by unavoidable Covid-19 and macroeconomic variables such as deposit rate, inflation rate, oil price, currency exchange rate, bank rate, interest rate of loan, and gold price. Interest rates are found to positively correlate with stock market performance (Ologunde et al., 2006). A favorable correlation between oil prices and stock returns during Covid-19 has also been observed for oil-importing countries (Prabheesh et al., 2020). Additionally, the exchange rate shows a substantial positive association with the performance of Bangladesh's capital market (Jahur et al., 2014). Hossain et al. (2021) performed a study on Bangladesh and identified that Covid-19 daily new confirmed cases, inflation rate, bank rate and deposit rate have a significant adverse relation with the Dhaka Stock Exchange (DSE). Interest rates and inflation rates have a substantial negative relationship with the performance of Bangladesh's capital market (Jahur

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et al., 2014). However, Hossain (2020) identifies that inflation and interest rates do not significantly influence the firm's performance.

Previous studies like Hossain et al. (2021), Kashem (2022), Ahamed (2021), Golder et al. (2022), Gazi et al. (2022), and Miah et al. (2021) performed studies on Bangladesh to identify the effect of Covid-19 in different financial sectors of Bangladesh i.e. capital market, banking industry, etc. using data from pre-Covid, Covid-19 period and post-Covid period. There is a limited investigation in the context of Bangladesh examining the impact of Covid-19 on mutual funds' risk and risk-adjusted returns, particularly studies that account for the influence of broader macroeconomic parameters on these outcomes. Therefore, this research is designed to identify the influence of Covid-19 on the mutual fund performance measured by various risk and risk-adjusted return measures while controlling the influence of the macroeconomic parameters.

3. Hypotheses Development

The Market Resilience Theory and Capital Asset Pricing Model (CAPM) perspectives support that Covid-19 had no appreciable influence on mutual fund performance. The main factor influencing asset returns, according to CAPM, is systematic risk, often known as market risk (Sharpe, 1964). It is presumed that mutual funds were priced suitably for their systematic risk before the pandemic, meaning that their risk-adjusted returns ought to hold steady in the face of market fluctuations. Furthermore, financial markets are capable of absorbing shocks and returning to equilibrium, according to the Market Resilience Theory (Fama, 1998). Even if Covid-19 created some early turbulence, markets quickly reacted to the new information, and the returns and risk of mutual funds returned to normal. For instance, Liu et al. (2020) revealed that asset prices recovered quickly as a result of market resilience, indicating that the long-term effects on mutual fund performance were minimal. Adenomon et al. (2022) and Gherghina et al. (2021) reported no significant impact of Covid-19 on the risk and risk-adjusted returns of stock indices in Nigeria and Romania, respectively.

On the contrary, the perspective of the Efficient Market Hypothesis (EMH) indicates that prices in the capital markets reflect based on all publicly available information (Fama, 1970); thus, mutual fund performance during Covid-19 should reflect an efficient response to pandemic-related information. However, the great uncertainty surrounding the epidemic made market efficiency difficult, opening the door to price anomalies and increased volatility. Furthermore, according to behavioural finance theory, market inefficiencies may have resulted from investor irrationality motivated by fear and uncertainty, which raised fund risk and produced overreactions that affected their risk and return (Shiller, 2003; Mazur et al., 2020). Shankar et al. (2021) identified that the systematic risk of the capital market was influenced by Covid-19 pandemic. Liu et al. (2022) showed that the international stock markets faced higher risk during Covid-19. Consequently, by utilizing the Sortino, Treynor, Sharpe, and information ratios to assess the risk-adjusted performance of mutual funds during the Covid-19 period,

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Mirza et al. (2020) discovered that mutual funds fared better than comparable products. Maheen (2021) studied in India and found that Covid-19 significantly affected the mutual funds' performance. Alqadhib et al. (2022) studied Saudi Arabia utilizing panel data and discovered that Covid-19 had a significant favourable effect on mutual fund performance. Based on the above literature reviews, the following hypotheses are proposed for this study:

$H1_0$ = No significant difference exists in risk of mutual funds between Covid-19 and non-Covid-19 periods.

$H1_a$ = A significant difference exists in the risk of mutual funds between Covid-19 and non-Covid-19 periods.

$H2_0$ = No significant difference exists in the risk-adjusted return of mutual funds between Covid-19 and non-Covid-19 periods.

$H2_a$ = A significant difference exists in the risk-adjusted return of mutual funds between Covid-19 and non-Covid-19 periods.

4. Data and Methodology

4.1 Sample Selection and Data Sources

The research selects 27 conventional mutual funds listed on the Dhaka Stock Exchange (DSE) for a study period from January 2016 to December 2023. The Covid-19 period is defined as March 2020 to September 2021 (Golder et al., 2022; Lytton & Ghosh, 2024), while the non-Covid-19 periods are January 2016 to February 2020 and October 2021 to December 2023. The long-period data is utilized to assess the recovery impacts of Bangladeshi mutual funds, capturing pre-Covid trends, disruptions during Covid-19, and performance recovery in the post-Covid period. To generate a balanced data set, the conventional mutual funds (except Islamic mutual funds) that were inaugurated and listed in DSE before January 2016 are included in the sample to create a balanced panel because balanced data has fewer biases than imbalanced data and guarantees stability in data observations throughout time, improving the accuracy of econometric estimations (Baltagi, 2005).

The month-end closing price data of selected funds is collected from the Dhaka stock exchange and investing.com[1], and data on controlled variables are collected from the data bank of Bangladesh Bank[2] and World Bank[3] (following Hasan & Hasan, 2024; Hasan & Islam, 2023). In addition, monthly Covid-19 cases data are gathered from the Directorate General of Health Services in Bangladesh following Bangladesh Bank (2021). Next, the following formula is used to calculate the monthly returns from the mutual funds (Hasan, 2024):

[1] https://www.investing.com/
[2] https://www.bb.org.bd/en/index.php
[3] https://www.worldbank.org/ext/en/home

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$$\bar{R}_{i,t} = ln\left(\frac{P_{i,t}}{P_{i,t-1}}\right) \dots\dots\dots\dots\dots\dots (i)$$

Where, the natural logarithm is indicated by *ln*, a unit of fund indicated by *i*, *t* indicates time, $P_{i.t-1}$ indicates prior period data, $P_{i,t}$ indicates current period data and $\bar{R}_{i,t}$ shows the return of fund *i* at time *t*.

4.2 Variables Description

Various proxies are utilized to examine the impact of the Covid-19 epidemic on mutual fund performance. Risk measures and risk-adjusted return metrics serve as indicators of mutual fund performance. Monthly Covid-19 cases are used as a proxy for the Covid-19 pandemic. Additionally, this investigation controls several macroeconomic indicators, including the GDP growth rate, deposit rate, broad money supply, amount of exports, remittances flow, and amount of imports, to ascertain their influence on the mutual fund risk and risk-adjusted return during Covid-19. Here, the 12-month rolling-window method is applied to measure the risks (beta and standard deviation) and the other measurement of risk-adjusted return (Treynor ratio, Sharpe ratio) of mutual funds (following Hasan, 2024; Champagne, 2018). A summary of the variables is provided in Table 1.

Table 1: Variables Description

SL	Parameters	Definition/ Formula	References
		Risk and Risk-Adjusted Return Measures	
1.	Standard Deviation	The volatility of a mutual fund is quantified by the standard deviation, which indicates the extent to which returns deviate from the average return. Standard deviation is calculated using the below formula- $SD_{i,t} = \sqrt{\frac{1}{t-1}\sum_{t=1}^{T}(r_{i,t} - \bar{r}_{i,t})^2}$; Where *SD* indicates standard deviation, *i* denotes the fund units, *t* denotes time, while *r* stands for monthly return and *r-* for mean return.	Humphrey & Lee (2011)
2.	Beta	The volatility of a portfolio relative to the market as a whole is measured by its beta, which shows how sensitive the portfolio is relative to changes in the market. The below formula is used to compute beta- $(r_{i,t} - r_{f,t}) = \propto_{i,t} + \beta_{i,t}(r_{m,t} - r_{f,t}) + \varepsilon_{i,t}$; where *r* indicates monthly return, *t* indicates times, the risk-free rate is indicated by *f*, *i* for the fund, *t* for time, β for beta, m for market, $\propto$ indicates constant term and ε stands for error.	Hoepner & Schopohl (2018)
3.	Sharpe Ratio	The Sharpe ratio calculates an investment's risk-adjusted return by comparing its excess return above the risk-free rate to its standard deviation.	Sharpe (1964)

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		The Sharpe ratio is determined using the following formula: $SharpeRatio(SR) = \frac{r_{i,t} - r_{f_{i,t}}}{\sigma_{i,t}}$;where r indicates monthly return, i indicates the fund, t indicates time, risk-free rate is indicated by f, and σ indicates standard deviation.	
4.	Treynor Ratio	The Treynor Ratio assesses risk-adjusted return by contrasting excess return over the risk-free rate with the beta, so measuring performance in relation to market risk. Treynor ratio is calculated using the below formula- $TreynorRatio(TR) = \frac{r_{i,t} - R_{f_{i,t}}}{\beta_{i,t}}$; where r represents the monthly return, i indicates the fund, t represents time, risk-free rate is denoted by f, and the systematic risk beta is denoted by β.	Mirza et al. (2020)
		Macroeconomic Variables	
5.	Deposit Rate	The deposit rate indicates the interest rate that banks and other financial institutions provide investors or depositors for depositing into their accounts.	Hossain et al. (2021)
6.	GDP Growth Rate	The GDP (gross domestic product) growth rate of a nation is the percentage increase in GDP over a given period that reflects the health and performance of the economy. Using the EViews program, the proportional Denton method is applied to transform annual GDP data into monthly data (Baum et al., 2006).	Hussain (2017)
7.	Broad Money Supply	The term "broad money" refers to money in circulation as well as demand deposits, time deposits and savings held by corporations, people, and other monetary aggregates.	Hasan & Hasan (2024)
8.	Amount of Export	The money earned by exporting products or services from one nation to a foreign consumer is known as the amount of exports.	Jahur et al. (2014)
9.	Import Payment	An import payment is the sum paid for products and services that are bought from foreign countries.	Hasan (2024)
10.	Remittance	A remittance is a payment sent by an individual employed overseas to their relatives residing in their home country.	Hasan & Islam (2023)
		Covid-19 Pandemic	
11.	Covid-19 cases	Monthly new infection in Bangladesh is treated as Covid-19 cases	Gherghina et al. (2021)

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4.3 Econometrics Models of Data Analysis

The study used both univariate and multivariate data analysis techniques to investigate the impact of Covid-19 on mutual funds' performance. A paired T-test is applied to see whether the performance varies between Covid-19 and non-Covid-19 periods or not. Then, the panel data analysis model is utilized to examine the effect of Covid-19 on mutual fund performance in the multivariate setting where the influence of macroeconomic parameters is controlled. The following regression equation has been developed for the panel data analysis-

$$Performance_{i,t} = \beta_0 + \beta_1 Covid19_{i,t} + \beta_2 Controls_{i,t} + \varepsilon_{i,t} \dots\dots\dots (i)$$

Where β denotes coefficients, *Covid19* denotes monthly Covid-19 cases. *Controls* denote the macroeconomic indicators (i.e., GDP growth and deposit rates, broad money supply, amount of exports, remittances and amount of import) which represent the controlled variables of the study, *t* denotes time and *i* denotes mutual funds, *Performance* denotes dependent variables, here 4 performance measures proxies have been utilized such as beta, standard deviation, Treynor and Sharpe Ratios and ε stands for the stochastic error term.

To conduct the data analysis, first, data is normalized using the 'Two-step data Normalization Method' where the 'fractional rank' in the first step, then the 'Inverse Documented Frequency (IDF)' to normalize the data (Templeton, 2011; Hasan et al., 2024). The normality of the data set is subsequently checked utilizing the Shapiro–Wilk test, which confirms that data is normally distributed. In addition, the multicollinearity, heteroscedasticity, autocorrelation, and cross-sectional correlation issues are checked by applying the Variance Inflation Factor (VIF), Breusch-Pagan/ Cook-Weisberg test, Durbin-Watson test, and Pesaran test, respectively to select the appropriate panel data analysis model.

5. Results and Discussions

5.1 Descriptive Statistics

Table 2 illustrates the descriptive statistics of risk measures, i.e., standard deviation and beta, the risk-adjusted return measures, i.e., Sharpe and Treynor ratios, and macroeconomic variables. Panels *A* and *B* of Table 2 confirm that mutual fund overall risk (standard deviation) and systematic risk (beta) are numerically greater during the Covid-19 period than they were during the non-Covid-19 period. This suggests that during the Covid-19 period, mutual funds are more exposed to risk than they are during the non-Covid-19 period. The Sharpe ratio, a risk-adjusted return measure, indicates that Covid-19 exhibits a numerically higher Sharpe ratio compared to the non-Covid-19 period. This suggests that mutual funds perform better during a crisis in the economy. However, the Treynor ratio is numerically lower during the Covid-19 time than it was during the non-Covid-19 period, indicating that systematic risk was higher during the Covid-19 times which reduces systematic risk-adjusted performance.

Additionally, this study includes several macroeconomic variables as controlled variables while examining the impact of Covid-19 on the performance of mutual

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funds. Panel *D* shows the descriptive statistics of macroeconomic factors where the mean value of the monthly deposit rate is 4.81% and the monthly GDP growth rate is 6.36%. The average of exports and imports demonstrates that during the study period, there was a 1,394.68 million dollar monthly trade deficit in Bangladesh, which can be balanced by managing the monthly remittances of 14161.41 million dollars. Besides, broad money has the highest mean value, which is BDT 1659131 crore, and the volatility of broad money is BDT 280818.93 crore. Finally, panel E shows that, on average, 24360.62 people were affected by Covid-19 every month, and the highest number of monthly infections was on 31st August 2021.

Table 2: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Panel A: Risk and Risk-Adjusted Return Measures (Covid-19 Period)					
Standard Deviation	513	0.0941	0.0291	0.029	0.161
Beta	513	0.7285	0.4637	-0.769	1.855
Sharpe Ratio	513	-0.4344	1.2724	-3.048	3.079
Treynor Ratio	513	-0.1548	2.5502	-5.801	2.315
Panel B: Risk and Risk-Adjusted Return Measures (Non-Covid-19 Period)					
Standard Deviation	1,755	0.0631	0.0349	0	0.223
Beta	1,755	0.5850	0.7392	-8.703	5.239
Sharpe Ratio	1,755	-0.9455	1.3972	-21.671	3.071
Treynor Ratio	1,755	-0.0240	2.7270	-84.948	95.472
Panel C: Risk and Risk-Adjusted Return Measures (Total Period)					
Standard Deviation	2268	0.0701	0.0361	0	0.222
Beta	2268	0.6174	0.6892	-8.703	5.239
Sharpe Ratio	2268	-0.8298	1.3863	-21.671	3.079
Treynor Ratio	2268	-0.0535	2.6881	-84.948	95.472
Panel D: Macroeconomic Variables					
Deposit Rate	2268	4.8141	0.5354	3.97	5.71
Export	2268	3595.47	834.18	520.01	5365.19
Import	2268	4990.15	1114.04	2489.80	7706.40
Remittances	2268	14161.41	3690.89	6917.97	23284.87
Broad Money Supply	2268	1659131	280818.93	1143271	2127921
GDP Growth Rate	2268	6.3565	1.0438	3.45	7.88
Panel E: Covid-19 Cases					
Covid-19 Cases	2268	24360.62	57517.52	0	328902

Notes: This table shows the descriptive statistics for risk measures, risk-adjusted return measures, and macroeconomic factors of mutual funds using the monthly data between January 2017 and December 2023. Panel *A* shows the risk measures and risk-adjusted return measures for the Covid-19 period (March 2020 to September 2021), Panel *B* shows the risk measures and risk-adjusted return measures for the Non-Covid-19 period (January 2016 to February 2020 and October 2021 to December 2023), Panel *C* shows the risk measures and risk-adjusted return measures for the total study period and Panel *D* shows the description on macroeconomic factors. Here, the GDP growth rate is yearly data, which is transformed into monthly data by applying the *Dentonmq* method. Additionally, Panel E shows the monthly number of Covid-19 new cases.

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5.2 Results of Mean Comparison Test (Paired T-test)

Mean difference analysis is performed to compare the performance of Bangladeshi mutual funds between the Covid-19 period and the non-Covid-19 period. The paired two-sample t-test is applied for the mean comparison using the normally distributed data following researchers like Berger and Zhou (2014). Table 3 below displays the results of the mean difference analysis -

Table 3: Mean Comparison of Mutual Fund Performance Between Covid-19 and Non-Covid-19 period

Variables	Mean		Difference of Mean
	During Covid-19	Non-Covid-19	
Panel A: Risk Measures			
Standard Deviation	0.0941	0.0631	0.0310*** (20.27)
Beta	0.7285	0.5850	0.1435*** (5.31)
Panel B: Risk-Adjusted Return Measures			
Sharpe Ratio	-0.4344	-0.9455	0.51109*** (7.82)
Treynor Ratio	-0.1548	-0.0241	-0.1307 (-1.006)
No. of Observation	513	1,755	-

*, **, *** indicate the level of significance at 10%, 5% and 1% level respectively.

Notes: This table shows the mean difference analysis of mutual funds' risk (Panel A) and risk-adjusted return (Panel B) between Covid-19 and non-Covid periods using the paired two-sample t-test. The data used in this study is from January 2017 to December 2023 and the t-test is performed assuming unequal variance following Levene's test.

Table 3 shows that, compared to the non-Covid-19 period, both the standard deviation and beta had significantly higher means during the Covid-19 period. This indicates that mutual funds faced greater risk during the pandemic, confirming hypothesis H1a. Additionally, the mean value of the Sharpe ratio, a measure of risk-adjusted return, is significantly higher during the Covid-19 period than in the non-Covid-19 period, supporting hypothesis H2a. The findings are aligned with the results of Golder et al. (2022), who found that during Covid-19 the risk of the stock market is higher and stock market performance is better than non-Covid-19 period. However, there is no statistically significant difference identified for the Treynor ratio during Covid-19 and non-Covid-19 periods. Overall results from the mean comparison test suggest that mutual fund risk and risk-adjusted return are substantially higher in the Covid-19 period than in the non-Covid-19 period.

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5.3 Correlation Matrix

Table 4 is the correlation matrix, which shows the interrelation among the variables, i.e., dependent and dependent variables, dependent and independent variables, and independent variables. This correlation matrix confirms that risk measures (standard deviation and beta) have a statistically significant correlation with all macroeconomic parameters. Additionally, a statistically significant association exists between macroeconomic indicators and risk-adjusted return measures i.e. the Treynor and Sharpe ratios. Also, all macroeconomic variables have statistically significant relationships with each other. This correlation matrix primarily shows the macroeconomic variable's relationship with risk measures along with the risk-adjusted returns. This matrix also confirms that Covid-19 cases have a statistically significant relationship with risk and risk-adjusted return measures and macroeconomic variables. Furthermore, the correlation matrix also displays the multicollinearity issue between the independent variables. A multicollinearity issue is likely to arise if the correlation coefficient is higher than 0.80, but in this table, all variables have a coefficient value less than 0.80, which indicates no multicollinearity problem among the variables (Bohrnstedt & Carter, 1971).

Table 4: Correlation Matrix

	Standard Deviation	Beta	Sharpe Ratio	Treynor Ratio	Deposit Ratio	Export	Import	Remittance	Broad Money	GDP growth Rate	Covid-19
Std. Dev	1.00										
Beta	0.54***	1.00									
Sharpe Ratio	0.32***	0.19***	1.00								
Treynor Ratio	0.07***	-0.04***	0.48***	1.00							
Deposit Rate	-0.007	0.24***	-0.007	-0.021	1.00						
Export	-0.29***	-0.36***	-0.13***	0.04*	-0.53***	1.00					
Import	-0.12***	-0.29***	-0.009	0.07***	-0.58***	0.73***	1.00				
Remittance	-0.21***	-0.37***	-0.11***	0.05**	-0.39***	0.60***	0.41***	1.00			
Broad Money	-0.12***	-0.31***	-0.04*	-0.005	-0.61***	0.61***	0.65***	0.71***	1.00		
GDP Growth	0.14***	0.10***	0.11***	0.018	-0.19***	0.022	0.20***	-0.34***	-0.26***	1.00	
Covid Cases	0.30***	0.03*	0.16***	0.04*	-0.33***	0.005	0.08***	0.21***	0.28***	0.08***	1:00

The symbols ***, **, and * denote statistical significance for the variables at the 1%, 5%, and 10% levels, respectively.

Notes: The table represents the Pearson correlation matrix of risk and risk-adjusted return measures of 27 conventional mutual funds and 6 macroeconomic factors utilizing data from January 2017 to December 2023. Here, Covid-19 cases are considered as the proxy of the Covid-19 pandemic.

5.4 Results of Regression Analysis

Diagnostic tests were carried out on the panel data prior to selecting the appropriate data analysis model. The diagnostics test results suggest that data is normally distributed, and there were no problems with multicollinearity, heteroscedasticity, autocorrelation, or cross-sectional correlation. Following the

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undisclosed results of the Hausman Test and the Breusch-Pagan Lagrange Multiplier Test, the random effects model is primarily selected for this study (Nguyen & Nguyen, 2019; Hasan et al., 2024). The results of the random effects model show that Covid-19 has a major impact on mutual fund risk and risk-adjusted returns (Table 5).

Table 5: Effect of Covid-19 on mutual fund performance (Random effect model)

	Model - 1	**Model - 2**	**Model - 3**	**Model - 4**
	Standard Deviation (T-Value)	**Beta (T-Value)**	**Sharpe Ratio (T-Value)**	**Treynor Ratio (T-Value)**
Covid-19 Cases	0.000002***	0.000012***	0.000004***	0.000003*
	(14.30)	(4.96)	(6.73)	(2.38)
Deposit Rate	-0.004260*	0.141000***	0.071100	-0.040700
	(-2.48)	(4.06)	(0.92)	(-0.27)
Export	-0.000015***	-0.000092***	-0.000307***	-0.000169
	(-11.66)	(-3.48)	(-5.22)	(-1.46)
Import	0.000003**	-0.000056**	0.000142**	0.000452***
	(3.09)	(-2.71)	(3.08)	(4.98)
Remittance	-0.000001***	-0.000048***	-0.000028*	0.000101***
	(-4.06)	(-8.62)	(-2.27)	(4.09)
Broad Money	0.0000003	0.000001	0.000002	-0.000021***
	(0.68)	(1.43)	(1.17)	(-5.27)
GDP Growth Rate	0.001590*	0.041900**	0.098500**	-0.090400
	(1.99)	(2.59)	(2.72)	(-1.27)
Constant	0.12600***	0.71200*	-1.48800*	1.11700**
	(8.19)	(2.31)	(-2.17)	(2.82)
Adjusted R2	0.2344***	0.2089***	0.1230***	0.1003***
Chi2	984.07***	833.21***	451.85***	347.17***
Observation	2268	2268	2268	2268

*, **, *** indicate statistical significant at the 10%, 5%, and 1% level, respectively.

Notes: The results of the random effect model are shown in this table. In the column, Model-01 is the standard deviation, model-02 is the beta, model-03 is the Sharpe ratio and model-04 is the Treynor ratio. The monthly data will be utilized for 27 conventional mutual funds from 2017 to 2023. The row shows the independent variables, i.e., monthly Covid-19 cases, and control variables, i.e., macroeconomic variables.

Regression analysis results show that Covid-19 has a significant impact on the risk exposure of mutual funds, confirming hypothesis *H1a*. The standard deviation coefficient in Model 1 of Table 5, which is 0.000002 ($t = 14.30$, $p < 0.001$), indicates a statistically significant rise in total risk in line with the epidemic increases and vice-versa. The beta coefficient ($\beta = 0.000012$, $t = 4.96$, p

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< 0.01) shows a statistically significant positive relationship with Covid-19 cases, suggesting that the systematic risk of mutual funds increases when Covid-19 cases increase and vice-versa.

These findings support the hypothesis that Covid-19 increased mutual fund risk exposure in terms of both systematic risk (beta) and total risk (standard deviation). The results of the positive impact of Covid-19 on mutual fund risk exposure are consistent with Hossain et al. (2021), Odhiambo et al. (2020), Rizwan et al. (2020), and Shankar et al. (2021). These findings highlight how Covid-19 increased unpredictability in mutual funds risk, complicating risk management. The increase in beta denotes heightened susceptibility to market fluctuations, posing difficulties for portfolio managers seeking to preserve stability and efficient diversification amidst economic turmoil. Additionally, macroeconomic factors, including deposit rate, imports, exports, remittances, and GDP growth rate, are revealed to have a statistically significant effect on the riskiness of mutual funds, and broad money supply does not have any statistically significant effect on the risk measures.

Consequently, the regression results show that Covid-19 cases significantly affect the risk-adjusted returns of mutual funds, which validates hypothesis *H2a*. In Models 3 and 4, both the risk-adjusted return measures, Sharp ratio (β= 0.000004, t = 6.73, p < 0.01) and Treynor ratio (β= 0.000003, t = 2.38, p < 0.10), exhibit a statistically significant positive relationship with Covid-19 cases. The results of Mirza et al. (2020), Maheen (2021), Alqadhib et al. (2022), Odhiambo et al. (2020), and Hossain (2020) are consistent with the effect of Covid-19 on mutual fund performance when returns are adjusted for risk. Additionally, the GDP growth rate, exports, imports, and remittances all have statistically significant effects on performance metrics for mutual funds, such as the Sharpe ratio. Subsequently, the broad macroeconomic determinants of import, remittance, and broad money supply exhibit statistically significant influence on the Treynor ratio.

5.5 Robustness Analysis

The results of the regression analysis utilizing the dynamic feasible generalized least squares (FGLS) model for panel data are shown in Table 6 as a part of the robustness analysis of the results derived from the random effects model. The results of the dynamic model substantially correspond with the results of the random effects model. The dynamic model further supports the statistically substantial effect of Covid-19 on mutual fund risk and risk-adjusted returns. Additionally, it highlights the considerable influence of the macroeconomic variables used as controlled factors on mutual funds' risk and risk-adjusted returns.

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Table 6: Impact of Covid-19 on mutual fund performance (FGLS Model)

	Model - 1	Model - 2	Model - 3	Model - 4
	Standard Deviation (T-Value)	Beta (T-Value)	Sharpe Ratio (T-Value)	Treynor Ratio (T-Value)
Covid-19 Cases	0.000002***	0.000012***	0.000004***	0.000003*
	(13.20)	(4.78)	(6.74)	(2.38)
Deposit Rate	-0.004260*	0.141000***	0.071100	-0.040700
	(-2.31)	(3.91)	(0.92)	(-0.26)
Export	-0.000015***	-0.000092***	-0.000307***	-0.000169
	(-10.77)	(-3.35)	(-5.23)	(-1.45)
Import	0.000003**	-0.000056**	0.000142**	0.000452***
	(2.87)	(-2.60)	(3.09)	(4.97)
Remittance	-0.000001***	-0.000048***	-0.000028*	0.000101***
	(-3.73)	(-8.29)	(-2.27)	(4.08)
Broad Money	0.0000003	0.000001	0.000002	-0.000021***
	(0.60)	(1.37)	(1.17)	(-5.27)
GDP Growth Rate	0.001590*	0.041900**	0.098500**	-0.090400
	(1.83)	(2.49)	(2.73)	(-1.26)
Constant	0.12600***	0.71300*	-1.48800*	1.11700**
	(7.67)	(2.24)	(-2.17)	(2.70)
Chi2	582.81***	494.22***	152.39***	47.06***
Observation	2268	2268	2268	2268

The statistical significance is shown at the 10%, 5%, and 1% levels, respectively, by *, **, and ***.

Notes: The table presents the Feasible Generalized Least Square regression results, utilizing data from 27 conventional mutual funds between January 2017 and December 2023.

6. Conclusion

This study aims to evaluate the performance of Bangladeshi mutual funds during the Covid-19 period compared to the non-Covid-19 period. The analysis employs monthly closing data from 27 conventional mutual funds spanning January 2016 to December 2023. A 12-month rolling window method is used to calculate total risk, systematic risk, and the Sharpe and Treynor ratios, providing a comprehensive evaluation of mutual fund performance utilizing the before, during, and after data of the pandemic period. Both the univariate (paired t-test) and multivariate analysis (random effect model and Feasible Generalized Least Square Methods) confirm that the Covid-19 pandemic demonstrates significantly

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higher risk and risk-adjusted returns of mutual funds compared to the non-Covid-19 period. Therefore, Covid-19 had a considerable impact on mutual funds by raising both risk indicators, such as standard deviation and beta, reflecting increased market volatility and changing investor behaviour. During the pandemic, the Sharpe ratio and Treynor ratio showed improved risk-adjusted returns and effective risk management. Furthermore, the mutual fund's risk was substantially influenced by all macroeconomic indicators, including the GDP growth rate, deposit rate, export, import, and remittance, during the Covid-19 period, except broad money supply. Moreover, mutual funds' risk-adjusted return was also impacted by macroeconomic variables during the Covid-19.

The study offers important new insights into the risk profiles and risk-adjusted returns of mutual funds, which helps to explain their dynamics during exceptional occurrences such as the Covid-19 pandemic. The results show that mutual funds were more volatile and sensitive to changes in the market, which put conventional risk management techniques to the test. Furthermore, the Treynor ratio and the Sharpe ratio indicate better risk-adjusted returns. The need for fund managers to create flexible strategies that improve portfolio resilience in times of crisis is highlighted by this dichotomy. This study enhances the literature by illustrating the connection between macroeconomic variables and mutual fund performance, aiding investors in making decisions during volatile periods.

The study was conducted with certain limitations, like other studies. The sample selection comprised solely 27 conventional mutual funds listed on the Dhaka Stock Exchange before January 2016, omitting Islamic and younger mutual funds, hence constraining the generalizability of the findings to the wider mutual fund market. The study utilized month-end closing prices of mutual funds and monthly Covid-19 cases that may inadequately reflect the dynamic effects of Covid-19 on mutual fund performance, given that investor behavior frequently varies and impacts mutual funds' performance over shorter timeframes. However, the lack of reliable data sources about the investor's attitudes during the periods restricts the inclusion of this variable in the data analysis.

Future research opportunities include examining the influence of Covid-19 on mutual funds using daily or weekly panel data and including both Islamic and newer funds, enabling more nuanced insights. The study period is limited to 2016 to 2023, but researchers can also increase the data period. Additionally, exploring other macroeconomic determinants like exchange rates, unemployment rates, and inflation would provide a comprehensive view. Researchers could also consider expanding the scope to include international mutual funds, enriching the analysis and facilitating cross-border comparisons, thereby contributing valuable insights into global investment strategies during crises.

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The Impact of Digital Leadership Dynamic Capabilities on Driving Digital Transformation and Innovation: The Moderating Role of Task Complexity

JUJBR

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Abstract: *In the wave of digitalization, information technology (IT) sectors are playing a crucial role for thriving digital transformation (DT) and innovation, where digital leaders serve as the epitomes of success. This study aims to investigate the influences of digital leadership (DL) on thriving digital innovation (DI) by analyzing the mediating effects of DT in interlink between DL and DI, and the moderating role of task complexity (TC) between the relationship of DL and DT. To conduct this study, data were collected from 403 employees at different levels within IT organizations in Bangladesh using convenient sampling methods, and the analysis was performed with SPSS 23 and AMOS 24 software. The results demonstrate that DL has a substantial positive effect on DI, and DT plays partially mediating role between DL and DT. Also, TC plays a significant moderating role interlink between DL and DI. The findings highlight the dynamism of DL can foster DT which is conducive to innovation. To cope with TC, DL needs to embrace an adaptive and malleable digital transformational strategy to promote DI. To achieve organizational success, DL guides teams to enhance required digital infrastructure and capabilities which is favorable for innovation. This research is grounded in the dynamic capabilities view (DCV) and resources-based view (RBV) theories, and identifying factors could be crucial for IT organization management, policymakers, and relevant authorities to maintain unwavering organizational performance and gain competitive advantages.*

Keywords: *Digital Leadership, Digital Innovation, Digital Transformation, Task Complexity, Bangladesh.*

1. Introduction

Digital technologies, like big data, IoT, AI, and cloud computing, are growing phenomenon that supports the digitalization of organizations. Following the global COVID-19 pandemic and under the pressure of ongoing global transformation; organizations are constantly changing, and business environment become hypercompetitive. The technological dynamism is also shaking Bangladesh and pressurizing it to become digitalized. For example, to provide IT support, numerous organizations in Bangladesh like Vivasoft, Brainstation 23, Enosis, TigerIT, Cefalo, SynthesisIT etc., are prominently obliged to engage their technology-experts or leaders to develop solutions that drive DT and foster DI

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(Top 20 Best Software Companies in Bangladesh, 2024). IT firms are also propelling to foster the digitalization of various sectors, such as banking, insurance, SMEs, NGOs, healthcare, and both profit and non-profit organizations. For these activities, Bangladesh is turned as home to approximately 4,500 software and Information communication and technology (ICT) firms that employ over 300,000 employees (BD, 2023) and numerous freelancers, and independent workers. In this context, Fitzgerald et al., (2014) demonstrated that IT organizations need to be succeed in a digitally volatile environment by embracing transformation by improving customer experiences and engagement, boosting operations, and developing innovative business models; otherwise, they risk for failure.

Additionally, in Bangladesh, the IT sector plays a fundamental role in the advancing the 'Smart Bangladesh,' initiative focusing on smart citizens, governance, economy, and societies, as outlined in the government's 'Smart Bangladesh Vision 2041.' Where, in pursuit of DT under the 'Digital Bangladesh,' vision, the country has launched a Satellite, developed a number of high-tech park and inaugurated software technology park (Saha, 2022) to drive digitalization. Digitalization involves the transition from physical to digital systems (Khan, 2016) mechanization, automation, or robotization, digitalization (Toduk, 2024). As new technologies continue to evolve, and they produce as by-product unknown challenges and drive environmental fluctuations. Due to the DT changing business processes, cultures, and organizational aspects to meet fluctuating market demands brought about by digital technologies (AlNuaimi et al., 2022). Based on the concept presented by Chen et al. (2024), TC link to technological changes can manifest three ways: first, component complexity, which includes proper execution of takes and the use of information cues; second, co-ordination complexity, includes encompasses the interdependencies among acts, information cues, and products; and third, dynamic complexity, supposed to adapt environmental changes. Digital leaders may be the right person to effectively manage DT, navigating task complexities, and drive DI. Despite a growing number of researches, the effect of digital leadership's dynamic capabilities (DC) on DT, and DI as well as moderating role of TC at the organizational level is yet unknown. Therefore, the question arises: ***What roles do the dynamic capabilities of digital leadership play in managing DT and fostering digital innovation in Bangladesh? Whether task complexity have significant effect in the relationship between DL and DT?***

Firstly, De Waal and Heijtel (2016) demonstrated, digital leadership (DL) is the blend of transformational leadership and digital skills. Apart from this, Zhu (2015) has characterized DL as visionary, inquisitive, thought leaders, effective communicators, collaborators, and creative. Besides this, DL also possess a vast amount of digital management experiences (Zeike et al., 2019), digital capabilities (Narbona, 2016), and social networking skills (Narbona, 2016). Thereafter, this research perceives DL possess a dynamic capability of leadership. Actually, the DC and digital knowledge of DL set them combination of

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transactional, transformational leadership and authentic leadership styles (Prince, 2018). Secondly, DT infers planned change, including the shift of the organization system related to big data, cloud computing, and mobile technologies by using social media for providing goods and services (Bresciani et al., 2021). Also, AlNuaimi et al. (2022) explained, DT includes transformation of business processes, organizational culture and aspects for supporting changing market demand brought about by digital technologies. Thirdly, the DI refers to 'the creation of market offerings, business processes or models that result from the use of digital technology' (Nambisan et al., 2017); 'the development of new products, services, or solutions by using digital technology' (Khin & Ho, 2019). Finally, TC reflected by the structure of a task indicated by its structure, which includes the quantity of work elements, the number of sub-tasks, and the diversity of task elements, among other factors (Ham et al., 2011). In IT firms the task and sub-tasks can be varied and typically involve a mix of technical, project management, customer service, and strategic responsibilities.

After following the background and clarification of the variables, now there is a discussion of the research gap and contributions. There is a growing need for DL to adapt to digitally dynamic environment (Mollah et al., 2024) in order to enhance DT capabilities and foster DI for organizational success. DL possesses the ability to tackle diverse challenges and seize opportunities that arise from digital evaluation (Ismail et al., 2023). Ismail and Admajid (2007) theoretically proposed that, in the future, visionary leaders will play a significant role in fostering an innovation culture within organizations. Another study, Ko et al. (2022) mentioned that IT departments and their services are perceived less important in the context of DT. Additionally, the International Data Corporation (IDC) forecasted that global investment in DT will reach $2.3 trillion in 2023. Bangladesh is also investing a huge amount of money aiming adoption of DT. Where DT is driven by advancements such as personal computers, AI, virtual reality, big data, and various social networking sites (Hitt et al., 2016). However, all forms of transformation and innovation require careful planning, organization, expert leadership, and in time control of strategic activities.

There are many researches have explored interlink between DL and innovation (AlNuaimi et al., 2022; Fatima & Masood, 2024; Mihardjo et al., 2019). More details, AlNuaimi et al. (2022) found that digital transformational leadership positively influences DT and suggested that in future ‘innovation’ can be used for further extension of the research. Especially, Erhan et al. (2022) asserted that future research can expand on the role of DL by considering into necessary perspective. Besides this, Mihardjo et al. (2019) found that DL has a substantial effect on innovation in the telecommunications industry, while Benitez et al. (2022) demonstrated that DL has a substantial effect on innovation management in European firms. Along with this Senadjki et al. (2023) found that DL has a substantial effect on performance in Malaysia. Furthermore, in a previous study, Niu et al. (2022) found impact of DL on organizational innovation, contributing to organizational sustainability. There are few researches where TC is used a

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moderator while one study conducted and found TC effect in relationship between transformational leadership and organizational learning in micro SMEs among the IT managers (Tarliman et al., 2022). This research gap motivates to develop these research framework (Figure 1) and empirically test the results in the IT sector of Bangladesh, aiming to achieve following specific objectives:

(i) To explore the impact of digital leadership on digital innovation in the IT sector of Bangladesh.

(ii) To examine the mediating role of DT in the relationship between digital leadership and digital innovation.

(iii) To evaluate the moderating role of TC between digital leadership and DT.

In summary, this research considers the dynamic role of DL based on DCV and investigates DT abilities and DI from the perspective of RBV theory. And the key objectives of this research are to find the digital leader's DC in driving DI and examining the moderating effect of DT on the relationship between DL and DI. Additionally, it aims to investigate the moderating effect of TC on the relationship between DL and DT in the IT sector of Bangladesh. Thereafter, by applying DC of DL for managing DT and navigating TC; this research will contribute for strategic decision making and gaining competitive advantages by taking futuristic decision.

2. Literature Review and Hypotheses

2.1 Theoretical grounds

This research is grounded based on DCV and RBV theoretical framework to address the research questions and objectives. The DCV theory is proposed by Teece (2007) to address dynamic environments. Previously Azzam et al. (2023) also used DL as based on DCV theory, which is also strategically supportive for developing RBV. According to Yu et al. (2018) DCV is the extension of the RBV theory, used to utilize the skills and knowledge for sustainable competitive advantages. The RBV theory explains that resources which are valuable, rare, inimitable, and non-substitutable are essential for gaining higher performance (Barney, 1991). Practically, in IT firms the capabilities of DL, DT effort, and the TC are highly dynamic and need constant adapt to the changing environmental factors. The DC of digital leaders enable them to integrate, build, and reconfigure internal and external competences, as outlined in Teece et al.'s (1997) concept. Integration of digital leaders' DC, effective management of DT, and the ability to navigate TC are all essential for thriving DI, generating additional resources, and for supporting the achievement of competitive advantages and organizational sustainability.

2.2 Relationship of digital leadership and digital innovation

In the digital wave of DT, DL is crucial for driving innovation and organizational success. DL fosters a culture of agility, adopts advanced technology, empowering employees, and formulates malleable organizational strategies and structures. Notably, DL encompasses capabilities and skills in DT (De Waal & Heijtel, 2016) which also entail directing and influencing overall organizational strategies

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(Porfírio et al., 2021). In addition, digital leaders are capable of handling digitally volatile environments and managing innovation (Mihardjo et al., 2019). Innovation involves utilizing information technology (IT) to create value (Saldanha et al., 2017). It emphasizes the significance of relational and analytical information processing in improving customer participation for processes and open platform structures (Appio et al., 2021). Actually, the relationship between DL and innovation is pivotal for nurturing a culture that encourages creativity, adaptability, and technological development (Ismail et al., 2023). In IT firms, digital leaders are focusing on DI by formulating strategies, developing organizational culture, and structure to achieve sustainable goals while satisfying customer demands in an increasingly digital landscape.

Moreover, digital technologies modernize organizations and enable the leveraging or creation of core skills, providing businesses with a competitive edge (Verhoef et al., 2019). For instance, Ding et al. (2014) mentioned that digital leaders make decisions based on their digital vision and capabilities. Additionally, Erhan et al. (2022) found that DL positively influences power for employees' innovative work behaviors, including idea generation, exploration, championing, and implementation. Khin and Ho (2019) found that DI positively influences on financial and non-financial performance in the IT sector. They also foster information sharing and invention to achieve open innovation, which is crucial for competing effectively and outperforming others (Wang et al., 2022). Also, DL is creating a vision for the upcoming future and, based on that vision, leading organizations toward achieving expected goals. However, research on the role of DL in driving DI within the IT sector of Bangladesh is still limited. Therefore, the succeeding hypothesis was posited:

H1: DL positively influences innovation.

2.3 Mediating role of digital transformation capabilities

In the era of the 4th Industrial Revolution and technological advancements, DL dynamic capabilities serve as a key enabler of organizational transformation and innovation. Importantly, transformation refers to the 'continuous recombination and reconfiguration of resources and structures under changing environments to support the business models' (Teece, 2007). DT is a procedure of integrating advanced technologies which enhances value for customers through novel solutions, improves the efficiency of the system (Attaran, 2020), and meets the growing needs of customers (Mak & Shen, 2021). IT system aligns with complex use of digital technologies for value construction, technology management, and the formulation of organizational strategies and culture (Saarikko et al., 2020). DL also possesses the capabilities to transform and integrate digital technology into corporate operations, serving as propeller for DT (Chanias et al., 2019). Research also reveals that a leader's effective leadership style and capabilities play a significant role in supporting DT in Portuguese (Porfrio et al., 2021). Additionally, it has been found that structure, culture, and leadership are key factors in success of DT (Leso et al., 2023). In the IT sector, as digital leaders play a key role, their DC may significantly impact the management of DT.

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Moreover, in a competitive environment, DT is critical for organizational success and makes a difference in competitive advantages (Schilke et al., 2018). The DC of the organizations are essential for 'addressing rapidly changing environments' (Teece et al., 1997). In IT firms, DC of digital leaders enhance the ability to quickly adapt to a volatile environment, which is supported by Breznik and Lahovnik (2016) by demonstrated that DC "hold the potential for a sustained competitive advantage, especially in a turbulent environment". Theoretically, DC involve three mechanisms: sensing, seizing, and transforming capabilities (Teece, 2007). As digital leaders possess multidimensional skills and digital expertise, they can effectively sense, seize, and transform IT firms in response to both global and local customer demands. To achieve this, IT organizations must prioritize on creativity and innovation, while DT emphasizes boosting productivity and innovation, enhancing both the quantity and quality of innovation (Chen & Kim, 2023). In Bangladesh, the activities of DT in the IT sector are supported by around 500 IT organizations and approximately 0.6 million independent workers (BD, 2023). Therefore, IT supports to modernize infrastructure, enhances data analysis capabilities, and establishes a more malleable and responsive organizational structure (Nadkarni & Prügl, 2021). Therefore, it indicates that the success of the DT is evidenced by the resulting of innovations.

H2: DL has a positive influence on DT.

H3: DT has a positive effect on DI.

Furthermore, Zhou et al. (2022) demonstrated DT has mediated by executive confidence, environmental technology innovation, and management innovation in Chinese public organizations. Besides this, Liu and Jung (2021) found that DT mediates the interlink between corporate social responsibility (CSR) and authenticity in Korean electronic products, while Tuyen et al. (2023) identified it as a mediating factor between CSR and corporate innovation in the context of Vietnam. In addition, a study conducted in Saudi universities found that DT serves as mediator between organizational culture and job satisfaction among faculty members (Zhou et al., 2022). Senadjki et al. (2023) confirmed DT acts as a mediator between DL and performance. However, there is still a lack of studies to explore the mediating role of DT between DL and innovation in IT sector from a Bangladesh perspective. So, proposes the following hypothesis:

H4: Since DL has positive effect on DT, and DT has positive effect on DI, it can be inferred that DT mediates the association between DL and DI.

2.4 Moderating role of task complexity

Task complexity is growing due to environmental dynamism and the need for rapid adaptation of new technology. Therefore, it is inevitable to enhance strategic change, and innovation capabilities through DT. Campbell (1988) defined TC as primarily focusing on tasks performed by individuals, without addressing the situation of collaboration. However, in the age of digitalization, collaborative work has increased; therefore, across the individual level of work

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complexity differs (Hærem et al., 2015). Additionally, TC encompasses both physical and biological sciences (Gell-Mann & Lloyd, 1996) as well as organizational studies (Zhou, 2013). Digitalization has also increased psychological pressure to achieve goals within limited resources; therefore, TC may impact DT and performance.

There are few studies on the role TC in organization. For example, Afsar and Umrani (2019) found that TC moderates the relationship between transformational leadership and employees' work motivation in the Pakistani manufacturing industry. Similarly, Wang et al. (2014) found that TC moderates the association between transformational leadership and creative role identification. However, the study Endris et al. (2017) study revealed that TC didn't significantly moderate the association between leadership self-efficacy and leadership effectiveness. Jung et al. (2022) found that TC moderated in the association between paradoxical leadership and creative self-efficacy. The rapid advancements in technology and continuously shifting environmental conditions are leading to further increase of the TC. However, no studies have examined the moderating role of TC in the association between digital leadership (DL) and DT within the context of Bangladesh or from an IT organizational perspective. Therefore, to address this research gap, this study posits the succeeding hypothesis:

H5: TC moderates the association between DL and DT.

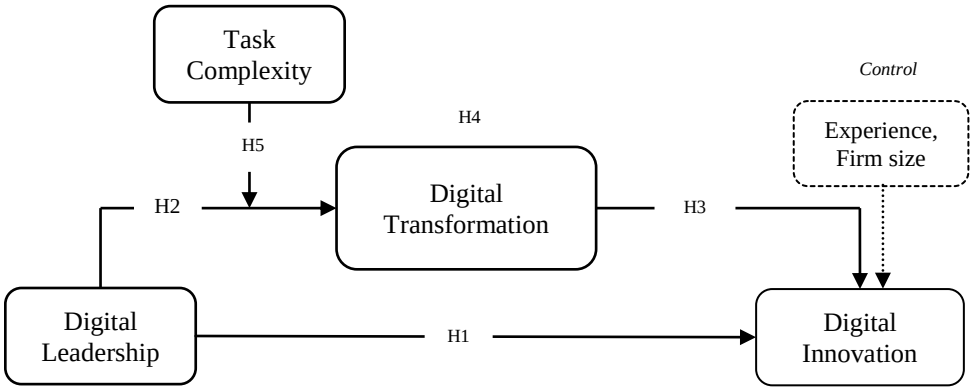

Figure 1. Research Framework

3. Methodology of the Study

This study employed a quantitative approach to explore the association among DL, DT, TC, and DI in the IT sectors of Bangladesh. To accomplish the study's objectives, primary data were collected by using purposive sampling methods based on the self-administering questionnaires. Questions were developed through a critical review of existing literature and data analyzed by using SPSS 23 and AMOS 24 to achieve research objectives.

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3.1 Sampling process

The convenient sample data were collected from employees of various IT firms in Bangladesh by utilizing a web-based questionnaire in Google form. At a start, a small note was included related to study description and participant's willingness to take part in the study. Also, a pilot study with five questions to check for validity and reliability. The first five responses demonstrated consistent and reliable results (DL = 0.871; DT = 0.702; TC = 0.902; and DI = 0.795). Approximately, 1200 questions were distributed, yielding a response rate 35.5%. A total of 426 responses were collected employees of various levels of organization as cross-sectional samples. After data cleaning, 403 responses were deemed acceptable for analysis.

The outcomes showed that among the respondents, around 85% were male, and 15% were female. In terms of work experiences, 63.8% of the employees had between 1 to less than 6 years of experience, followed by 15.6%. with less than 1-year experience. Regarding firm age, results exhibited that 45.9% of IT establishments are operational for more than 5 years but less than 11 years, 25.1% for less than 5 years, and only 0.7% for more than 20 years. Finally, the organizations size analysis revealed that 46.7% had less than 100 employees, while 53.3% had more than 100 employees.

3.2 Measurement items

To assess DL, this study employed six-item adopted from Erhan et al. (2022). Also, Shin et al. (2023) and Mollah et al. (2023) used it to measure organizational performance in Korean organizations, following a five-point Likert scale ranging from "1 = strongly disagree to 5 = strongly agree". Next, to measure DT, we used five items devised by AlNuaimi et al. (2022). For DI, six items were adopted from Paladino (2007) and Zheng et al. (2021). To assess TC, four items used by Sia and Appu (2015) with five-point Likert scale ranging from "1 = always to 5 = never." Additionally, two control variables-employee experience and firm size were included to control for the proposed model.

4. Results

4.1 Bias test and the measurement model analysis

To assess the common method variance (CMV), this study followed the KMO test and Bartlett's test of sphericity. The KMO value is 0.913 (x^2 = 3609.160, df = 210, $p < 0.001$), demonstrating that the relationship matrix is not an identity matrix. Harman's single-factor test depicted that the total variance explained by a single component was 36.40%, which is less than 50% threshold, suggesting that there is no CMV problem (Podsakoff et al., 2003). Additionally, to test the path analysis, a bootstrap of 5,000 was applied to assess SEM. Table 1 shows the outcomes, of a four-factor structure delivered the best fit for the data, with goodness-of-fit indices meeting or exceeding standard values (Hu & Bentler, 1999).

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Table 1. Model fit analysis

Model	GFI	AGFI	RMR	SRMR	CFI	RMSEA [90% of CI]	X^2/(d.f.)
1 Factor (DL, DT, TC, DI)	.98	.93	.020	.034	.97	.092 [.055; .133]	4.40***
2 Factors (DL+DT, TC, DI)	.96	.94	.021	.035	.97	.053 [.036; .070]	2.14***
3 Factors (DL+DT+TC, DI)	.96	.94	.023	.036	.97	.048 [.034; .060]	1.91***
4 Factors (DL+DT+TC+DI)	0.93	0.91	.028	.041	.95	.049 [.040; .057]	1.96***
Reference Standard	≥0.9	≥0.8	<0.08	<.05	≥0.9	≤0.08	≤ 5

Note(s): **p < .05, **p < .01, ***p < .001; GFI = Goodness of Fit Index; AGFI = Adjusted Goodness of Fit Index; RMR = Root Mean Squared Residual; SRMR = Standardized Root Mean Squared Residual; RMSEA = Standardized Root Mean Squared Residual; CFI = comparative fit index.*

To assess the convergent and discriminant validity, study model conducted tests of composite reliability (CR), average variance extracted (AVE), and Cronbach's alpha. All three measures fell within the suggested acceptable ranges (Fornell & Larcker, 1981) (CR > 0.70), AVE > 0.50), and Cronbach's a (> 0.70). It should be noted that, due to the low loading DL1 and TC1 were eliminated.

Table 2. Convergent validity and reliability

Constructs	Items	Loading Value	AVE	CR	Cronbach's α
Digital Leadership	DL2	0.690	0.595	0.880	0.804
	DL3	0.612			
	DL4	0.641			
	DL5	0.712			
	DL6	0.709			
Digital Transformation	DT1	0.758	0.616	0.889	0.837
	DT2	0.728			
	DT3	0.698			
	DT4	0.691			
	DT5	0.684			
Task Complexity	TC2	0.661	0.592	0.812	0.763

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Constructs	Items	Loading Value	AVE	CR	Cronbach's α
	TC3	0.753			
	TC4	0.749			
Digital Innovation	DI1	0.831	0.578	0.891	0.857
	DI2	0.781			
	DI3	0.670			
	DI4	0.685			
	DI5	0.600			
	DI6	0.724			

Note(s): *AVE = Average Variance Extracted; CR = Composite Reliability*

4.2 Descriptive statistics and discriminant validity analysis

This study has tested mean, standard deviation, and multicollinearity (Table 3). Male respondents are 0.85 or 85% and female respondents are 0.15 or 15%, mean of IT experience 2.15 indicates employee's IT experiences centralized between 6 to 11 years. Similarly, mean of firm size is 1.53 indicates number of employees of the organizations concentrated within medium (49 to 99 employees) types of organizations. On the other hand, the mean and standard deviation of all latent variables (DL, DT, innovation and TC) are higher than their central response central values. As we have got response in a five-point Likert scale ranges from 1 (strongly disagree) to 5 (strongly agree) and middle value was 3 (Neutral). Therefore, higher than 3 indicates that most of the respondents have positive perceptions.

Additionally, results show that all the VIFs fall under 5, which indicates that this study has no multicollinearity issues as the VIF less than 10 (Hair et al., 2009). Researchers analyzed the association among demographic information and latent variables. The results revealed a positive correlation between firm size and experience with all other latent variables. DL is positively correlated with DT ($r = 0.55$, $p < 0.01$), TC ($r = 0.42$, $p < 0.01$), and DI ($r = 0.45$, $p < 0.01$). Similarly, Table 3 shows a correlation between all the latent variables. Furthermore, the assessment of discriminant validity revealed that the square roots of AVE outperform the other diagonal and horizontal correlation coefficients (Fornell & Larcker, 1981), thereby confirming the nonexistence of any discriminant validity matters in this study.

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Table 3. Descriptive statistics and discriminant validity

Variables	1	2	3	4	5	6	7	8
1. Gender[a]	1							
2. IT Experience[b]	.11*	1						
3. Firm Age[c]	0.07	.23**	1					
4. Firm Size[d]	0.07	-0.04	.40**	1				
5. Digital leadership	-0.05	-.20**	-0.05	.19**	**(.77)**			
6. Digital Transformation	0.02	-.14**	0.02	.19**	.55**	**(.79)**		
7. Task Complexity	0.02	0.03	-0.04	.15**	.42**	.43**	**(.77)**	
8. Digital Innovation	-0.04	-0.02	-0.08	.14**	.45**	.58**	.47**	**(.76)**
Mean	0.85	2.15	2.35	1.53	4.32	4.24	4.06	4.04
SD	0.36	0.84	1.27	0.50	0.56	0.62	0.72	0.67
Collinearity Test (VIF)	1.02	1.15	1.31	1.29	1.60	1.57	1.36	1.02

Note(s): **p < .05; **p < .01; ***p < .001*; *[a]Coded O = Female, 1 = Female; [b]Coded 1 = Less than 1 year, 2 = More than 1 to less than 6 years, 3 = More than 6 to less than 11 years, 4 = More than 11 to less than 16 years, 5 = More than 16 to less than 20 years, 6 = More than 20 years; [C]Coded 1 = Less than 5 year, 2 = More than 5 to less than 11 years, 3 = More than 11 to less than 16 years, 4 = Less than 16 to more than 20 years, 5 = More than 20 years, [d]Coded 1 is Small= 1 to less than 49, 2 is medium = 49 to 99; 3 = 100 or more than 100 employees; The bold values in the parentheses are the square root of AVE for each variable.*

4.3 Hypothesis testing

First, to test hypotheses H1, the results proved DL has a substantial effect on DI ($\beta = 0.128$, $p < 0.05$). Therefore, hypothesis H1 is supported. Second, the results from examining H2 found that DL has a substantial effect on DT ($\beta = 0.053$, $p < 0.001$), and H3 proved that DT positively influence DI ($\beta = 0.420$, $p < 0.001$). Therefore, H2 and H3 are supported. Third, the results for hypothesis H4 indicate that mediating effect of DT between DL and DI is significant ($\beta = 0.022$, $p < 0.001$). Since both direct and indirect effects are significant, this indicates that DT has a partial mediating effect between DL and DI. Therefore, H4 is accepted. Lastly, hypothesis H5 confirmed that TC significantly moderates between DL and DT ($\beta = 1.770$, $p < 0.001$). Therefore, H5 is supported (Figure 2). Finally, the control variables, IT experience ($\beta = 0.002$, $p > 0.05$), and organization size ($\beta = 0.058$, $p > 0.05$), show an insignificant impact on innovation indicates no controlling effect in the model.

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Table 4. Results of the hypotheses

Hypotheses and Pathways		Standard Estimates		(95% of confidence interval)		*P* vale	Results
		Direct	Indirect	Lower Bound	Upper Bound		
H1	DL→DI		.128*	024	.232	.046	S
H2	DL→DT	.053**		.020	.101	.003	S
H3	DT→DI	.420***		.301	.555	.000	S
H4	DL→DT→DI		.022***	.009	.048	.003	S
H5	DT×TC→DT	1.770***		1.652	1.892	.001	S

*Note(s): *p < .05, **p < .01, ***p < .001; S/NS = Supported/Not Supported*

5. Discussions

This study is a successful endeavor to reveal the interactive roles of DT and TC in the association between DL and DI in Bangladesh's IT sector. IT organizations are increasingly relying on DL to steer their initiatives aimed at achieving these objectives. Traditional ways, Hambrick and Mason (1984) demonstrated that leaders typically operate at the upper echelons of organizations; however, in the digital age, DL can be found at any level within the organization. Such as DL may work various levels, including the Board of Directors and C-suite executives' level (Valentine & Stewart, 2015), senior and upper-level IT leaders (Zeike et al., 2019), IT leadership roles (El Sawy et al., 2016), organization level (Antonopoulou et al., 2021), and others levels (Narbona, 2016). Therefore, researcher gathered data from employees at various levels within the IT sector of Bangladesh and the general discussions are as follows.

First, the results align with past studies that demonstrated a substantial effect of DL on DI (Erhan et al., 2022). The results explain, DL is digitally capable, visionary, futuristic, thought leaders, collaborators, agile, and creative (Zhu, 2015). They possess extensive knowledge to handle volatile environments (Mihardjo et al., 2019), serves as a key driver for fostering innovation (Wang et al., 2022) in IT sectors of Bangladesh. This result highlighted that DC of digital leaders' support DT, navigating TC and enhancing innovation. Second, the results show DL has a substantial influence on DT. These findings provide similar results those of Benitez et al. (2022) that digital leaders play a vibrant role in DT and organizational adaptation. Also, digital leaders are proficient in ICT-based knowledge sharing and internet base management systems (Panir et al., 2018), which support different organizations through IT. Furthermore 'transformative vision and forward-looking perspective' of digital leaders drive cultural reform and enable quick adaptation in turbulent environments (Weill & Woerner, 2018). The discussion approves that digital leaders DC play crucial role

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in upgrading infrastructure, improving data analysis capabilities, and developing a flexible strategy along with responsive organizational system to achieve competitive advantages.

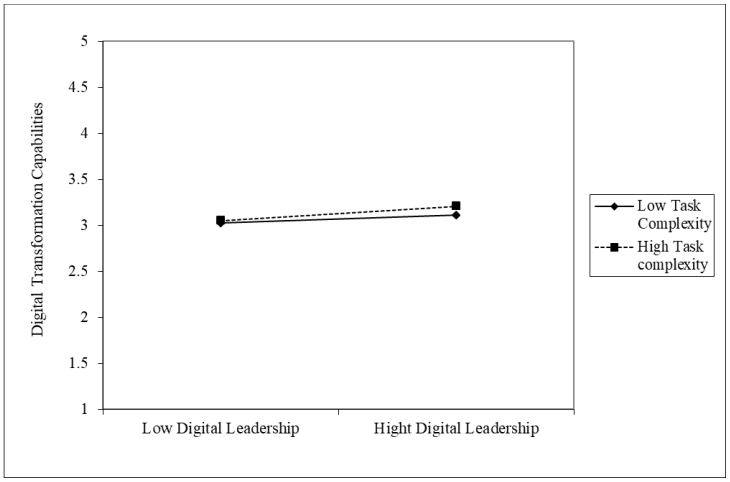

Figure 2. The moderation effects

Third, the results demonstrate that DT has partial mediating relationship between DL and DI, aligning with findings from previous studies (Zhou et al., 2022; Liu & Jung, 2021). Practically, these results indicate that DT plays an integral role in enhancing innovation, driven by DC of DL in the IT sector. Additionally, based on DCV, the digital leaders encompass investing in new technologies, cultivating digital competencies across the organization, and fostering a digital culture that embraces digital change. Lastly, the moderating role of TC in the relationship between DL and DT demonstrated significant contributes to enhancing originality in leadership research. To the best of our knowledge and findings, the moderating role of TC suggests that lowers levels of DL and lowers DT are moderated by TC. The findings also depict that lower level DL and DT significantly interact with TC suggesting that DL is capable of handling lower levels DT and TC. Lastly, the finding also revealed that DL are capable of managing volatile and turbulent environments, and handling TC to drive DT and enhance innovation performance for sustainability.

5.1 Implications of the study

This study makes both theoretical and practical contributions. Theoretically, the results show a connection between DCV and RBV, highlighting that DCV has a significant impact on resource enhancement in IT sector. First, DL embody DC and vibrant roles in enhancing DT and innovation across various IT sectors, including support for the digitalization of banking, healthcare, SME, and more. IT also supports for the development of new processes or enhancing existing digital management processes in innovative ways to better serve customers, supporting software and web development, network administration, cybersecurity

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enhancements, database management, and more. Second, due to globalization and digitalization, DT is valuable not only for perusing emerging opportunities but also for fostering innovation and ensuing sustainable performance (Mollah et al., 2023). Third, as DT mediates between DL and DI indicates that DT has influencing power of generating innovation in IT sectors of Bangladesh.

In addition, to turn the 'Smart Bangladesh' vision into reality, IT firms are conclusively supporting IT-related development and implementation, while digital leaders are plying pivotal role in driving digitalization efforts (Ke & Wei, 2008). Fourth, TC moderates the relationship between DL and DT infers that DC of DL are exclusively managing TC while DT is evident. Hereafter, the findings of the study provide significant insights for managers and policymakers, indicating that IT firms must need to focus on organizational development and customer satisfaction alongside competitive service delivery. Ultimately, as organizations concentrate on DT and innovation to enhance competitiveness and sustainability, digital leaders emerge as the driving force behind successful transformation and innovation in Bangladesh.

5.2 Limitations and future research directions

Though this study presents some notable implications; there are some limitations and conceptual arguments required to address. First, the unit of analysis was IT knowledge employees who have digital knowledge or are associated with digital activities in IT firms in Bangladesh. In future study needs to cover multiple sectors for generalization. Second, based on Erhan et al.'s (2022) suggestions, this study considered DL as predictive variable and DT as mediator, TC as moderator and digital innovation as dependent. In the future, other relevant constructs such as benevolent leadership, managerial support, AI, supportive culture, and creativity can be used for further research. In general, innovation encompasses product or service, process, and model innovation (Bresciani et al., 2021). However, this study did not separately analyze innovation in terms of product and service, which could provide more detailed insights. Future research could examine product and service innovation separately to gain deeper insights into their distinct impact. Fourth, as this study utilized a quantitative approach with 403 cross sectional data, future study could benefit for applying mixed methods for more comprehensive understanding. Also, longitudinal or comparative approaches that account for social, economic, and political perspectives can ensure further potential contributions.

5.3 Conclusion

This research highlights the interconnectedness of DL, DT, and DI capabilities. By prioritizing the development of robust DL and enhancing comprehensive DT, organizations can effectively deal with TC in a digitally volatile environment, thereby ensuring their sustainability and adaptability. Furthermore, recognizing the DC of digital leaders in handling TC in expert hands can help tailor leadership approaches to different organizational contexts. This understanding can further enhance management efficiency and foster DI within organizations in

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Bangladesh. In conclusion, IT organizations serve as the backbone of digital systems, with DL acting as the driving force behind effective management; therefore, to ensure sustainability, organizations need to stay tuned with DL.

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Appendix: Questionnaire

Sources	Variables and items
Erhan et al. (2022); Mollah et al. (2023)	**Digital Leadership**
	Supervisor/leader raises the awareness of the employees of the institution about the risks of information technologies
	Supervisor/leader raises awareness of the technologies that can be used to improve organizational processes
	Supervisor/leaders determine the ethical behaviors required for informatics practices together with all its stakeholders.
	Supervisor plays an informative role to reduce resistance to innovations brought by information technologies
	Leaders share his/her own experiences about technological possibilities that will increase the contribution of his colleagues to the learning of organizational structure
	In order to increase participation in the corporate vision, a digital leader guides the employees of the institution about the technological tools that can be used
AlNuaimi et al. (2022)	**Digital Transformation**
	Digitalize everything that can be digitalized.
	Collect large amounts of data from different sources
	Aim is to create more robust networking with digital technologies between the different business processes
	Aim is to enhance an efficient customer interface with digitality
	Aim at achieving information exchange with digitality
Sia and Appu (2015)	**Task Complexity**
	Found my job very complex
	Task is mentally demanding
	Task required a lot of thought and problem solving
	Found job to be a challenging task
Paladino (2007)	**Digital Innovation**
	The quality of digital solutions is superior compared to our competitors
	The features of digital solutions are superior compared to our competitors
	The applications of digital solutions are totally different from our competitors
	Digital solutions are different from our competitors' in terms of product platform.
	New digital solutions are minor improvements of existing products
	Digital solutions are new to the market at the time of launching

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Bangladesh and the Blue Economy: Its Prospects, Challenges and Exploring Sustainable Solutions

JUJBR

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Abstract: *The Blue Economy (BE) is a relatively inchoate concept whose prerequisite is the sustainable use of the oceans while maintaining marine environmental integrity. Coastal countries are naturally in a relatively favorable position, as opposed to landlocked nations, in taking advantage of marine resources such as marine fisheries, oil, gas, minerals, renewable energy sources, marine biotechnology, and tourism within their maritime jurisdictions. Bangladesh, a country with a coastline of 710 kilometers, sovereignty over 354 nautical miles, and rights over the continental shelf area of 1,83,613 square kilometers, is at a similar advantage. According to 2018 World Bank report, Bangladesh's blue economy sector contributes approximately 3% to its GDP. This paper specifically focuses on Bangladesh's blue economic potential and its growth. The research discusses the prospects of the multivariate sectors within Bangladesh's Blue Economy, such as mariculture, metals and minerals, offshore oil/gas reserves, marine-derived pharmaceuticals, green energy, and tourism. Upon collecting data exclusive to the oceans/blue economy, it was analyzed and then integrated into the study to objectively evaluate the prospects of the Blue Economy sectors in Bangladesh. These prospects were then followed by addressing the existing key challenges associated with the aforementioned sectors. Finally, the paper introduces pertinent policy recommendations Bangladesh may integrate as national policies for effective sector-based blue economic growth, efficiency in blue economic diplomacy, enhancing public-private cooperation, and improving local, plus foreign investments to embolden the Blue Economy sectors of Bangladesh.*

Keywords: *Blue Economy, Ocean's Economy, Marine Economy, Blue Economy of Bangladesh, Marine Sectors of Bangladesh, Oceans Economy of Bangladesh.*

1 Introduction

Blue Economy conceptualizes the oceans and seas as "development spaces", providing focus on ocean economic growth, and preserving the oceans' ecosystem integrity (Alam, 2014). Gunter Pauli, in his book "The Blue Economy:

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10 Years, 100 Innovations, 100 Million Jobs", brought the blue economy concept within a prominent discussion paradigm (Pauli, G., 2010). According to Pauli, the blue economy concept promotes the "optimum usage" of marine resources such as fish, corals, seaweed and related organisms, natural energy reserves (oil, gas, and minerals), shipping services, energy generation, and other similar marine/ocean-based economic sectors.

According to Pauli's definition, coastal countries are at an advantage in harvesting the marine resource deposits within their internationally recognised maritime region. However, the concept of the blue economy is yet very inchoate. Even the European Union as a whole has most recently begun to prioritize its marine fisheries sector (Cisneros-Montemayor et al., 2021). Keen et al. (2018) seconds such a statement by claiming that the blue economy concept is yet traversing its theoretical stages. However, as inchoate as the blue economic practices may be, the potential of this sector is nevertheless very promising.

Bangladesh, littoral to the Bay of Bengal, a region abundant in untapped marine resources, may be able to harness impressive tangible yields from its coastal periphery. The yields may stem from Bangladesh's Exclusive Economic Zones (EEZ), as well as from its access to the external international waters. It has been estimated that about the equivalent of 81% of Bangladesh's land resources can be found in its seas (Alam, 2019). According to experts in the field, Bangladesh's GDP could increase by 3%–4% through the proper utilization and materialization of its blue economy sectors (Syfullah, 2021).

The evident potential of Bangladesh's Blue Economy sector has given impetus to this research. The work focuses on the potential of different sectors that comprise Bangladesh's blue economy landscape; such as mariculture, offshore oil and gas, shipbuilding and scrapping, marine research and medicine, renewable resources, and tourism. The meat of the research is to explain such prospects from the growth potential of Bangladesh, address relevant challenges, and provide sustainable solutions.

1.1 Research Objective:

The objective of this research is to discuss the relevant prospects of Bangladesh's Blue Economy sectors, address the blue economy's most salient challenges, and present fortified 'reality-driven' solutions.

The research aims to explore the potential of individual blue economic sectors such as mariculture, offshore oil/gas, minerals, metals, marine biotechnology, and tourism, and to address notable challenges associated with those sectors, such as lack of investments and infrastructure, absence of modern technology in those sectors as well as absence of knowledge. Through addressing said challenges, the research aims to provide policy recommendations focusing on foreign investment growth, improving research, practicing blue diplomacy, introducing advanced technology, and other similar endeavors.

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1.2 Literature Review

Before proceeding with reviewing literature, we make sure to note that most recent research works conducted on the blue economy are still traversing the theoretical realm, due to the inchoate nature of the field itself.

The article by Hussain et al. (2018) discusses the multivariate nature of the blue economy while focusing on the BE's growth potential in Bangladesh. Their work discusses the potential of Bangladesh's blue economic sectors, while adequately addressing the challenges associated with the BE's growth in Bangladesh. It mentions the necessity to prioritize domestic and foreign investments, and introduces ideas such as Marine Spatial Planning (MSP), and Marine Protected Areas (MPA) to synergize economic growth with environmental sustainability. The authors recommend relevant governmental policy introduction to promote Bangladesh's BE growth. However, the authors did not elaborate or specify how Bangladesh's authorities might materialize such recommendations.

Similarly, Cisneros-Montemayor et al. (2021) explain how the majority of marine resources fall within the EEZ of a country, as opposed to international waters. Their work has shown that countries such as Bangladesh, Taiwan, and China prefer mariculture cultivation but confront limitations such as infrastructure inefficiencies and proper policy approaches. Their research elaborated on how regions such as Africa and Asia have very promising deposits of marine resources. However, these regions tend to have less enabling conditions to trade than the US or Europe. This research did not adequately address how to circumvent or solve such challenges.

Haque's (2020) work dominantly focuses on "blue diplomacy" as a prerequisite to blue economic growth. The study iterated the necessity for developing and using specific tools for cooperation between member states for mutual growth in the blue economy and improving foreign investments into Bangladesh. Haque promotes reaching solutions through diplomacy, incorporating international organizations such as UNEP, UN-Water, the World Water Council, and other synonymous offices. The research sought solutions by implementing legal frameworks at the sub-national, national, inter-basin, and global levels to improve blue economic growth in Bangladesh. The author did address insufficiencies in Bangladesh's national blue economic policies and mentioned growth stymies. However, the research did not elaborate on the challenges faced by the blue economy in Bangladesh or provide elaborate recommendations through arguments and empirical data.

Patil et al. (2019) conducted a study that supposes that industries that are growing around the oceans are growing with each other, not in isolation. The study mentions the lack of distinct national policies as stymies against blue economic expansion in Bangladesh. Furthermore, the research highlighted the unavailability of disaggregated data in the Bangladesh Bureau of Statistics (BBS) surrounding the blue economic sectors. The authors had recommended that the BBS open an "Ocean's Account" that would keep a separate account of the i)

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industries growing around the ocean area and ii) their proximity to the coastal region. Evidently, the study did not adequately focus on how to address these challenges through specific actions.

A study by Keen et al. (2018) focused on the Small Island Developing States (SIDS), and how the blue economy was germane to such countries vulnerable to climate change and ocean ecosystem degradation. The authors primarily focused on marine fisheries, where the research advocated for synergizing scientific data with local knowledge. The study recommended sustainable use of the oceans, stronger institutional frameworks facilitating the blue economy locally, and a gender-equitable approach to such an economic practice. Despite the study being substantial, the paper did not elaborate on specific actions to be taken by relevant authorities to address challenges.

It is evident that there are significant research gaps existing in these works conducted on Bangladesh's blue economy potential. And such gaps provided the determination and zeal to conduct this research.

1.3 Research Methodology

The study uses the Desk Study method that incorporates the use of secondary data such as academic works, gray literature, reports, newspapers, and opinion editorial articles among other available secondary sources.

This method follows an abductive approach that re-contextualizes existing phenomena to gain a novel perspective and to generate newer theories. The approach allows researchers to generate new ideas and hypotheses, allowing them to build on existing research by providing innovative perspectives.

The information acquired from the aforementioned secondary sources is investigated scrupulously and incorporated into the study. After a thorough analysis of said information, a conclusion is formed based on their objective interpretation.

1.4 Research Limitations

Due to the underdeveloped and theoretically restricted nature of BE research both in Bangladesh and globally, the researchers often failed to access relevant and updated qualitative and quantitative data. Furthermore, given the academic background and field(s) of expertise of the authors, they were limited to analyzing literature from their limited, policy-oriented views. The work was also restricted to the use of secondary data exclusively due to limitations faced by the researchers in conducting field visits and surveys.

2 The Significance of Bangladesh's Blue Economy

The significance of Bangladesh’s blue economy lies in factors such as strong economic ambitions, addressing national inadequacies, practicing rights over available national marine resources and exploring sustainable alternatives.

With the upward trend of global population growth, specifically in the southern hemisphere, solely relying on land-based agriculture, farming, and natural

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resources are failing to meet national requirements. Countries around the world have fallen short of ways other than to diversify their production capabilities, and this is where littorals tend to have a proverbial "ace up their sleeve". Bangladesh enjoys 200 nautical miles (NM) of ocean borders, 354 nm of seabed resources (continental shelf), and an additional 200 nm of ABNJ (Area Beyond National Jurisdictions) (Rashid, 2018; Haque, 2020; p. 1). And according to the most recent estimate by the World Bank (2018), the blue economic sectors of Bangladesh contribute 3% to the country's GDP (Patil, 2018; Ahmed, 2024). As of now, 26 areas have been declared as being part of the blue economy in Bangladesh which include marine fisheries, oil and gas extraction, minerals, marine biotechnology, shipping, tourism among others (Ziauddin, 2023; p. 40; Tahmid, 2021).

The data discussed in Table 1 makes evident how the blue economy-based sectors have had and are continuously contributing to the aggregate economy of Bangladesh.

Table 1: Financial Evaluation of Major Blue Economy Sectors of Bangladesh from 2010-2015 (in USD Millions) (Bhuiyan, M. et al., 2021; p. 9).

Economic Sector	2010	2011	2012	2013	2014	2015
Marine Fisheries	843.75	949.48	1107.42	1231.06	1384.77	1475.66
Oil	21.90	23.84	26.82	28.77	29.35	34.05
Gas	948.35	956.30	1041.35	1127.73	1158.13	1305.42
Sea Salt	119.25	123.48	160.90	206.00	212.35	214.84
Sand, Minerals and Coal	735.18	944.39	1183.79	1452,46	1644.08	1893.14
Water Transport	1215.14	1330.36	1450.21	1606.10	1682.31	1816.67
Trade and Shipping	31,390.15	36,178.04	41,728.94	47,156.44	52,078.80	58,466.90

It is evident from the data enumerated above that with the proper policies, the blue economy sectors of Bangladesh may usher in a higher influx of foreign reserves.

The blue economy has been considered as part of Bangladesh's national growth paradigm since 2015. In fact, the government had introduced specific initiatives to integrate the blue economy and its development in its 7th five-year plan for the fiscal years (FY) FY2016-FY2020. The policies targeting blue economic growth included improving mariculture capacities, extractive technological upgrades, increasing skill sector-specific skilled labour, and boosting investments among others.

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Additionally, the Government of Bangladesh (GoB) had inaugurated the "Blue Economy Cell" in 2017, under the Energy and Mineral Resources Division of the Ministry of Power, Energy, and Mineral Resources (MOPEMR) that would directly address BE necessities and assure that pertinent policies are being introduced and suggested (Islam & Shamsuddoha, 2018; Alam, 2019). Blue economy is also part of Bangladesh's more recent initiative of the 2100-Delta Plan (Sarker, 2019).

3 Blue Economy and its Prospects for Bangladesh

The idea of a blue economy within the relevant agencies of Bangladesh had been engendered post-resolution of the maritime disputes with neighboring Myanmar and India in 2012 and 2014 respectively. This was indeed a critical diplomatic/economic-strategic success for Bangladesh (Alam, 2019).

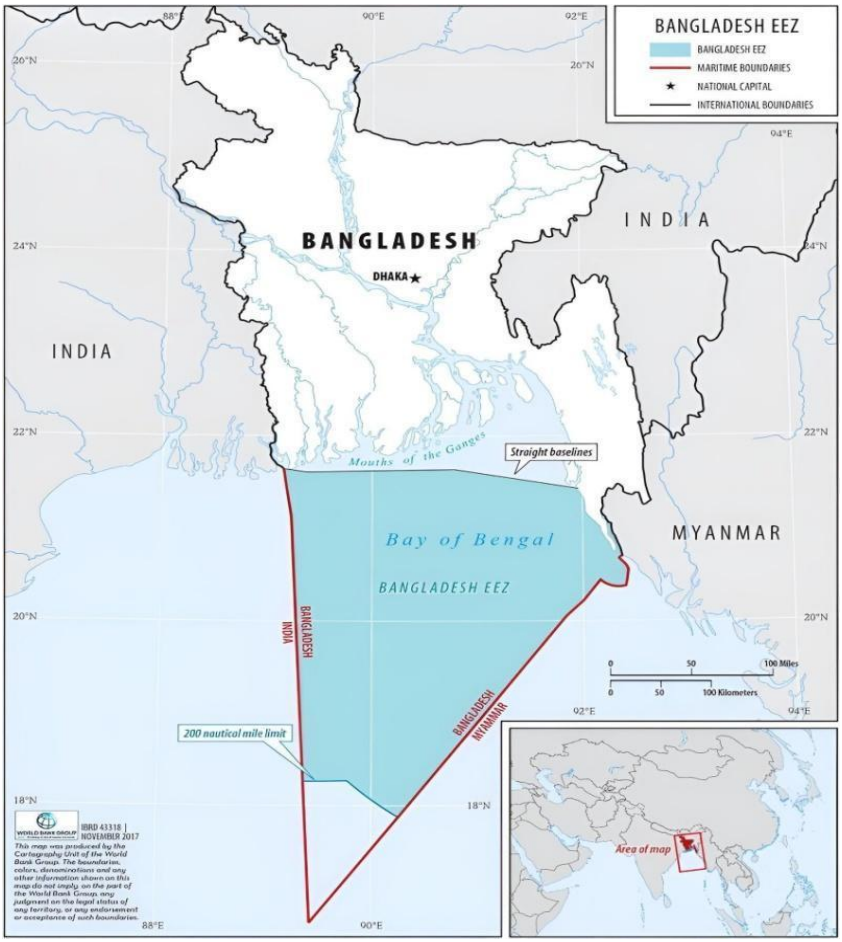

Figure 1: The Exclusive Economic Zone of Bangladesh (Patil et al., 2019; p. 2)

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Fig. 1 above visualizes the Bay of Bengal, where Bangladesh now has a total of 121,110 square kilometers of marine area, including the exclusive economic zone. The blueprint to “Bangladeshi” maritime aspirations was the "Territorial Waters and Maritime Zones Act-1974” (and its annexure Maritime Zones Rules-1977) (Haque, 2020; p. 2), by Bangabandhu Sheikh Mujibur Rahman, who had envisioned an exclusive maritime territory for Bangladesh after the country's independence, long before the materialization of any International Waters Governance treaties. The provisions of the 1974 Act, and its 2021 Amendment had paved the way for the proper management and protection of coastal marine resources, preservation of biodiversity, pollution control, coastal zone management, conserving marine protected areas, shipping and fisheries. Around 18.2 percent of Bangladesh's population depends on the country's ocean economy (Patil, 2018; Iqbal, 2020). To validate this data, Table 2 enumerates the annual gross value added to Bangladesh’s aggregate economy from its blue economy sectors.

Table 2: Annual Gross Value Added (GDA) from Bangladesh's Blue Economy. (Patil et al., 2019; p. 8-10).

Ocean economy industry/ service (Nominal USD Millions)	2009-10	2010-11	2011-12	2012--13	2013-14	2014-15
Marine capture fisheries	664.00	777.00	786.23	907.49	1037.49	1167.79
Marine aquaculture and shellfish farming (shrimps and crabs)	78.65	92.48	99.76	122.05	144.99	163.20
Sea salt production	123.20	124.11	145.51	184.35	195.45	197.88
Crude petroleum extraction	22.42	23.65	23.69	25.16	26.40	30.55
Natural gas (liquid) extraction	971.13	948.62	919.94	986.25	1041.87	1174.58
Maritime freight transportation	307.90	319.55	295.81	300.33	327.15	375.58
Maritime passenger transportation	617.61	659.27	606.66	663.14	720.69	788.35
Port and harbor operations	104.95	103.29	135.57	145.32	172.37	202.17
Shipbuilding and repairing	110.32	114.77	106.68	109.58	108.59	387.06
Ship breaking	127.39	130.80	134.27	136.83	138.31	138.21

We now discuss the array of prospects and potential sectors under the blue economy banner that are not only promising, but have evidence supporting their potential in generating foreign revenue, and have long-term positive growth projections.

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3.1 Mariculture: The Economic Prospects of Marine Fisheries

Mariculture strictly adheres to this practice of aquatic cultivation exclusive to the seas and oceans (Alam, 2019). Although fish only accounts for 5% of the entire blue economic sector worldwide, it can contribute up to 68% to a country's GDP (IMF, 2015). In Bangladesh, marine fisheries contribute at least 20% of total fish production, with 5 million people working in this sector. There are 450 species of fish that are found within Bangladesh's EEZ, compared to the 250 species cultivated inland. Additionally, Bangladesh currently tops the list of 11 Hilsa (Tenualosa Ilisha) capturing countries around the world (Bangladesh Economic Review, 2023; 102). Hilsa is the most prominent catch of fishes found in the Bay of Bengal, with over 4,96,417 mt (metric tons) catch annually (5,67,000 mt in FY 2021-2022), contributing around 44% of the marine-captured fish, 12.22% of the total annual fish capture, generating over 1% of the total gross domestic product of Bangladesh. (Asaduzzaman et al., 2020; 2; Bangladesh Economic Review, 2023; p. 104). Hilsa capture provides employment for 2–2.5 million people, worth $1.3 billion dollars per year (BOBLME, 2012; p. 3, 5; Hossain et al. 2014) Shrimp and prawns are the second major exportable items contributing to Bangladesh's foreign reserve influx (Azad et al., 2019). Furthermore, fish parts such as desiccated smaller sharks, rays and fins of larger sharks have significant international demand.

As an environmentalist move, the GoB has formulated the "Marine Fisheries Act-2020" and the "Marine Fisheries Policy 2022" to prioritise sustaining marine ecology (Bangladesh Economic Review, 2023; p. 105).

It takes a minimum of 5–12 years to bring new mariculture species into the market and 5–10 years to create genetic developments or selective breeding programs (Failler et al., 2021; p. 20). Much dedication, patience, innovation, and research need to be implemented in this sector for major improvements.

3.2 The Economic Potential of Sea Sand and Mining below the Seabed

Massive sulfide deposits, cobalt crusts, and polymetallic nodules have been found lying on and beneath the seabed within Bangladesh's allocated ocean area (Bari, 2017; p. 10). The International Seabed Authority (ISA) had set up Mining Code Regulations for submarine mining while also providing licensing for these endeavors. It is being estimated that 10% of the world's minerals, including copper, zinc, and cobalt, could be extracted from the ocean floors by 2030, generating nearly 10 billion euros (Alam, 2019).

'Clay', the raw material for cement is present 30 to 80 feet deep into the Bay of Bengal (Rashid, 2018). It may be possible for Bangladesh to export cement elsewhere after meeting domestic needs if raw clay can be extracted from shallow areas of the oceans. Additionally, thorium and uranium have been found underneath the seabed in 13 places, estimated to be greater in value than gold. It is also possible for Bangladesh to explore mining possibilities beyond its EEZ, endeavors that are overlooked but permitted by the ISA (Nijam, 2022).

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Additionally, resources found in beach sand, including zircon, kyanite, garnet, magnetite, monazite, ilmenite and leucoxene, have high demand in the industries and factories of the country and abroad (Alam, 2019). Brown Monazite in particular is used in nuclear bomb and energy technology. There are 17 discovered mineral deposits in Bangladesh's coastal region, with their amount being nearly 17,50,000 tons (Bangladesh Atomic Energy Commission, 2019). A significant amount of foreign currency can be earned by exporting these mineral resources that have unremitting demand across the world (Alam, 2019; Nijam M., 2022).

3.3 Shipping and the Marine Ports: Their Contribution and Necessity

The shipping and logistics sector of the economy emerged during 1991-1992, when Bangladesh was quite inept in integrating this relatively new economic concept. 80% of global trade by volume and 70% of trade by value is carried on by seas, oceans and ports (Bhuyan, 2021; p. 9). In Bangladesh, 90% of Bangladesh's freight trade is centered around coastal shipping (Alam, 2019). In fact, Bangladesh has been estimated to handle 124 million tons of cargo by 2043 (Ziauddin, 2023; p. 43). Between 2004 and 2014, Bangladesh had garnered over $95 billion dollars through shipping/freight operations, import-export, and shipping through airlines. (Alam, 2014).

Bangladesh mainly has three ports; the Chittagong Port, the Mongla Port, and the Payra Port. It has been estimated that each year these ports receive up to 3000 vessels for imports and exports (Alam, 2019). The Mangla and Chittagong ports by themselves receive 600 ships annually (Ziauddin, 2023; p. 43). The Chittagong port handles the largest portion of freight traffic, handling 98.43% of said traffic in 2017-18 (CPA, 2022).

Seaports are a very significant part of the BE. According to Mordor Intelligence (2022), Bangladesh's freight and logistics market has shown an estimated projected compounded annual growth rate of more than 6% for the next 5 years. The Matarbari Deep Seaport, being constructed by the Chittagong Port Authority (CPA) in Matarbari of Cox's Bazar, is estimated to turn Bangladesh into 'the most important export-import hub of the region'. The deep seaport will be the first of its kind in Bangladesh that will allow for larger mother vessels, specifically, ships with a capacity of carrying 8,000 TEUS (Twenty Foot Equivalent Units) containers to be able to berth (Shyamol, 2022).

Feeder services (Feeder services connect larger vessels with smaller ports by transferring cargo via smaller vessels) play a substantially large role in continuing global trade relations for Bangladesh. Feeder service relations with India, Malaysia, Singapore, Sri Lanka, Myanmar, and Thailand ports could play as a game changer in Bangladesh's transshipment sector. Until now, Bangladesh has only had active transshipment relations with India but has faced setbacks due to the onset of COVID-19 and a low profit margin from this bilateral agreement (Mamun, 2021).

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Bangladesh's inland waterways cover 24,000 km in length with approximately 1000 landing points and 21 inland river ports, making the system one of the largest in the world. Chittagong Port handles about 3 million TEUs annually, and 80% of them are bound for Dhaka. If Bangladesh were to update its inland water transportation system, it could increase its GDP by 1%, while foreign trade would increase by 20% (Alam, 2019). The same literature suggests that containers that can be carried via inland water transit would cost less than rail. The most relevant river routes in Bangladesh are situated at some of the most prominent river ports, such as Dhaka, Narayanganj, Chandpur, Bhairab, Barisal, Chittagong, and Khulna. Enhanced connectivity of Bangladesh' river ports is necessary to facilitate direct shipment of cargoes to the capital as well as other national destinations.

3.4 Ship Building and Ship Recycling; its Growth Potential

The number of shipyards and workshops in Bangladesh exceeds 300 that allow the country to meet nearly 100% of its requirement of inland vessels such as dredging barges, fast patrol boats, passenger vessels etc. These shipyards are efficient in building good-quality ships, saving the Bangladesh Government a significant amount of foreign currency, while also boosting forex reserves through exporting these vessels abroad. These shipyards are constructing 10,000 DWT (deadweight tonnage) sea-going ships for exports and are expected to upgrade capacities to 25000 DWT (Alam, 2019).

Additionally, the deconstruction and scrapping of ships also facilitate the growth of Bangladesh's economy. Approximately 300 ships are recycled in Bangladesh each year, amounting to 24% of the total scrapped ships worldwide. Furthermore, 70%–75% of scrapped steel in industries and rerolling mills in the country come from scrapped ships (Bhuyan, 2021; p. 11). The Hasina administration had declared ship recycling activities as an 'industry' on 13th February 2011 (Mandated by the Bangladesh Ship Recycling Act-2018) (BSS, 2022).

Data suggests that Bangladesh has significant potential to be a strong ship-scrapping economy. In 2017, more than 7000 ships were scrapped for raw steel to be sent to industrial steel and re-rolling mills (Alam, 2019). These metal scraps are later repurposed into metal furniture, pipes, steel water taps, steel rods, and other similar products. Bangladesh has 124 ship-recycling yards, contributing an estimated average of 2.4 billion USD to the national economy annually (Alam, 2019). All in all, the facet of ships, through both recycling and producing, can act as an economic bastion for Bangladesh.

3.5 Marine Biotechnology: The Future of Modern Medicine

The marine biotechnology sector in Bangladesh can be a powerful sector for innovative food supplies, securing green energy and environmental remediation, as well as in the developing pharmaceutical sector of Bangladesh. In 2017, there

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were over 36 marine-derived drugs under clinical development, this included 15 for cancer treatment. For instance, 'Acyclovir' and 'Zovirax', the antiviral drugs were obtained from nucleosides isolated from Caribbean sponges (Islam et al., 2024). Another drug 'Yondelis' was developed from small soft-bodied marine animals, and was the first drug of marine origin to fight cancer. Moreover, seaweed and mollusks have medicinal properties, and clams have been found to alleviate coronary issues (Ab Lah et al., 2016, Smoothey, 2013; Mahaffey et al., 2008 as cited in Hussain et al., 2019; 7). Additionally, both micro and macroalgae extracts have high value in the nutraceuticals and pharmaceutical industries. Macroalgae producers can target human food markets as a protein staple, in the animal feed industries, fish medications, and as preservatives. Polyunsaturated fatty acids such as omega-3 and omega-6, as well as other microalgae-based antioxidants are available in the market (Alam, 2019).

If such processes run as smoothly, there could be a drastic pharmaceutical evolution in the next 20–25 years with the apt acceleration of the marine biotechnological sector.

3.6 Offshore Oil and Gas: Untapped Potential

With the onset of the Russo-Ukraine war, the global price of crude oil and natural gas had consequently reached unprecedented heights, despite impositions of price caps. Such volatility in fuel prices increases the cost of international trade, with the cost being transferred to individual consumers. So, the necessity to explore national fuel resources, both inland and offshore, have significantly increased for Bangladesh.

In 2009, offshore fields accounted for 32% of worldwide crude oil production, and this is projected to rise to 34% by 2025. Experts estimate that the reserves in Bangladesh's offshore marine deposits are just as vast as its onshore counterparts, which may increase the GDP of Bangladesh to $2.5 trillion (Alam, 2019).

After winning the disputes over maritime boundaries with Myanmar in 2012 and India in 2014, Bangladesh had acquired 26 blocs in the maritime boundary from its neighbors, 15 of which are deep-sea blocs, and 11 being shallow water ones. It has been estimated that there are 26 Tcf (trillion cubic feet) of natural gas deposits in Bangladesh, of which only 1 Tcf has been found offshore as of now (Alam, 2019). Noteworthy small-reserve gas wells, the Sangu and the Kutubdia, have been exploited well. Sangu's 0.8 Tcf of reserves have been fully exploited, whereas Kutubdia's 0.04 Tcf of reserves are yet to be done the same with. Furthermore, no commercial quantities of hydrocarbons have yet been produced from the drilling of the Magnama (3.5 Tcf) and Hatia (1.0 Tcf) (Alam, 2019). Some Bangladeshi gas blocks are believed to have comparable geological structures and gas/oil potential as Myanmar, given the proximity of our deposits to theirs.

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3.7 The Renewable Energy Dialogue: For a Sustainable Future for Bangladesh

Recent estimates suggest, demand for renewable energy is expected to increase two and a half times by 2035 worldwide than it is today (Alam, 2019). Bangladesh, which relies dominantly on natural gas and furnace oil to generate electricity, needs sustainable alternatives to align with international sustainable energy standards. The use of wind, waves, and ocean current to generate electricity, using onshore grids for storage, is a viable solution to meet Bangladesh's ever-growing energy demands, given that the country has a potential to generate 30 GW of energy from offshore wind farms (Islam et al., 2024).

However, renewable sources only make up for 1.69% of the national power supply, mostly from solar energy (Bangladesh Economic Review, 2023; p. 147). The 500 MW offshore wind projects near Cox's Bazar portends potential, however still insufficient (Islam et al., 2024).

Nevertheless, Bangladesh does have potential to thrive in the renewable sector, mostly attributed to its geographical location and climate conditions. Moreover, initiatives as such create sector-based employment opportunities. With the right policies, the country may be able to harness maximum efficiency in the renewable sectors, reaching closer to its blue economic targets.

3.8 Tourism: Generating Revenue from International Vacationers

Tourism accounts for approximately 5% of the global GDP, and in 150 nations, the tourism industry adds 6%–7% to employment (Alam, 2019). For instance, coastal tourism in the US and Australia generate an annual revenue of 129 billion USD and 20 billion AUD respectively (Islam et al., 2024). Additionally, tourism acts as the primary source of foreign revenue for half of the Least Developed Countries (LDCs).

Coastal countries lie on a bed of advantages for their proximity to the ocean line, which can be incentivized for proliferating a fruitful coastal tourism sector. Bangladesh revels in the advantage of possessing a coastline of 710 kilometers. Approximately 8.3 million USD in revenue is generated from Bangladesh' tourism sector alone (The Financial Express, 2021). Various activities surrounding its coastal areas, such as yachting, coastal travel services, and cruising. In addition, the hotel and resort sector can assist Bangladesh in generating high revenues.

However, to improve Bangladesh's tourism sector, relatively advanced infrastructure such as helipads, jetties for yachts, and cruise ship facilities are most required.

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4 Blue Economy and its Perils; Challenges for Bangladesh

Despite the prospects for the blue economy for Bangladesh, the sector is not without its challenges. Alongside the prospects, the researchers believe that the challenges in the blue economy of Bangladesh should be significantly discussed for multidimensional solution-making. For instance, Bangladesh is yet to achieve a more financially profitable position in shipping, with only 71 registered medium-scaled ships, which are impotent in delivering minute fractions of Bangladesh's shipped exports (Ziauddin, 2023; p. 42). Moreover, investments and incentives in shipbuilding are still not up to scale to the country's production capacity due to insufficient governmental priorities/abilities, and absence of international confidence to invest in Bangladesh's shipbuilding industry (Alam, 2019). Another prime sector would be seabed mining, which stir up ecological disturbances and threats to biodiversity, such as sediment-plume generation, release of chemicals, noise pollution, and so on (Levin et al., 2016; Gollner et al., 2017; Tilot et al., 2018). Moreover, a Norwegian study had identified overfishing as a top concern for marine environmental degradation, alongside an increase in temperature, acidification of ocean waters, and contamination (Jex, 2016). More issues as such are discussed in points.

I. Government data suggests that fishermen from other countries catch about 8 million tons of fish in the Bay of Bengal, compared to Bangladesh's 93,000 tons. This illegal fishing has depleted Bangladesh's resources. Despite Bangladesh being allowed its own 200 nautical miles of EEZ, only 30–40 nm is explored for fishing activities. Additionally, the country's fishermen cannot catch demersal fish below the 50-feet depth limit in the deep sea due lack of upgraded equipment and absence of necessary data (Alam, 2019).

II. Substantial plans for offshore oil and gas extraction are necessary for sustainable and operational marine resource exploitation. As we share marine borders with India and Myanmar, whoever taps into any gas reserves below the ocean floor, will be the one who will harness most of these reserves.

III. Bangladesh neither has a blue economy roadmap, nor does it have a specific Blue Economy Policy (Haque, 2020).

IV. Salt production in the country is yet to reach the maximum capabilities of industrial-level production. 6 million locals are associated with Bangladesh’s shipbuilding and salt industry (Failler et al., 2018). The salt production in the country is produced manually using local equipment, but on a very small scale. For instance, the salt production of Bangladesh's Cox's Bazar coastal segment is 22mt, whereas the Samut Sakhon of Thailand produces 43mt (Hossain et al., 2006; p. 163–164).

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Such production is insufficient for exporting on a large scale after pacifying domestic demand.

V. Stronger maritime research needs facilitation regarding the availability of marine resources, deep-sea fishing, biochemical innovation, biotechnology and marine genetic engineering among others. And to facilitate stronger research, Bangladesh needs a more educated and trained society of marine researchers (Syfullah, 2021; Ziauddin, 2023; p. 43; Islam et al., 2024).

VI. Maritime safety and surveillance need standard planning and execution. The UNCLOS governs the "High Seas" that extend beyond the national 200 nm but lacks efficient maritime patrolling and governance. This ineffectiveness exacerbates acts such as illegal fishing, illegal trade, slave trading, and piracy (Alam, 2019). Moreover, both the Bangladesh Navy and The Coast Guard lack sufficient patrol boats for inspecting crimes and committed pollution by ships and other vessels (Ziauddin, 2023; p. 46).

VII. The practice of ‘Blue Diplomacy’ by relevant governmental actors is a very weak Bangladesh, alongside evident insufficiencies in blue diplomacy research (Haque, 2020; p. 8).

VIII. Bangladesh’ inadequacies in blue economy-centric infrastructure has resulted in very little foreign direct investment in the BE sectors. This backtracks the country's progress quite excruciatingly.

IX. Bangladesh's human resources require relatively upgraded training to contribute resiliently to the BE. An estimated 30 million people are connected to the Oceans Economy in Bangladesh (Failler et al., 2018).

X. Unmanaged mass tourism negatively impacts coastal ecosystems, often impacting the marine protected areas. Pollutants from the industrial factories in the country's north, as well as pesticides, and insecticides used in farming travel downwards south via Bangladesh's extensive river system and pollute the marine environment, causing rapid acidification of the sea, and eventually the ocean (Iqbal, 2020).

XI. Strong similarities between SDG-14 (Sustainable Development Goal No.14, that addresses the sustainability of marine life and preserving the environmental integrity of the oceans) and Bangladesh's blue economy policies are absent.

5 Policy Recommendations for Bangladesh's Blue Economy

Despite evident challenges affecting Bangladesh’s blue economic growth, they are solvable through taking necessary measures. We list out a number of policy

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recommendations to expand upon and proliferate the blue economy sectors of Bangladesh. They are as follows:

I. Fishing within Bangladesh's nautical miles needs to be securely monitored to restrict illicit activities such as illegal fishing. Moreover, advanced technology for deep-sea fishing and trawlers with long-line equipment should be made available, plans that have been a part of Bangladesh's 7th Five-Year Plan. Bangladesh's foreign partners, such as Norway and Japan, both with rich coastal heritages, can assist the country in acquiring necessary technology such as advanced research vessels and sophisticated deep-sea fishing technology (Islam et al., 2024).

II. Bangladesh's EEZ abounds in jellyfish, which has high international demand. These jellyfish have the ability to adapt in warm and polluted waters (The Business Insider, 2019), which is advantageous for Bangladesh's geography and ecological status. And according to a study by the Bangladesh Oceanography Research Institute (BORI), crab farming can help generate $30 million annually (Rayhan, 2024). These endeavors should be examined initially through demonstrative small-scale trials, and going forward, integrated into our national economic practices.

III. Bangladesh must increase the facilitation of its ocean-related research. This is absolutely imperative for increased innovations, and scientific and technological advancements in the oceanic sectors. The GoB had established the Bangladesh Ocean Research Institute (BORI) for significant empirical and physical advancements in the sectors of fish, mineral extraction, underwater reserves, and other similar activities. The institute has a 10-year goal in place, with a short, medium and long-term range of goals, estimated to generate 206 billion USD by 2028 (Rayhan, 2024). Additionally, the establishment of Bangladesh Institute of Maritime Research and Development (BIMRAD) has been a massive step forward in marine research and development.

IV. Some experts recommend for the government to facilitate a separate ministry for the blue economy, aptly named "The Ministry of Ocean Affairs" (Syfullah, 2021). The government is urged to consider this idea for streamlining BE activities that are presently scattered in between different ministries. The Norwegian governance structure for marine management may be exemplary in establishing a dedicated BE governmental entity (Islam et al., 2024).

V. The practice of blue diplomacy should be made relatively more mainstream within Bangladesh's diplomatic circles. Bangladesh already maintains blue diplomatic engagements with countries such as Australia,

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Malaysia, China, the US and more. Further improvement of such engagements is advised. The Ministry of Foreign Affairs (MoFA) already has a dedicated Maritime Affairs Unit (MAU) to practice, maintain and improve upon said engagements (Haque, 2020).

VI. The High Seas need more stringent monitoring by the UN to prevent piracy similar criminal acts that might restrict states' sovereign practices in their territorial waters. Bangladesh should efficiently equip its Navy and Coast Guard with an adequate number of patrol boats and necessary equipment.

VII. Seaports in Bangladesh should be relatively digitized to facilitate the most advanced port experience for import/export vessels. The Singapore Port's digital model can be exemplary in guiding Bangladesh' port digitization process. The US, Canadian and Norwegian port models may also be observed.

VIII. Proper planning for oil and gas extraction is much needed Private investment and public-private partnerships in such projects should be promoted through creating public-private investment frameworks and facilitating stakeholder dialogue. Investments from the likes of the Netherlands, the UK, Japan, and Qatar, countries with stupendous marine resource extraction experience and technology, may be welcomed.

IX. 'Marine Spatial Planning (MSP)' is a holistic approach which introduces responsible designated human activity in the seas/oceans so that no overlapping of marine-based activities occurs, maintaining the oceans' ecological integrity (Hossain et al., 2014, p. 45; Alam, 2016; Alam, 2018; p. 68). Following the concept of MSP, plans to establish and conserve Marine Protected Areas should be a top priority. Bangladesh may collaborate with countries such as The Maldives, Singapore, Japan, South Korea, Australia, and other littoral nations with experience in MPA conservation. Moreover, private investments and public-private partnership initiatives regarding MSP should be encouraged.

X. Relatively modern initiatives should be taken in Bangladesh's tourism sector, such as upgrading the restaurant sector using state-of-the-art technology, and through developing the boating, yachting and cruise shipping facilities. The Karnaphuli Cruise Ship that goes along the Chattogram-Cox's-Bazar-St. Martin route is a step in the right direction.

XI. Given the strategic importance of the Bay of Bengal, Bangladesh and India may benefit from mutual cooperation in the maritime sector (Sakhuja, 2014). India's "Ganga Vilas", the longest cruise ship in the world, aims to travel from the Indian town of Varanasi to Northeastern Assam while traveling through most of the riverways of Bangladesh.

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Such cooperation will further boost bilateral relations between the countries and support Bangladesh in collecting passage revenue (The Daily Star, 2023).

XII. Bangladesh should emphasize marine-based education and training to churn out an adept workforce. The Bangabandhu Sheikh Mujibur Rahman Maritime University (BSMRMU), set up in 2013, is an example of the GoB's efforts to advance maritime education, research and workforce development.

XIII. More emphasis should be put on renewables. Bangladesh's foreign partners, such as France, Germany, Japan, and China can facilitate technology transfer and intergovernmental collaboration. The AtlantOS "oil spill hazard mapping and disaster risk reduction best practices" is used to create large-scale simulations of oceanic oil spills by ships, and to promote prompt responses in actual, real-time conditions (Neves et al., 2018). Bangladesh can request a transfer of such technology to equip itself for similar emergencies in its own region.

XIV. Local shipping companies need to expand their fleets by improving private investments (Hossain et al., 2014, p. 7). The government should facilitate the promotion of shipbuilding via grants, governmental subsidization and by promoting private investment through aforementioned public-private investment frameworks. This trajectory will assist Bangladesh to generate up to 435 billion USD from international shipping by 2030 (Alam, 2019).

As conceptual as they may seem, these recommendations have been formulated based on the most potential sectors under Bangladesh’s blue economy, their prospects for sustainable growth, Bangladesh’s most relevant international engagements, and how these engagements may translate to economic gains using the most relevant literature. Given that Bangladesh carries the emblematic principle of ‘friendship towards all’ as its foreign policy, these recommendations will supplement Bangladesh’s dynamic and adept external affairs, and assist the country in its goal to materialize its blue economic aspirations.

6 Conclusion

The purpose of this research was to elaborately explain the current reality of the Blue Economy in Bangladesh and its potential to expand Bangladesh’s aggregated economic growth.

The paper was initiated through explaining both the definition and significance of the Blue Economy and its subsequent implications for Bangladesh. Elaborating on that, the research then detailed the prospects of each individual sector relevant to the overall Blue Economy identity. While reflecting on the prospects, the

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research delved into a brief account of the most relevant challenges associated with the aforementioned sectors of the BE, and the underlying causes of such challenges. Finally, keeping up with its solution-oriented approach, the paper presents recommendations in the form of what it perceives as relevant policy approaches to supplement existing governmental blue economic endeavors.

The Blue Economy cannot be understated in its ability to improve the international status of littoral economies. Through analysis, the research has deemed that the potential of the blue economy for Bangladesh far outweighs the challenges the sector may impose. The blue economic field requires a significant increase in research, especially regarding the aggregated data; both quantitative and qualitative. This can be adequately redressed through both public and private endeavours.

We conclude with the statement that with the apt legal, political, economic and social framework, the nation will undoubtedly reap the most impressive results from its blue economic sectors.

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The Role of Smart Tourism Cities (STCs) on Tourists' Destination Loyalty (TDL): Evidence from World's Largest Sea Beach Destination (Cox's Bazar)

JUJBR

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Abstract: *This research identified dimensions of smart tourism cities (STCs) and measured their impact on developing tourists' loyalty towards a specific location. This study employed a descriptive research methodology, utilizing quantitative approaches to find out the components of STCs and their impact on tourists' destination loyalty (TDLs). The convenience sampling method has been employed to gather data from 300 individuals. Quantitative data analysis was conducted using smart PLS 4 with the SEM application. The results indicate that four components, including smart tourist applications (apps), smart accommodations, innovative governance, and intelligent people (service providers), positively influence the TDL. Tourists emphasize tourist apps, advanced amenities like VR technology, live streaming, tourist-friendly destination management, and efficient and skilled workers to develop loyalty towards an STC. This study can motivate stakeholders in the tourism industry, particularly hotel owners, transportation owners, government officials, and other relevant parties, to develop a smart and sustainable tourist city. Moreover, the results could assist policymakers in identifying the specific aspects of STCs that are most impactful in fostering loyalty among tourists. This study exclusively focused on Cox's Bazar as a prospective smart tourist destination. Therefore, future studies should consider other destinations including smart mobility and smart security to achieve comprehensive knowledge.*

Keywords: *Smart; Tourism City; Destination; Loyalty; Bangladesh; Cox's Bazar*

1. Introduction

The tourism sector serves a crucial role in the economics of many countries due to its favourable impact on GDP, job creation, and global trade (Oromjonovna & Eshnazarovna, 2023). Recently, the concept of "Smart Tourism Cities" (STCs) has gained popularity, intending to enhance visitor experiences via digital technology and insights derived from data. On the other hand, a smart tourism ecosystem (STE) means a combination of tourist attractions utilizing modern technology to produce, manage, and distribute smart scenic experiences and services (Gretzel et al.,2015). Within this ecosystem, information sharing and co-creation of value are substantial. According to Mandić and Garbin (2019), a smart destination is a crucial component of smart cities that uphold the STE

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conceptual framework. Side by side, Wang et al. (2016) incorporated "smart tourism attractions" (STA) that include eight primary domains: intelligent data systems, advanced visual analysis, sophisticated electronic commerce systems, cutting-edge security measures, innovative mobility solutions, predictive analytics, and virtual experiences tailored for visitors. Both the STE area and the STA field played a significant role in shaping the core ideas of STCs. STCs have an impact on both inhabitants and visitors by making it easier for people to move around, distributing resources efficiently, ensuring long-term sustainability, and improving the overall quality of life and tourism experience (Lamsfus et al., 2015). Moreover, Azis et al. (2020) mentioned that smart tourist services enhance visitors' experiences, leading to increased loyalty to specific tourist sites. Nevertheless, this study exclusively examined innovative tourism technology, and its conclusions cannot be universally applied due to the substantial impact of STC infrastructures on tourist behavior (Um and Chung, 2021). The influence of STCs on the inclination of tourists to return to a specific location, especially in developing countries like Bangladesh, is yet uncertain.

The rise of "smart cities," "smart tourism "and" smart destinations" has attracted considerable interest because of the technology in improving both the tourist experience and the tourist industry's financial performance (Buhalis et al., 2023). To improve the travel experience for all parties concerned, Corrêa and Gosling (2021) define smart tourism as relying on internet-based systems that publicly distribute relevant data and link tourists, service providers, and others in real-time. Smart tourism utilizes technological breakthroughs to enhance tourists' experiences, increasing satisfaction and commitment to the place (Stankov & Gretzel, 2020). Um and Chung (2021) argue that smart city services directly influence tourist behaviour as tourists utilize the advantages of smart cities throughout their visit. Smart tourism is a crucial element of smart city pillars in countries like Portugal, where the tourism industry contributes over 5% to the GDP. This holds for both emerging and industrialized nations (Matos et al., 2019). Researchers assert that intelligent technology such as cloud storage, the internet, and mobile device connectivity will simplify finding and developing captivating new tourism destinations (Buhalis & Amaranggana, 2015; Jovicic, 2019). The expeditious decision-making about a destination is a prominent advantage of utilizing innovative tourism city services, as emphasized by Lee et al. (2018). Despite the widespread use and popularity of the STC concept in developed countries, there is a dearth of research on this topic in emerging nations such as Bangladesh.

Smart tourism towns greatly enhance employment opportunities in the transit, hotel, tour guide, entertainment, and retail industries (Buhalis et al., 2023). Furthermore, it will enhance infrastructure development by improving transportation systems, implementing efficient garbage management systems, enhancing public safety and security measures, and upgrading the overall city infrastructure (Han & Kim, 2021). STCs will enhance individuals' soft skills through collaborative learning and professional growth in various areas such as

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hospitality, technology, marketing, and urban planning (Buhalis et al., 2023). These technologies enhance the tourism business and boost visitors' experience through astute mobility, sophisticated accommodations, smart apps, advanced security measures, knowledgeable individuals, and cutting-edge governance (García-Maroto et al., 2024).

Cox's Bazar, known for being the largest beach in the world, attracts a significant number of tourists from different parts of the world annually. The Government of Bangladesh (GoB) has recently identified Cox's Bazar as a potential STC. Many measures have been implemented, including the construction of a marine drive road along the shore, the development of smartphone tourism apps, the integration of VR technology in hotels, and the establishment of digital information kiosks to enhance the tourists' experiences. How tourists view these activities and how they affect destination loyalty is unclear. Moreover, there is a lack of study concerning STCs and tourist loyalty within the setting of Bangladesh. Thus, the purpose of this study is to investigate how visitors' loyalty to Cox's Bazar, Bangladesh, is impacted by the STC concept.

RQ1: *To what extent STCs influence tourists' destination loyalty?*

RQ2: *What impact would STCs have on tourists' inclination to revisit?*

2. Literature Review and Hypothesis Development

2.1 Smart City and Smart Tourism City

The rise of smart cities in the twenty-first century is a direct consequence of the increasing development and integration of ICTs and efficient urban development (Hollands, 2008; Molinillo et al., 2019). According to Snow et al. (2016), a smart city is a neighborhood where organizations, government departments, and inhabitants collaborate to effectively integrate systems, including citizens, and uphold a particular level of living. Within the digital city movement, smart tourism and hospitality refer to the use of information and communication technologies (ICTs) to provide eco-friendly travel destinations, operations, and sights (Lamsfus et al., 2015). Hence, the construction of infrastructure necessary for the growth of smart cities has a direct impact on tourism. Accordingly, STCs are defined as those that implement smart tourism techniques (Um & Chung, 2021). Therefore, the STC has arisen as a new phrase to offer reciprocal benefits to visitors and inhabitants by creating a location that encourages sustainable tourism practices and guarantees excellent visitor experiences.

2.2 Association Between Smart Tourism (ST) and Smart City (SC)

The literature has recognized various attributes of smart cities. The fundamental pillars of a SC include human beings, devices, and systems that connect several sectors like health, telecommunications, transportation, learning institutions, tourism, amenities, and infrastructure (Khan et al., 2017). The key characteristics of "smart" tourism destinations involve converting physical infrastructure, operational procedures, and service delivery into digital form. Furthermore, these locations promote increased interaction between tourists and the local area while

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also considering the participation of residents and governing organizations. The main goal of ST is to construct and manage visitors' satisfaction (Koo et al., 2015).

ST sites implement structures and concepts of smartness that apply to urban and rural environmental development, resulting in significant advantages for the sustainable tourist sector. These locations facilitate establishing relationships between tourists and their visiting places, leading to substantial enhancements in visitor experiences (Del Chiappa & Baggio, 2015). In their study, Chan et al. (2019) discovered a significant association between the number of smart tourism attractions in a specific region and the level of satisfaction and commitment exhibited by tourists towards that particular site. The idea of a SC has had a significant impact on and accelerated the growth of "smart tourism," mostly through the application of technology and other breakthroughs in information (Li et al., 2017). As a result, the relationship between intelligent attractions and the concept of a SC has become increasingly significant. To encourage people to extend their stay or visit again, it is advisable to market the region as a "smart destination brand" (Kerr, 2006). Over time, these tourists may become increasingly interested in traveling to, revisiting, or even permanently moving to smart cities due to their appealing characteristics (Chan & Marafa, 2018). Tourists' opinions and first-hand encounters hold the same level of significance as the information and communication technology (ICT) infrastructure in cities when promoting a city as an intelligent destination (Hospers, 2010).

2.3 Dimensions of Smart Tourism City

Zhang et al. (2012) determined that the essential elements of smart tourist attractions are cloud computing, the Internet of Things (IoT), and client digital service platforms. The ability to easily access a variety of programs, data, and applications using a standard web browser is a fundamental feature of cloud computing (De Esteban et al., 2017). IoT offers smart locations the ability to rapidly collect and analyze data, as well as benefit from sophisticated automation and management features (De Esteban et al., 2017). A STC is built on a web of interdependent and connected systems that include its people, structures, associations, the press, transit, enterprises, utilities, hospitals, and tourists (Khan et al., 2017). According to Cohen (2014), Buhalis and Amaranggana (2014), Matos et al. (2019), the six essential elements of an STC are smart transport, digital sound governance, savvy environment, smart economics, talented people, and smart living. Furthermore, authors contend that the emergence of STC infrastructure is starting to impact the conduct of tourists, hence establishing a connection with visitor loyalty. Regardless of the reason for their visit, travellers have the opportunity to utilize and access city services while they are staying. Chan et al. (2019) stated that various factors contribute to visitor satisfaction in a smart city. These factors include information technology and infrastructure, the voluntary participation and expertise of the residents, innovation and the quality of life, and collaborative efforts in governance. This study did not take into account other variables, such as intelligent mobility and business facilities that could potentially impact the loyalty of tourists.

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2.3.1 The association between smart apps and tourists' destination loyalty

Prior studies on mobile tourist applications have primarily concentrated on specific areas such as e-reservation; location sharing, or airline tickets (Wang et al., 2016). Although several apps are designed exclusively for tourism, travelers do not use them frequently, especially during holidays (Tsiotsou & Ratten, 2010). Nevertheless, Ukpabi and Karjaluoto (2017) reveal a scarcity of research examining the customer acceptance of mobile information systems in the tourism industry. Moreover, the utilization of apps has shown an increase in both the phase of planning tourism and during the actual tourism experience (Castañeda et al., 2019). Castañeda et al. (2019) underscored the direct impact of tourism apps on travelers' loyalty. They highlighted the need for these applications to consider cost and benefit analysis, user enjoyment, and provision of timely information to encourage more significant usage. Moreover, Tavitiyaman et al. (2021) found that visitors' perceptions of the location were positively impacted by four innovative tourism application features: smart technology, smart touring, internet shopping systems, and smart projecting. In Bangladesh, now visitors frequently utilize different mobile apps such as Gozayaan to select particular tourist spots like Cox's Bazar. Thus, it is imperative to investigate the connection between destination loyalty and ST applications.

H_1: *Smart applications (apps) positively impact on TDL.*

2.3.2 The association between smart accommodations and tourists' destination loyalty

Smart accommodation includes VR technologies, online booking, CRM software, etc. Visitor happiness and loyalty can be improved using smart technologies, including accommodations, mobility, sharing, caring, and customization, as Azis et al. (2020) stated. ICT tools are crucial in connecting accommodation facilities and destination management organizations. They serve the purpose of communicating the offerings of these facilities, increasing their position in the market, and improving their competitiveness (Buhalis, 1998). Smart accommodation services with mobile applications can improve the choice of a particular destination (Gretzel et al., 2016).

Moreover, Digiorgio and Renga (2021) mentioned that websites that provide data and allow for booking for hotels, and CRM software with customized accommodation details will have a favorable correlation with direct bookings for accommodations. There is a positive correlation between direct bookings of accommodations and revenue. Furthermore, there is an adequate number of five-star hotels and motels equipped with sophisticated housing facilities in Cox's Bazar. Consequently, it is essential to examine how these intelligent accommodations affect visitors' purchasing decisions at the Cox's Bazar destination.

H_2: *Smart accommodations have positive implications for TDL.*

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2.3.3 The association between smart governance and tourists' destination loyalty

Several issues about citizen services, public participation, public sector operations, and improved public-government relations are all included in the concept of smart governance (Selada and Silva, 2020). When creating smart tourism destinations, governance ensures openness, transparency, responsibility, cooperation, creativity, and efficiency for all citizens (Santos et al., 2017). Destination governance is a significant topic in tourism and destination management. It involves organizing activities and coordinating various stakeholders to enhance the competitiveness of a destination. Several studies have explored this area, including those by Berittelli et al. (2007) and Pechlaner et al. (2012). Effective governance is crucial for achieving these goals, as highlighted by Crouch & Ritchie (2005); and Del Chiappa & Bregoli (2012). Smart governments formulate and oversee tourism strategies and implement appropriate measures to enhance tourists' inclination to revisit. Intelligent administration and competent governance are essential components of smart tourism that substantially influence travelers' loyalty (Li, 2021). The Government of Bangladesh has implemented strategic initiatives, including the establishment of a free trade zone and the digitalization of municipal services in Cox's Bazar. Consequently, it is essential to understand how these measures affect visitors' choice of Cox's Bazar as a smart destination.

H_3: *Smart governance has positive implications for TDL.*

2.3.4 The association between smart mobility and tourists' destination loyalty

Smart mobility is a viable option that pertains to the transportation of tourists from their residences to their desired locations and vice versa. Currently, the phrase "smart mobility" refers to the use of ICTs to enhance transportation and make it easier for tourists to access different sites. The management of tourism will be significantly impacted by the adoption of smart mobility, especially concerning the movement and modes of transportation that visitors choose (Tung et al., 2020). By lowering pollution, relieving traffic, increasing safety, and saving money on transportation, smart mobility has the potential to improve people's quality of life (Zygiaris, 2013). Marchesani et al. (2023) said that there is a link between the adoption of smart mobility practices in modern cities and the increase in visitor numbers, which fosters destination loyalty.

H_4: *Smart mobility has positive implications on TDL.*

2.3.5 The association between smart people and tourists' destination loyalty

The decision-making processes of visitors are influenced by the level of openness to new experiences and the extent of social engagement among smart people (Selada and Silva, 2020).

The expertise and reputation of a destination can significantly enhance the efficacy of destination marketing, enhance tourist satisfaction, and even act as a distinctive selling point for the location's brand (Boes et al., 2016). Furthermore, according to Prentice et al. (2020), AI and staff service quality contribute

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significantly to assessing total service quality, customer happiness, and loyalty. Therefore, it is necessary to find out the connection between intelligent people/ employees and tourists' destination loyalty. A fundamental component of smart tourism is the presence of knowledgeable individuals—a community of informed and service-oriented persons, encompassing residents, and tourism service providers, and policymakers, who jointly enhance the success of a destination. These personnel are essential in facilitating significant encounters, improving service quality, and cultivating a sense of belonging for tourists. Therefore, it is important to know how smart people influence visitors to visit Cox's Bazar.

H_5: *Smart people have a favorable impact on TDL.*

2.3.6 The association between smart safety and tourists' destination loyalty

A smart tourist location's competitive advantage depends on its historical and scenic appeal, infrastructure and amenities for tourists, and the quality of its services. These services include security and privacy, which are important considerations when a tourist chooses a location (Ruiz-Sancho et al., 2021). Moreover, smart tourism offers tourists weather updates and real-time data to ensure their safety and security (Ko et al., 2022). In the Cox's Bazar area, the governing body implemented a comprehensive safety system that includes the installation of CCTV cameras, the deployment of tourist police patrols, and the establishment of a helpline. This initiative aims to enhance safety and security in the region. The Additional Superintendent of Police (tourist police) stated that around 150,000 people can be accommodated in 450 residential hotels, and all accommodations are monitored by CCTV for security purposes (Prothom alo, 2023).

H_6: *Smart safety has a favourable implication on TDL.*

2.4 Tourist Destination Loyalty (TDL)

Prior studies have investigated the notion of tourist destination loyalty, applying the theoretical frameworks put forward by Amin (2016), Tabrani et al. (2018), and Zeithaml et al. (1996). To gauge and quantify the degree of a visitor's emotional attachment to a place, the tourism sector frequently employs the notion of "attitude loyalty." This method takes into account travelers' propensity to return, which is impacted by their prior experiences (Yoon & Uysal, 2005). The phrase TDL refers to the dedication of tourists to a particular spot (Chen & Gursoy, 2001; Lv and McCabe, 2020). Furthermore, Chen et al. (2020) defined TDL as the likelihood of both returning to a place and endorsing it to others. As stated by Shahijan et al. (2018), revisit intention pertains to the probability that a previous visitor will return to the same area. The main criterion we will use to determine destination loyalty in this study is users' expressed desire to return to the site.

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2.5 Conceptual Framework

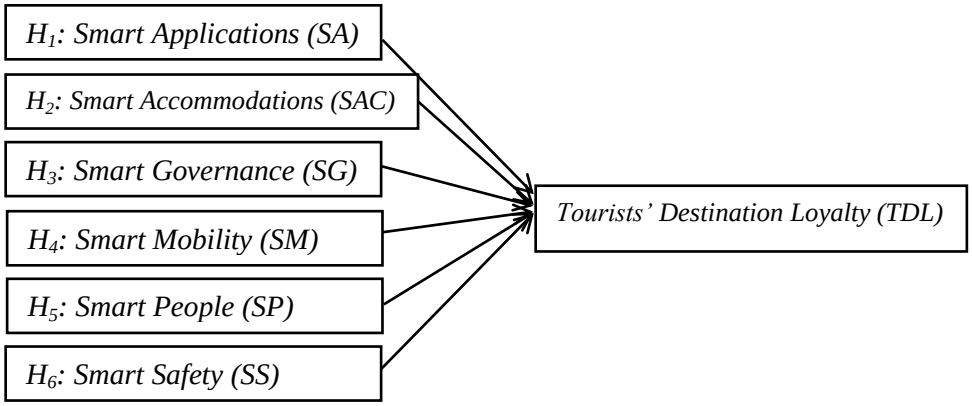

Figure 1: Proposed model for dimensions of smart tourism city and tourists' destination loyalty

3. Research Methodology

3.1 Research Design

A descriptive research design was employed in the study to determine the essential characteristics of STC that significantly support TDL. During the assessment, it was found that the models' methodologies and the highlighted hypotheses adhered to past research findings. According to an earlier study (Cavana et al., 2001), this approach and methodology can meet the needs necessary to provide trustworthy outcomes. Visitors to Cox's Bazar were asked to complete a standardized questionnaire on their own, which was used to gather data.

3.2 Research Instrument, Scale, and Measurement

There were three parts to the structured questionnaire. General questions concerning visitors' experiences visiting Bangladesh are covered in Section 1. Thirty-two items in Section 2 correspond to the six pillars of STC and three items for tourist loyalty variables. Five items in Section 3 give specific information about the respondents' demographic characteristics. Hence, a comprehensive set of six components has been utilized to clarify all aspects of a smart tourism city. According to prior validated studies, having a minimum of 3 items is essential to create the construct. The assessment of the items' dependability was conducted using Cronbach's alpha. The survey incorporated nominal, interval, and ratio methods to assess several aspects of the smart tourist city. The nominal scale was employed for categorical data, including gender, age, and binary yes/no inquiries. Additionally, an interval scale was used to assess tourists' perceptions of different aspects of smart tourism cities and their correlation with loyalty status. Finally, ratio approaches were employed to evaluate the frequency of tourist visits to Cox's Bazar. The survey employed Likert scales consisting of five possibilities to assess constructs and items.

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Table 1: List of constructs, items, and sources

Constructs	Items	Sources
Smart Application	Mobile apps, Websites of tourism, Blogs, new development, Online payments	Lee et al. (2018) Lee et al. (2020) Jeong and Shin, (2020)
Smart Accommodation	e-reservation, Quality of accommodation, Free WIFI, VR technology and customized CRM.	Um and Chung (2021)
Smart Governance	Partnership, Governmental initiatives, national tourism policy, Hi-Tech Park, Railway project	Chan et. al., (2019)
Smart Mobility	E-ticketing, Vehicle tracking system, Digital transportation facilities Smart airport, highway development	Kassim and Asiah Abdullah (2010) Jin et al. (2014) Tung et al. (2020)
Smart People	Interactive, IT Knowledge, Training, Socially interactive, efficient in delivering smart services	Selada and Silva, (2020)
Smart Safety	CCTV, Emergency number, Tourist police, data privacy, Tourist Police Patrolling	
TDL	Revisit, WoM, Recommend to others	Jeong and Shin (2020) Stylidis (2020)

3.3 Sampling Frame, Sample Size, and Data Collection Method

Cox's Bazar tourism destination's sample frame includes present and future visitors. The data collection was conducted using convenience sampling, a non-probability sampling technique. A survey was carried out, with a total of 300 participants. The data was collected using a computerized platform. The survey questionnaire was created on the Qualtrics platform. Visitors who had recently toured Cox's Bazar were provided with a Uniform Resource Locator (URL).

3.4 Measurement of Validity and Reliability, Data Analysis Techniques

Validity and dependability are crucial for guiding research on the correct path and identifying observable factors. The internal consistency was measured by utilizing Cronbach's alpha value. A Cronbach's alpha value exceeding 0.70 indicates a higher degree of internal consistency among the factor's components (Guilford, 1950; Nunnally, 1978). Items weighing less than 0.50 are not accepted. The present study will evaluate construct validity by examining correlations to ascertain how a scale effectively represents the concept being measured. An analysis of multicollinearity analysis was conducted to assess the interrelationships among the variables. The data analysis utilized structural

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equation modelling (SEM) with the software Smart PLS 4.0. In addition, the demographic profile was analysed using frequency distribution.

4. Results

4.1 Demographic Data

Table 2: Demographic Profile of Respondents (N=300)

Characteristics		%
Gender	Female	32%
	Male	68%
Education	PhD	4%
	Master's Degree	41%
	Bachelor's Degree	26%
	Higher Secondary School	21%
	High School Degree	4%
	Less than high school	4%
Age	20-25	25%
	26-35	40%
	36-45	18%
	46-55	12%
	Greater than 55	5%
Employment Status	Students	28%
	Homemaker	17%
	Self-employed/ Businessman	10%
	Employed part-time	9%
	Employed full time	32%
	Unemployed	3%
	Retired	1%
Number of Visits	Once	10%
	2-3 Times	59%
	4-5 Times	20%
	6-7 Times	7%
	More than 7 times	4%
	Sample Size	N= 300

4.2 Measurement Model

The present study employed measurement model testing to evaluate the concept and internal consistency reliability and validity (Table 3). Hair et al. (2013) said

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that the recommended minimum value for two reliability measures, α and rho_A, is 0.700 or higher. Table 3 shows that the values of α and rho_A are higher than the cutoff. The findings indicate that the range of factor loading values is 0.750 to 0.929, exceeding the α and rho_A cutoff values. Furthermore, the AVE is assessed by the convergent validity test and is expected to be greater than 0.500. The average of the squared loadings of the construct-related components is determined to be the AVE. The AVE values for SA, SAC, SG, SM, SP, SS, and TDL are 0.684, 0.781, 0.684, 0.835, 0.712, 0.812, and 0.812, respectively.

Table 3: Measurement Model Statistics

Items	Factor Loading	M	SD	Cronbach's alpha	Composite reliability	AVE
SA1	0.766	2.709	0.833	0.883	0.885	0.684
SA2	0.898	2.836	0.909			
SA3	0.835	2.692	0.899			
SA4	0.816	3.067	0.941			
SA5	0.814	2.970	0.952			
SAC1	0.891	4.047	0.702	0.860	0.860	0.781
SAC2	0.885	4.054	0.692			
SAC3	0.876	4.094	0.678			
SG1	0.838	3.993	0.633	0.846	0.847	0.684
SG2	0.813	3.846	0.691			
SG3	0.826	4.110	0.610			
SG4	0.830	3.923	0.721			
SM2	0.873	4.030	0.705	0.934	0.935	0.835
SM3	0.928	3.977	0.686			
SM4	0.929	3.970	0.691			
SM5	0.925	3.977	0.691			
SP1	0.750	3.749	0.772	0.898	0.904	0.712
SP2	0.867	3.906	0.730			
SP3	0.904	3.903	0.741			
SP4	0.824	3.766	0.771			
SP5	0.865	3.763	0.732			
SS1	0.895	3.007	0.954	0.769	0.771	0.812
SS2	0.908	2.893	0.915			
TDL1	0.887	3.910	0.803	0.769	0.778	0.812
TDL2	0.915	3.829	0.737			

Note. SA=Smart Applications, SAC= Smart Accommodation, SG= Smart Governance, SM= Smart Mobility, SP= Smart People, SS= Smart Safety, TDL = Tourists' Destination Loyalty.

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Tables 4 and 5's discriminant validity was evaluated using the HTMT and Fornell-Larker Criteria. Except for two values, 0.920 and 0.960, all HTMT values are below 0.850 (Hair et al., 2013), which further supports the discriminant strong validity of the constructs. The two HTMT values were included here since Hair et al. (2013) indicated that HTMT values within a range of 0.9 are also acceptable. The AVE showed a more vital correlation value than the other constructs, supporting the threshold (Hair et al., 2013). All AVE values are more significant than 0.80, indicating a substantial association among items within each construct. Therefore, all the constructs demonstrate satisfactory levels of discriminant validity.

Table 4: HTMT - List

HTMT ratio	
SAC <-> SA	0.312
SG <-> SA	0.432
SG <-> SAC	0.512
SM <-> SA	0.365
SM <-> SAC	0.920
SM <-> SG	0.590
SP <-> SA	0.313
SP <-> SAC	0.478
SP <-> SG	0.780
SP <-> SM	0.567
SS <-> SA	0.960
SS <-> SAC	0.327
SS <-> SG	0.411
SS <-> SM	0.342
SS <-> SP	0.317
TDL <-> SA	0.382
TDL <-> SAC	0.599
TDL <-> SG	0.767
TDL <-> SM	0.634
TDL <-> SP	0.845
TDL <-> SS	0.326

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Table 5: Fornell-Larcker criterion

Variables	SA	SAC	SG	SM	SP	SS	TDL
SA	0.827						
SAC	0.272	0.884					
SG	0.374	0.435	0.827				
SM	0.333	0.824	0.526	0.914			
SP	0.276	0.419	0.679	0.519	0.844		
SS	0.789	0.266	0.332	0.290	0.259	0.901	
TDL	0.316	0.485	0.621	0.538	0.708	0.253	0.901

4.3 Structural Model

Analyses of structural models depend on the VIF, R^2, path coefficient values, and Q-square, which are obtained from PLS and depicted in Tables 6, 7, and 8. The initial phase of evaluating the structural model involves assessing multicollinearity using the VIF. The VIF values were less than the suggested cutoff of 5, indicating that multicollinearity was not an issue. Furthermore, most results were below 3 (Hair et al., 2013).

Table 6: VIF Values

	VIF
SA -> TDL	2.799< 5.000
SAC -> TDL	3.145< 5.000
SG -> TDL	2.109< 5.000
SM -> TDL	3.680< 5.000
SP -> TDL	1.996< 5.000
SS -> TDL	2.688< 5.000

Subsequently, the explanatory capacity of the model is assessed. The analysis yielded an R-square value of 0.573 for the endogenous variable. The R square values can be characterized as ranging from moderate to enormous (Hair et al., 2013). The assessment of predictive relevance was conducted using the Q square value. The Q square values of the endogenous constructs are 0.551. The Q square values in the study can be characterized as ranging from moderate to large (Hair et al., 2013).

Table 7: R-square & Q-square Value

	R-square	Q^2predict
Tourists' Destination Loyalty (TDL)	0.573	0.551

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The path coefficient value is used to test the relationship between the variables being studied, as shown in Table 8. The objective of H_1 is to measure the correlation between the utilization of smart tourism applications and tourists' loyalty towards their chosen destinations. The findings indicate that smart tourism applications substantially affect travelers' loyalty to a particular place (β= 0.125, t = 2.138, p = 0.033). Therefore, H_1 was accepted. Next, the H_2 hypothesis examines the substantial influence of smart accommodations in a tourist city on travelers' devotion to that destination. The statistical analysis reveals a positive correlation (β= 0.152, t = 2.144, p = 0.032). Thus, H_2 is also compatible. Furthermore, H_3 demonstrates that a smart tourism city's smart governance substantially influences tourists' loyalty to their chosen destination (β= 0.183, t = 2.770, p = 0.006). Thus, the proof of H_3 is also established. Subsequently, H_4 determines that smart mobility has a negligible effect on tourists' devotion to a certain destination (β= 0.049, t = 0.617, p = 0.537). Therefore, H_4 is not supported. Subsequently, H_5 examines the substantial influence of smart individuals (service providers) in smart tourism cities on tourists' loyalty to their chosen destinations (β= 0.482, t = 6.910, p = 0.000). Thus, the H_5 is also supported. Based on the assessment conducted in H_6, it is determined that smart safety has an insignificant effect on tourists' loyalty to a destination (β= -0.086, t = 1.440, p = 0.150). Therefore, H_6 is rejected. Moreover, Figure 2 displays the study framework, which includes the path coefficients.

Table 8: Path coefficient statistics

Hypotheses	β	SD	t values	p values	Result
H_1: Smart Applications -> TDL	0.125	0.059	2.138	0.033	Supported*
H_2: Smart Accommodation -> TDL	0.152	0.071	2.144	0.032	Supported*
H_3: Smart Governance -> TDL	0.183	0.066	2.770	0.006	Supported*
H_4: Smart Mobility -> TDL	0.049	0.080	0.617	0.537	Not supported
H_5: Smart People -> TDL	0.482	0.070	6.910	0.000	Supported*
H_6: Smart Safety -> TDL	-0.08	0.060	1.440	0.150	Not supported

Note: TDL = Tourists' Destination Loyalty

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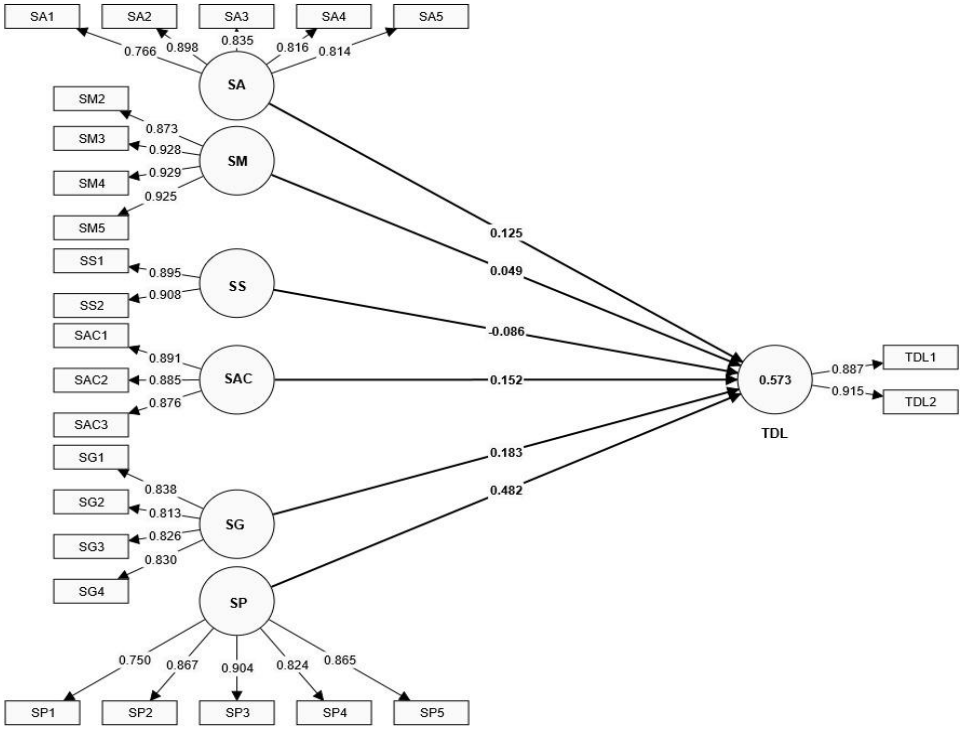

Figure 2: Research Model

Table 8 represents the result of the hypotheses. H_1 (Smart apps), H_2 (Smart Accommodation), H_3 (Smart Governance), and H_5 (Smart People) have been accepted based on the t-values and p-values. According to the statistical analysis results (H1: t =2.138, p =0.033), the use of smart tourism apps substantially impacts destination loyalty. Prior studies have also discovered that smart tourism applications substantially impact travellers' favorable experiences. Intelligent accommodations also substantially impact travellers' devotion to a particular destination (t =2.144, p =0.032). Tourists heavily rely on advanced accommodation features such as e-reservation and VR technology, which significantly impact their level of happiness. Subsequently, the effective management of a tourist city substantially impacts tourists' decision-making and loyalty to the location (t =2.770, p =0.006). Prior research has also demonstrated that effective governance significantly influences tourists' experiences and levels of satisfaction. Ultimately, individuals with high intelligence, particularly those who provide services, significantly impact the level of loyalty towards a specific location (t =6.910, p =0.000). Given that tourists rely heavily on service providers for an enjoyable experience, intelligent individuals are crucial in establishing destination loyalty in an STC. Furthermore, the findings indicate that smart mobility and smart safety are not considered factors contributing to tourists' loyalty to a place, since travellers expect minimal security and safety in any destination they visit.

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5. Discussion On Findings

This study investigates the implications of numerous STC characteristics on TDL. A study was conducted to determine the outcome by examining several categories of tourists in Cox's Bazar, Bangladesh. From the standpoint of tourists, four components, namely smart tourism applications (apps), smart accommodations, smart governance, and smart people (service providers), benefit the TDL (Azis et al., 2020; Buhalis et al., 2023; Ivars-Baidal et al., 2024). Government and business groups develop tourist applications to help tourists access various tourist locations and related services. Both private and public entities have developed various tourist applications, such as Bangladesh Tourist Spot, Vromon Guide, Bangladesh Travel, Hello Tourist, and GoZayaan. Given the availability of tourist applications on platforms like Google Play and other app stores, tourists can conveniently utilise these apps to discover ideal tourist sites. This, in turn, fosters loyalty towards those destinations.

Innovative housing is an essential aspect of STCs that fosters visitor loyalty (Azis et al., 2020). This is because travellers may now preview the amenities of accommodation facilities in a specific location using virtual reality (VR) technology before visiting. Furthermore, Cox's Bazar boasts numerous luxury hotels with a five-star rating, which serve as a prominent symbol of the city's tourism industry. Due to the excellent amenities provided, a specific segment of customers frequently return to the destination of Cox's Bazar.

Furthermore, effective governance serves as the primary foundation of STCs by guaranteeing favourable norms and regulations that promote the involvement of tourists and the local population. Ivars-Baidal et al., (2024) mentioned that good governance works as the primary pillar for developing STC. As tourism is an intangible concept, travellers heavily rely on knowledgeable individuals, particularly service providers. This hypothesis is supported by Buhalis et al. (2023). Tourists' final happiness and loyalty depend on the service quality provided by intelligent individuals. However, two factors smart safety and smart mobility have been rejected due to low factor scoring. One reason is that the survey participants may not have recognised substantial enhancements in transport systems, such as public transit accessibility, diminished commute duration, or the provision of real-time transport information. Next, tourists may not have observed the apparent safety enhancements (e.g., security cameras, and emergency response systems) linked to smart technology. In a nutshell, STC encompasses various facets, including intelligent applications, advanced lodging options, knowledgeable individuals, and efficient administration, all of which contribute to fostering tourist loyalty towards STC.

6. Conclusion

The notions of a smart tourist city and destination signify a fundamental change in how the tourism and hospitality sector is expanded and operated. The tourism industry may generate sustainable social and economic benefits by leveraging cutting-edge travel technologies, such as smart tourist applications, advanced

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accommodation options, data-driven insights, knowledgeable personnel, and digital governance. The sharing economy and advancements in information technology have made it more convenient for customers to obtain data on vacation spots. Therefore, to entice intelligent tourists to destinations such as Cox's Bazar, Bangladesh, and other emerging countries must make significant investments in improving their IT infrastructure. Most respondents agreed that Cox's Bazar offers advanced accommodation and travel alternatives, including smart apps, knowledgeable individuals, and efficient governance. To transform Cox's Bazar into an intelligent tourism destination, the Bangladeshi Government should proactively lead efforts in implementing smart security measures, enhancing smart mobility options, implementing digital governance practices, and developing smart applications. The importance of loyalty programs for tourists visiting smart tourism destinations is projected to increase as the world continues to adopt digital transformation and sustainable practices. By implementing these measures, we can ensure that tourism remains sustainable and fulfilling for future generations by fundamentally transforming how it is both encountered and overseen.

7. Implications of the Research

Theoretical implication: According to the author's knowledge, there is no research on the implications of STCs in developing countries. Consequently, the findings of this study will aid in the development of STC models for emerging nations. Furthermore, the conceptual model employed in the study will incorporate novel features of Smart City Technologies, including smart governance and smart citizens.

Managerial implications: Hence, the findings of this study will assist policymakers, particularly city councillors and government officials, in devising efficient strategies for creating smart tourism cities that can attract more tourists. Furthermore, this study may encourage stakeholders in the tourism sector, especially hotel proprietors, travel operators, government officials, and other pertinent entities, to create a smart and sustainable tourist city.

7.1. Limitations and Future Direction of the Research

Cox's Bazar has yet to be developed by contemporary principles of a smart tourism city. Despite possessing intelligent accommodations and additional amenities, these are inadequate to designate Cox’s Bazar as an STC. Consequently, it is challenging for visitors to ascertain which aspects of STC are present in Cox's Bazar. Consequently, two significant features, namely smart mobility and smart security inside the STC framework, were dismissed. Future research may be undertaken regarding these two aspects of STC and their effects on visitor loyalty.

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What Makes Someone Want to Buy Something Online? A PLS-SEM Approach: Evidence from Bangladesh

JUJBR

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***Abstract*:** This study investigates the determinants of consumers' online purchase intention, utilizing elements from the Unified Theory of Acceptance and Use of Technology (UTAUT) model, with income as a moderator. Data was acquired by handing out questionnaires to 522 Bangladeshi internet users and analyzed using SmartPLS (Partial Least Square) 3.0 *software with structural equation modeling (SEM)*. The findings show that behavioral intention is significantly predicted by performance expectancy, effort expectancy, social influence, and facilitating conditions with *income significantly moderating these relationships*. The findings have practical relevance for online retailers to *enhance strategies based on these findings*. This study contributes to the body of existing research in the literature by analyzing particular components of the UTAUT framework in relation to online purchase intention in Bangladesh. It also tackles the dearth of studies on the moderating influence of income in the UTAUT model, providing insightful information for governments and online merchants alike regarding the behavior of consumers.

Keywords: *Online purchase, UTAUT, SmartPLS, Behavioral intention, Performance expectancy,* Effort expectancy, ocial influence, Facilitating conditions.

Paper Type: *Research Paper*

1. Introduction

In the era of globalization, the continuous growth of the e-commerce sector has captured the interest of scholars and practitioners around the world who want to learn more about its applications in terms of shopping online by area (Otarinia, 2024; Akgül et. al., 2019). Customers might take advantage of information technology to facilitate purchasing activities, assessing factors like ease of use and reading feedback from other users to make informed choices about products and services (Swift, 2001). The online platform offers consumers a wide range of facilities, including time efficiency, amazing deals, a large product choice, and lower, competitive prices, all of which encourage people to the online shopping activities (Dharmawirya and Smith, 2012). Based on information collected by eMarketer (2021), the retail e-commerce sales reached $19.821 trillion in 2023 in

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US, a 12 percent rise over the previous year. In Bangladesh, this sector has also seen substantial growth, driven by the increasing adoption of online shopping among its consumers. The Bangladesh Ecommerce Market Opportunities Report (2023) states that the country's e-commerce market reached US$6.9 billion in 2022 and grew by 9.33% annually. The e-commerce sector in Bangladesh has a promising medium- to long-term growth story. E-commerce is anticipated to expand at a compound annual growth rate (CAGR) of 7.37% from 2023 to 2027.

Due to the technological advancements, online platforms have become more ingrained in people's daily lives, blurring the distinction between online and offline activities and erasing the constraints of time and location (Abeele et al., 2018). Through active internet use, customers may follow a product's lifecycle from production to sale at retail, improving their capacity to make well-informed choices. Furthermore, customer reviews and comments on these sites influence other people's purchasing decisions, creating a more engaging shopping environment (Akgül et al., 2019).

The rapid evolution of then technology in Bangladesh has significantly influenced consumer behavior, encouraging the adoption of new, innovative payment methods that are gradually replacing traditional systems (Flavian et al., 2020). However, a segment of Bangladeshi consumers remains hesitant about online transactions, due to limited technological familiarity, which has slowed e-commerce growth. Recognizing this challenge, the government has prioritized the expansion of e-commerce to foster broader adoption of digital platforms.

However, there is a scarcity of research that explores the important factors that influence online purchasing intentions and characteristics of customers. As well as, few studies have seen the constructs of Unified Theory of Acceptance and Use of Technology Model (UTAUT) in online purchase intentions (Oktaviani et al., 2024; Winarno, & Roostika, 2024). In Bangladesh, there is no attempt to find out what factors stimulate the behavioral intentions of Bangladeshi e-shoppers'. And, no study has seen the effect of income as moderator in the UTAUT model to the behavioral intentions of online customers. To take advantage of this fantastic potential, this study aims to investigate these critical aspects and capitalize on the potential of the e-commerce market in Bangladesh.

It's crucial to comprehend the elements that affect customers' decisions to make purchases online given the rising popularity of e-commerce. Understanding these elements is essential because they can help businesses tailoring their strategies to better meet consumer needs and enhance user experience. Recent conceptual and empirical studies have conducted in-depth analyses of online purchasing behavior, focusing on various aspects such as online shopping behavior, the intention to use internet marketing, motivations for performing online purchases, and the adoption of mobile shopping and so on. For instance, studies by Venkatesh et al. (2003); Oktaviani et al., (2024); Winarno, & Roostika, (2024); Zia et al., (2022) have explored the UTAUT model and its' constructs in different contexts. Despite several studies on online retail purchasing and the Unified Theory of Acceptance and Use of Technology (UTAUT), there is a scarcity of

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research on how UTAUT contents and other variables influence customers' purchase intentions in Bangladesh.

The UTAUT model, which focuses on individual and organizational variables for online purchasing intentions, can be used as a possible lens to investigate the essential elements affecting consumers' intention to purchase online. Performance expectancy and effort expectancy have been found as significant drivers of behavioral intention to utilize a technology that are linked to individual attitudes and encourage consumers to buy something online (Utomo et al., 2021; Ryu & Fortenberry, 2021). Social influence, among other things, should be considered in order to extend the continuance intention to utilize internet technologies (Tam et al., 2020). However, only a few research have looked into these factors of behavior in the context of online purchasing intention. Moreover, according to previous researchers, facilitating condition appears to be a major element influencing consumers' attitudes and acceptance of online purchasing (Choi, & Park, 2020).

Other essential elements must also be researched in order to acquire a better understanding of customers' intentions to buy online. The goal of this study is to see how personal factor (such as income) influenced customers' online purchase intention. Online buying studies have become more well-known over the last decade for examining various demographic aspects of clients that impact their impulse buying behavior. Few studies have looked at gender variations in drivers of online buying intention in the UTAUT model and they have found significant positive impact of gender in the relationships of the other constructs and customers online buying behavior (Dewi, et al, 2020; Saleem, et al., 2022). Moreover, this study aims to detect the effect of income as moderator in the UTAUT model to evaluate the behavioral intention to buy something online.

2. Literature Review

Framework for a Unified Theory of Acceptance and Use of Technology

The Unified Theory of Acceptance and Use of Technology (UTAUT) is one of the most comprehensive theories for predicting and forecasting whether new technology will be accepted or rejected (Sikdar et al., 2019; Rydz et al., 2021). The performance expectancy, effort expectancy, social influence, and facilitating condition are the four core integrated variables that make up the UTAUT model (Sikdar et al., 2019; Acharya & Ganesan, 2019). These variables have a great consequence on how we avail new technology and intention to use it, with gender, age, experience, and our volition acting as moderators. UTAUT has been used in a variety of studies to better predict the elements that has impact on customers' online shopping intention (Van et al, 2020; Acharya & Ganesan, 2019). However, if it is to be used in the context of consumers, additional effective elements from the consumer side must be included to boost the UTAUT's relevance in the perspective of the consumer (Gefen et al., 2003; Pavlou, 2003). Because incorporating these additional elements can provide a deeper understanding of the factors influencing online shopping intention,

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especially in unique cultural contexts like Bangladesh, where technological adoption is growing rapidly but may still encounter specific consumer concerns.

UTAUT is used by Venkatesh et al (2003) in an attempt to measure an individual's behavioral intention to adjust to a new technological environment. The research concluded that 70% of behavioral intentions may be explained by UTAUT. High levels of performance expectancy, effort expectancy, trust, and self-efficacy were found to have a substantial influence on the customer's buy intentions by Pappas et al. (2011). Dharmawirya and Smith (2012) conducted a study to find out what makes customers more likely to buy online. They found that performance expectations and conditions that make it easy to buy online are the most crucial factors that affect consumers' plans to buy again. They also came to the conclusion that performance expectations, effort expectations, and habits affect behavioral intentions to use mobile apps, but price doesn't have much of an effect on mobile activity or behavioral intentions.

Juaneda-Ayensa et al. (2016) used the UTAUT 2 model in their investigations with the goal of identifying the variables that influence the behavior of multi-channel consumers with the desire to embrace and avail new technologies in the buying process. According to the study's findings, personal innovation, effort expectations, and performance expectations were the key predictors of purchasing intentions. Miladiovic (2016) used the UTAUT 2 model to examine the acceptance of fashion-based buying practices and came to the conclusion that users' behavioral intentions when using mobile fashion shopping applications are influenced by performance expectations, habits, enabling circumstances, and recreational motivation.

Performance expectancy, hedonic motivation, and facilitating factors were found to have a positive effect on the intention to buy for fresh agricultural items online using the UTAUT 2 model, which was developed by An et al. (2016). In their study, Singh et al. (2017) used the UTAUT 2 model to analyze the intention to buy things online. They have come to the conclusion that the variables included in this model have a favorable impact on consumer intentions to buy something online. Social influence and trust are the primary drivers of consumer desire to purchase in e-commerce, according to an analysis of these factors conducted by Mariani and Lamarauna (2017) using the UTAUT model. The differences in consumers' readiness to make electronic purchases were studied by Sanchez Torres et al. (2017) in Columbia. Their research, which used the UTAUT model, found that performance expectations and social pressure are influential in online shopping.

The UTAUT model is used in this study, however it is expanded by including income as a moderating variable to provide a better understanding of online purchase intention. As a result, the range of cellular model includes four variables as independent factors influencing consumer’s behavioral intention toward online purchase: performance expectancy, effort expectancy, social influence, facilitating condition and one moderating variable income (Figure-1). Furthermore, prior UTAUT researchers had constraints due to the limiting

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evaluation of the product and online shop, which was tied to only there is one product and one online shop category. As a result, this proposed research fills in the gaps by looking at e-commerce in Bangladesh, which encompasses both product/service elements and online merchants.

3. Conceptual Model and Hypotheses Development

Recent studies have demonstrated that the UTAUT paradigm is useful for comprehending how different technologies are adopted. For instance, it was utilized in various studies (Zia et al., 2022; Winarno, & Roostika, 2024; Oktaviani et al., 2024) to pinpoint the key elements that motivate people to make online purchases. All of the original UTAUT variables were retained in further studies of emerging technologies using the UTAUT2 model. The UTAUT2 model, introduced by Venkatesh et al. (2012), builds on this foundation to address consumer technology acceptance more directly by adding hedonic motivation (enjoyment or pleasure in using the technology), price value (cost considerations), and habit (tendency to use technology routinely). While UTAUT2 provides a comprehensive framework for understanding consumer-focused contexts, this study retains the original UTAUT constructs to streamline the analysis and focus on the core factors influencing e-commerce adoption in Bangladesh. Given the study's objective, we chose not to incorporate UTAUT2's additional constructs, as the UTAUT framework's primary variables sufficiently address the factors impacting online purchase intentions within the local context. One dependent construct (Behavioral Intention) and four independent constructs (Performance expectancy, Effort expectancy, Social influence and Facilitating condition) from UTAUT's five primary constructs were retained for this investigation. Figure 1 depicts the conceptual framework of this study.

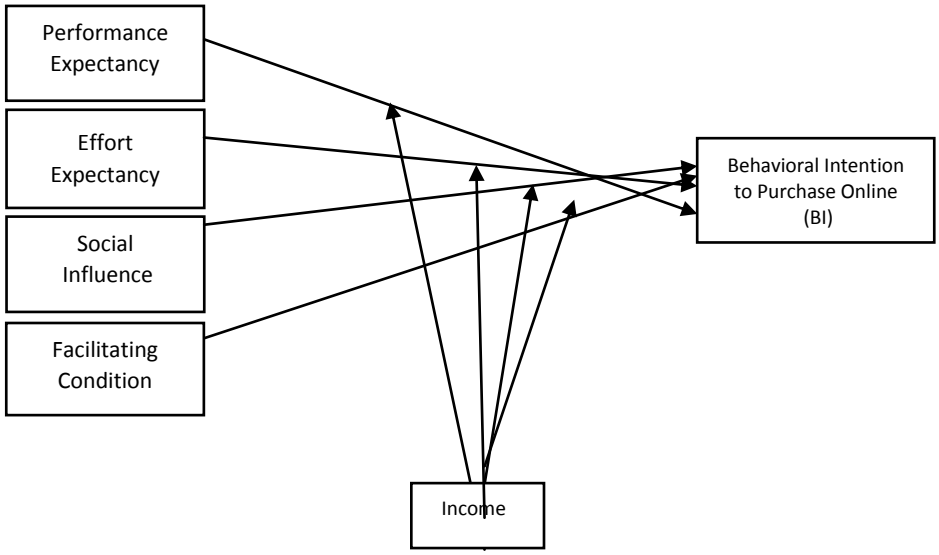

Figure: 1 Conceptual Framework

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3.1 Performance Expectancy

Performance Expectancy is an extrinsic motivator. It shows how users anticipate to perform after using a technology or system as opposed to the previous ones (Silic & Back, 2017). Several studies have examined the link between perceived performance and behavioral intention, with the conclusion that performance expectations positively affect the continuance intentions and is demonstrated to be a primary predictor of the intention (Nurdin et. al., 2023).

Expectations for online shopping include time savings, appealing discounts, a wide selection of products, and lower costs, all of which significantly increase consumers' buying intention. (Zahari et al., 2023; El Moussaoui et. al., 2023). Several prior studies have shown that consumer expectation of performance has a major beneficial influence on their desire to purchase online. As a result, the given hypothesis is proposed:

H1. Performance Expectancy impacts the behavioral intentions in a positive way.

3.2 Effort Expectancy

Effort expectancy means the way of allowing the desired consequences of employing new technology as an internal incentive (Baltruschat et. al., 2023). The amount of effort consumers must put while searching for information and making purchases on a website will influence their decision to use the online shopping technique (Sudirjo et. al., 2023). It has been revealed that the behavioral intention is affected by effort expectation. Furthermore, according to many studies (Iranmanesh et. al., 2022; Acharya & Ganesan, 2019), the effort expectancy has a positive relationship with the willingness to buy something online. Therefore, the hypothesis is advanced:

H2. Effort expectancy also impacts on the likelihood of making an online purchase in a positive way.

3.3 Social Influence

The term "social influence" means how other people's ideas impact a focus individual's perceptions, and it may be thought of as an external incentive stimulant (Wang et. al., 2016). Various researchers have addressed and identified social impact as a crucial motive in prior novel technology research, the behavioral goal of technological acceptance. Consumers who have the ability, other customers who exchange product-related information are more likely to be influenced by other consumers who communicate with one another or with their e-retailer (Bramall et. al., 2005). This is why social influence is a good way to look at customer intentions and actions when it comes to online purchasing. As a result, the hypothesis is formulated:

H3. Social influences affect online purchasing intention in a positive way.

3.4 Facilitating Condition

The technological infrastructure and organization that assist in the creation of a new system are examples of facilitating conditions that can be viewed as either aids or hindrances in the environment (Venkatesh et al., 2003). However, studies

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conducted in developing countries show that FC promotes the use of financial technology. FC has contributed to the expansion of mobile banking in both Bangladesh (Hussain et al., 2019) and Pakistan (Hussain et al., 2019). In Bangladesh's online shopping context, similar facilitating conditions are at play; the increasing availability of internet access, government initiatives supporting digital commerce, and rising public familiarity with online payment methods have all encouraged e-commerce adoption. In light of this, this study proposes this hypothesis:

H4. Facilitating condition positively impacts customers' behavioral intents to purchase online in Bangladesh.

3.5 Description of Moderator – Income

Income is a significant moderator in online purchase intentions. It affects the relationship between a customer's attitude towards online purchasing and their actual behavior of buying goods or services online (Rehman et. al., 2019). The affordability of products or services that a person can buy online is directly influenced by their income (Sudirjo et al., 2023). Consumers with higher income levels may have more purchasing power, which increases their likelihood of making expensive online purchases (Lubis, A. N. 2018).

Additionally, income can also impact the perceived risk associated with online shopping. Due to their capacity to bear financial losses, people with higher income levels may view online shopping as being fewer risks (Cho & Lee, 2006). Conversely, people with lower income levels may view internet buying as riskier since they may have less financial security to rely on in the event that something goes wrong (Cho & Lee, 2006).

Therefore, marketers should consider income levels when targeting their audience and designing their online shopping platforms. In line with this, the hypotheses that link moderating effects of income are surmised below:

H5. Income moderates the relationship between PE and customers' BI to make online purchase intentions.

H6. Income moderates the relationship between EE and customers' BI to make a web purchase.

H7. Income moderates the relationship between SI and customers' BI to make online shopping.

H8. Income moderates the relationship between FC and customers' BI to make online buying.

4. Research Methodology

4.1 Context

The study aims to examine and predict the relationship between individual and organizational factors by applying the Unified Theory of Acceptance and Use of Technology (UTAUT) model in a real-world context. Next, this study made a

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questionnaire to get enough information to test and validate the final framework for online purchase intention in Bangladesh and to test the hypotheses that had been made set up based on the discussions about the review of the literature.

Internet users in Dhaka, Bangladesh, who are at least 18 years old, are the focus of this study. Dhaka was selected for this analysis since it is home to the majority of Bangladesh's internet users. There are two administrative city corporations in Dhaka—the DSCC and the DNCC—that may be good representations of the whole country's population.

4.2 Data collection and Sample

Bangladeshi consumers who use the internet on a regular basis are given a survey form with a cover letter explaining the overall purpose of the study with detailed instruction. The respondents were selected on a simple random sampling basis. Five Hundred and Twenty-Two (522) participants filled up the questionnaires handed out. The Outcome showed that most respondents were male (55.6%), single (74.7%), aged below 20 years old (33.2%), and earned a monthly income less than 20,000 Tk (36.8%). Moreover, most respondents were students with an education level of Master's degree (50.8%).

Table 1: Demographic characteristics of the Sample (n=522)

Demographics		Frequency	Percentage (%)
Gender	Male	290	55.6
	Female	232	44.4
Education	PHD	12	2.3
	Masters	265	50.8
	Bachelor	143	27.4
	Diploma	17	3.3
	HSC	49	9.4
	SSC	36	6.9
Marital Status	Single	390	74.7
	Married	130	24.9
	Divorced	2	0.4
Age	Below 20 years	173	33.2
	20-25 years	129	24.8
	26-30 years	141	27.1
	31-35 years	42	8.1
	36-40 years	21	4.0
	41-50 years	9	1.70
	Over 50 years	6	1.10

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Demographics		Frequency	Percentage (%)
Job Experience	Less than 1 year	231	44.3
	1-3 years	193	37.0
	Over 3 years	98	18.8
Monthly Income	Less than 20000	192	36.8
	20001-50000	181	34.7
	50001-100000	117	22.4
	100001-200000	5	1.0
	Over 200000	27	5.1

4.3 Instrument Development

This study's questionnaire is divided into seven sections (General information, Performance expectancy, Effort Expectancy, social influence, facilitating condition, Income level and online behavioral intention) and uses structured questions. The degree to which respondents agreed or disagreed with each statement of all constructs was measured using a 7-point Likert scale (1= strongly disagree, 2=quite disagree, 3=slightly disagree, 4= neither disagree nor agree, 5 = slightly agree, 6= quite agree, 7= strongly agree). To ensure the validity of the questionnaire, two experts in e-commerce and online purchasing—selected based on their extensive experience and academic backgrounds in digital consumer behavior—were personally consulted. Their feedback helped refine the questionnaire for consistency, relevance, and comprehensiveness, contributing to its face and content validity. The questionnaire was set in English at first. However, because all of the responders were native Bengali speakers, the questionnaire was translated into Bengali.

SPSS Version 25 and the Partial Least Squares Structural Equation Model (PLS-SEM) have been used to evaluate the data collected. Descriptive statistics (frequency and percentage) have been utilized to analyze the respondents' demographics. Each variable's data and questionnaire items have been examined using the mean and the standard deviation. The consistency and reliability of the data have been assessed with Cronbach's Alpha. The instrument's validity and reliability have been assessed by computing factor loadings.

5. Results

5.1 Data Analysis

The study used PLS-SEM methodology to analyze the data. The measuring model is evaluated in the first step, which looks at the reliability and validity of the constructs. In the second step, the structural model is evaluated, which looks at the direct relationship between external and endogenous components. In all postulated links, the constructs' reliability and validity are investigated. The structural model is then tested with 5000 bootstrap re-sampling as the second phase of the bootstrapping procedure.

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5.2 Measurement Model Assessment

The measurement model has been examined in two ways: first, its construct, convergent, and discriminant validity have been examined. The assessment followed the guidelines laid out by Hair et al. (2016), which involved looking at loadings, average variance extracted (AVE), and composite reliability (CR) (Yeap et al. 2016).

The term "construct validity" refers to how closely the test's findings correspond to the hypotheses that informed their development (Sekaran and Bougie, 2010). Internal consistency and the reliability greater than the cutoff value of 0.708 is typical of adequate measurement models (Hair et al. 2014). However, Hair et al. (2016) stated that researchers ought to carefully assess the impacts of item removal on the composite reliability (CR) as well as the validity of the constructs, and only should consider for removal from the scale those that when eliminating the indicator leads to an increase in CR. Almost all of the item loadings were more than 0.70, which means they pass the fit test.

Additionally, if the AVE is 0.5 or greater, it means the concept has appropriate convergent validity (Bagozzi and Yi 1988; Fornell and Larcker 1981) and may account for more than half of the variation in its indicators. All item loadings were over 0.5, and composite reliabilities were all in excess of 0.7. (Hair et al. 2010). The AVE for this investigation ranged from 0.764 to 0.834, which indicates that the indicators caught a significant portion of the variation when compared to the measurement error. The findings are summarized in Table 2, which demonstrates that all five components can be measured with high reliability and validity. In other words, the study's indicators meet the validity and reliability criteria established by SEM-PLS.

Table 2: PLS-SEM Assessment Results of Reflective Measurement Models

Construct	Indicator	Mean	SD	Loading	Average Variance Extracted (AVE)	Composite Reliability (CR)	Cronbach's Alpha
BI	BI1	6.318	1.073	0.930	0.834	0.938	0.901
	BI2	6.323	1.092	0.907			
	BI3	6.333	0.965	0.904			
PE	PE1	6.289	1.001	0.878	0.764	0.907	0.845
	PE2	6.264	1.054	0.846			
	PE3	6.316	1.018	0.898			
EE	EE1	6.293	1.043	0.854	0.775	0.912	0.855
	EE2	6.356	0.926	0.878			
	EE3	6.316	1.035	0.909			

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Construct	Indicator	Mean	SD	Loading	Average Variance Extracted (AVE)	Composite Reliability (CR)	Cronbach's Alpha
SI	SI1	6.262	1.130	0.908	0.768	0.930	0.899
	SI2	6.201	1.194	0.910			
	SI3	6.216	1.130	0.842			
	SI4	6.277	1.109	0.844			
FC	FC1	6.255	1.086	0.902	0.795	0.921	0.871
	FC2	6.276	1.004	0.882			
	FC3	6.375	0.941	0.890			

The discriminant validity of the components was assessed using Fornell and Larcker's approach as well as the cross-loading values. For a model to be discriminant, the correlations between its individual components must be smaller than the square root of the average variance across items (AVE) for the respective component (Fornell and Larcker 1981). We observe that for all reflective constructs, the square roots of the AVE of the construct (represented diagonally and bold) are bigger than the correlation (stated off-diagonally) using the method described by Fornell and Larcker (Table 3).

Table 3: **Discriminant Validity of the Data Sets (Fornell and Larcker's Technique)**

	BI	PE	EE	SI	FC
BI	**0.913**				
PE	0.822	**0.874**			
EE	0.843	0.828	**0.880**		
SI	0.820	0.839	0.777	**0.877**	
FC	0.786	0.788	0.780	0.770	**0.892**

Further, the cross-loading values were evaluated, and it was found that all of the values are more than 0.707. All of these results point to the fact that each item is highly correlated with its own underlying construct. Each possible cross-loading value is listed in detail in Table 4. In sum, all indicators validate the concepts' discriminant validity. Constructs can be put forward to test the conceptual model because appropriate results have been discovered for construct reliability, convergent validity, and indicator reliability.

All items had a higher loading with their own underlying construct, as shown by the results, and the cross-loading values were also analyzed, with all values being more than 0.707. Table 4 displays all possible cross loading values.

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Table 4: **Discriminant Validity of the Data Sets (Cross-Loadings)**

	BI	PE	EE	SI	FC
BI1	**0.930**	0.738	0.797	0.736	0.713
BI2	**0.907**	0.746	0.733	0.772	0.722
BI3	**0.904**	0.767	0.780	0.741	0.718
PE1	0.684	**0.878**	0.712	0.700	0.652
PE2	0.736	**0.846**	0.679	0.757	0.687
PE3	0.731	**0.898**	0.779	0.739	0.724
EE1	0.733	0.739	**0.854**	0.708	0.722
EE2	0.747	0.712	**0.878**	0.672	0.644
EE3	0.746	0.735	**0.909**	0.673	0.695
SI1	0.775	0.729	0.701	**0.908**	0.688
SI2	0.789	0.763	0.722	**0.910**	0.706
SI3	0.655	0.727	0.683	**0.842**	0.680
SI4	0.640	0.726	0.612	**0.844**	0.624
FC1	0.746	0.716	0.729	0.737	**0.902**
FC2	0.690	0.716	0.689	0.686	**0.882**
FC3	0.660	0.674	0.665	0.630	**0.890**

In conclusion, the discriminant validity of all the constructs is met by the measurements. Construct reliability, convergent validity, and indicator reliability have all been evaluated and found to be adequate, thus the conceptual model may be put to the test.

5.3 Structural Model Assessment

The collinearity concerns, path co-efficient, coefficient of determination (R2), and effect size (f2) were assessed as part of Hair et al (2014)'s four-step methods for evaluating structural models. The substantial causal influence of lateral collinearity can skew results even if discriminant validity standards are fulfilled (Kock and Gary, 2012). The degree of collinearity between indicators is quantified by the variance inflation factor (VIF). The VIF values for each construct show that they are all below the threshold value of 5 (Hair et al., 2014), indicating that the structural model is free from collinearity problems. In order to examine the connections between the variables, the SmartPLS 3 program was utilized. The significance and t-statistics for every possible path were evaluated using software bootstrapping, with a total of 5000 replicates. Table 5 summarizes the results of the structural model analysis, which can also be depicted in the Figure 2, with the corresponding R2, f2, and t-values. According to the results of

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this analysis, there was a significant positive relationship between the behavioral intention and performance expectancy (β=0.160, p=0.005), effort expectancy (β=0.346, p=0.000), social influence (β =0.297, p=0.014), and facilitating condition (β = 0.145, p=0.044). Therefore, it demonstrates the correctness of all these assumptions. The model's robustness was demonstrated by an R2 greater than 0.35, as suggested by Cohen (1988).

Table 5: Analysis of the structural model

Hypothesis	Relationship	Stand. β-Value	Effect Size f^2	Std Error	t-Value	P-Value	R^2	Decision
H1	PE -> BI	0.160	0.024	0.074	2.814	0.005	0.800	Supported
H2	EE -> BI	0.346	0.125	0.082	5.060	0.000		Supported
H3	SI ->BI	0.297	0.104	0.086	2.452	0.014		Supported
H4	FC -> BI	0.145	0.031	0.087	2.019	0.044		Supported
H5	Income*PE-> BI	0.061	0.003	0.083	2.090	0.037		Supported
H6	Income*EE-> BI	0.079	0.010	0.061	2.676	0.007		Supported
H7	Income*SI-> BI	-0.053	0.002	0.087	1.966	0.049		Supported
H8	Income*FC-> BI	-0.075	0.006	0.088	2.062	0.039		Supported

Although the p-value is useful for assessing the statistical significance of each relationship between exogenous constructs and endogenous components, it does not provide information about the influence's extent, which is synonymous with the findings' practical importance. In this research, we used a rule of thumb proposed by Cohen (1988) to assess the extent of the effect. By this criterion, an effect size of 0.02, 0.15, or 0.35 indicated a moderate, medium, or substantial impact, respectively. Table 5 shows that the effect sizes of social influence, enabling circumstances, and both performance and effort expectations are moderate. Since the effect size varies with the complexity of the model, the research setting, and the specific field of study (Sullivan and Feinn, 2012), it is difficult to calculate an impact size using a rule of thumb (Hair et al., 2010).

The moderating effects of income shows that the relationships between performance expectancy and behavioral intention, effort expectancy and behavioral intention, social influence and behavioral intention, facilitating condition and behavioral intention are significantly influenced by income level of the Bangladeshi consumers.

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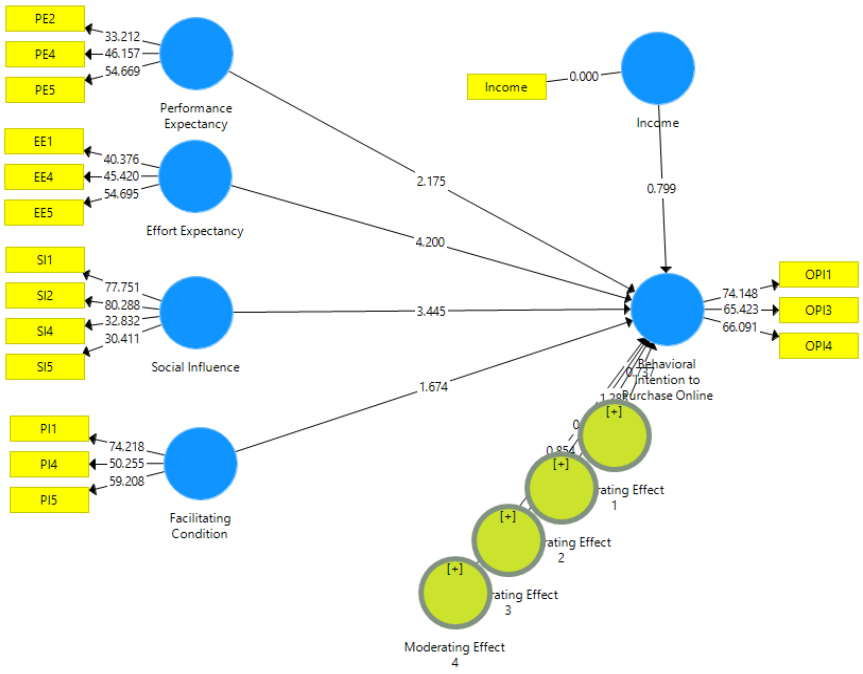

Figure 2: Structural Model with T-values.

6. Discussion

The study's PLS-SEM model satisfied the proposed conceptual framework. The findings show the relationship between performance expectancy and behavioral intention to buy something online was shown to be substantial for the data, which supports hypothesis H1.

Similarly, the relationship between effort expectancy and behavioral intention to make online purchase was shown to be substantial for the data, which supports hypothesis H2. Again, the data indicates that there are no substantial variations in the link between social influence and online purchase intention (H3). Furthermore, the data also suggest that there are no substantial variations in the link between facilitating condition and online purchase intention (H4).

This conclusion is consistent with data from which it is found that practicality issues are the most important motivator of an online purchase for the most of Bangladeshi customers. This demonstrates that if utilizing online purchasing channels is the easiest and quick, consumers will try to utilize them to make an online purchase. It's worth noting that Bangladeshi online merchants take consumer efforts into account by supporting and encouraging internet usage and enhancing internet connection speed for all times.

The study's findings also demonstrate a favorable and major relationship in social interaction, there is a behavioral goal for internet buying. It confirms the prior

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prediction that the strength of social media will increase customers' online buying intentions in the future. This means that digital merchants use design to emphasize the benefits of online purchase.

Consumers in Bangladesh may want to Gain comments, support, and recommendations from family members when making a purchase through internet shopping channels which might easily affect their capacity to buy online. As a result, it's logical to infer that one of the most significant considerations for Bangladeshi buyers while making online purchases is social effect. Surprisingly, the data also demonstrated that the facilitating condition had a positive influence on behavioral intention, which is consistent with previous findings. This shows that if online customers are more creative, their capacity to create unique choices will improve, increasing the chance of individuals buying online. One possible explanation is that, because of the extensive usage of the internet in Bangladesh and the rising number of resourceful clients, the majority of online buyers are very used to with how to set up an e-commerce site.

7. Conclusion, Design Implication, Limitations and Further Research

7.1 Theoretical Contribution

Although it is true that much research has been conducted on consumers' intentions to shop online, a little is known about the connections between the aspects of the UTAUT as a theoretical model (Almashhadani et. al., 2023). In addition, only a few studies have looked at the impact of income on internet buyers' purchase intentions (Srivastava et. al., 2023; Lu et. al., 2009; Mohammed & Alkubise, 2012). As a result, the study's first theoretical contribution is to look into the individual factors (performance expectancy, effort expectancy, social influence, and facilitating conditions) that influence applying the UTAUT theory to the online buying intention.

Also, no research has specifically examined the factors influencing behavioral intentions of Bangladeshi e-shoppers. Given Bangladesh's emerging e-commerce sector and limited experience with online shopping platforms, this study is unique in its focus on this context. Notably, no previous study has considered income as a moderating factor within the UTAUT model in predicting online purchase intentions in Bangladesh. This research aims to address this gap, thereby offering new insights into the factors influencing e-commerce adoption among Bangladeshi consumers.

7.2 Practical Contribution

The government of Bangladesh has set a goal for Bangladesh to become a middle-income society by the end of 2035, which is in line with the expansion of Bangladesh's digital sector, and it has a vision to make Bangladesh the leading telecom economy in Southeast Asia by the year 2030 (Chowdhury et. al., 2020; Teske et. al., 2019; Ferdaush, 2015). This vision is in accordance with the growth of Bangladesh's digital sector. Bangladesh's government is prioritizing e-commerce to enhance its digital economy (Chowdhury et al., 2020). To achieve

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the national goals, this is undertaken. In order to boost up the e-commerce, the Bangladeshi government has created a comprehensive online marketplace. In addition, little was known about Bangladeshi customers' online purchasing behavior before this study.

As a consequence, the outcome of this research will help the government by supplying reliable information about factors stimulating online purchase motive. This research presents a model that might help online retailers and the government obtain a better comprehension of the motives of online customers and the elements that influence them that influence their willingness to buy something online.

The findings suggest that by emphasizing performance expectancy, effort expectancy, and facilitating conditions, online businesses can increase customer satisfaction and profitability. Purchase intentions can be increased by streamlining the purchasing process and developing a user-friendly platform. Innovative consumers are more likely to shop online, and companies can take advantage of this by providing tactics that boost purchase intention and lessen customer anxiety. Social influence is also important because online feedback system can have a positive impact on purchasing decisions. Online merchants should reassure customers of safe transactions by sharing their security measures on social media and other platforms in order to build trust.

7.3 Limitations and Future Research

While the findings offer valuable insights into factors that encourage online purchasing intention, this study also has limitations that future research can address. First, this study concentrates on the moderating effect of income to the consumers' behavioral intentions neglecting other factors like as experience, trust, attitude and risk awareness that might account for the disparities in behavioral intention of Bangladeshi consumers. Second, the study's data originated from the respondents in Dhaka (DSCC & DNCC), hence it may not represent all Bangladeshi customers. However, more consumer analysis research in other cities may improve the study's generalizability. Third, with a higher proportion of male respondents, the results may be influenced by gender imbalance. Future research should explore economic and gender disparities in more depth. Being a cross-sectional research, the fourth limitation is that it cannot establish a direct link between variables across time. As individuals grow intellectually and experientially, their perspectives on many concepts may evolve. Consequently, a longitudinal technique might be used in future studies to get more accurate results from a targeted sample of participants.

Finally, this study relied on quantitative data collected through questionnaires, which may limit the depth of analysis as it explores the results of statistical testing only. Future research would benefit from utilizing a variety of approaches, such as qualitative or mixed methodologies to deepen conceptual understanding also. Lastly, mediating factors such as user experience or customer satisfaction may be incorporated into the model to assess the underlying mechanisms at play here.

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7.4 Conclusion

This study analyzes the relationship between prospective characteristics of buying behavior and customers' intentions to make purchases via online. The Constructs from UTAUT model served as the base for this study. The overall purpose of this study is to acquire a deeper comprehension of the phenomenon of behavioral intention to purchase online, specifically as it relates to the environment of Bangladesh.

According to the outcomes of the study, the performance expectancy, effort expectancy, social influence, and facilitating condition are the most powerful predictors of consumer online purchase intention, and that all of these factors are related to income level of the consumers.

Overall, Addressing the limitations identified in this study, the theoretical and practical contributions to the literature on online purchase intention can be significantly enhanced.

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