The Impact of Integrated Border Security System on Human Trafficking in Bangladesh: The Mediating Effect of the Use of Advanced Technology

S. M. Zobaer Alam[1]
Associate Professor, Department of Business Administration-General, Bangladesh
University of Professionals, Mirpur Cantonment, Dhaka-1216, Bangladesh

Abstract:- This paper explores the effect of integrated border security and advanced technology on human trafficking in Bangladesh, focusing on the mediating role of advanced technology. Human trafficking remains a critical issue in Bangladesh due to socio-economic challenges and the nature of bordering regions despite substantial technological and policy advancement. Through empirical analysis, this study reveals that advanced technology such as biometric identification, data analytics, and real-time data sharing significantly bolster the effectiveness of the Border Security System in identifying and preventing human trafficking issues. This paper highlights the significance of comprehensive policies, sufficient investment on specialised training, and community engagement in addressing human trafficking. The study offers valuable insights for policymakers and stakeholders, signifying the need for ongoing adaptation and collaboration to combat human trafficking effectively.

Keywords:- Integrated Border Security Systems (IBSS), Use of Advanced Technology (UAT), Human Trafficking (HT).

I. INTRODUCTION

The integration of advanced technology in the border security system has emerged as a prime strategy in fighting against human trafficking, a pervasive issue in Bangladesh. Human trafficking in Bangladesh is a critical concern that requires comprehensive analysis and robust intervention (Husain, 2024). The government's effort to enhance the Border Security three integrator system has shown significant promise in addressing this critical issue, but all the challenges remain (USAID, 2023). Bangladesh is a densely populated developing Nation in South Asia and encompasses an area of 14860 square kilometres (Quader, 2020). The country shares an extensive land border with India and Myanmar. The total length of Bangladesh's land border is 4413 km, with the Bangladesh-India border alone stretching about 4142 km (Dinesh Mahur, 2014). Conversely, the Myanmar border constitutes 4.14% of Bangladesh's total land boundary, accounting for 271 km. In spite of various interactions with these neighbouring countries, border issues have recently taken precedence. The border region is characterised by a diversified natural landscape and very topographical features that result in porous boundaries. This Porous border leads to a large number of issues, among which human trafficking is the most eminent (Hossain & Islam, 2020). Human trafficking in Bangladesh has been intensified by different elements such as property and lack of education, especially in border communities. All these factors contribute to the persisting human trafficking cases in the Bangladesh-India-Myanmar bordering regime, leaving the residents of these areas vulnerable to being victims of trafficking (Das & Lin, 2023). The introduction of advanced technology in the border security system has the potential to mitigate these challenges by developing the detection and prevention of trafficking activities (Álvarez, 2022). The application of technology such as biometric identification, data analytics, data sharing, and DNA forensic technology has been instrumental in strengthening Border Security measures (Department of State, 2023; Shekhar & Vincent, 2022). A thorough examination of the current literature suggests that although the incorporation of technology into border security in Bangladesh is advantageous, it also increases the susceptibility of the general people to fall prey to technology-evolved traffickers (Islam, 2019). Essential as they are anti-trafficking measures have occasionally resulted in unintended consequences encroaching on the Human rights of those ensnared by the security mechanism (Corinna-Tri, 2021). The role of International and Domestic responses cannot be understated, as integrated Border Security initiatives have been supported by international collaboration and domestic policies focusing on increasing Regional Cooperation (Islam, 2019). Advanced technology, such as biometrics surveillance systems and Data Analytics, has improved the capacity of border security agencies to take the initiative to identify and prevent trafficking (Antonopoulos et al., 2020). Moreover, this technology facilitated real-time data sharing and improved the coordination between different law enforcement agencies (Corinna-Tri, 2021). However, implementation of technology requires substantial investment and progressive advancement to coke with evolving trafficking methods (USAID, 2023). The thematic analysis of cross-border security challenges in Bangladesh suggests that technology plays a mediating role in the effectiveness of the Border Security System in combating human trafficking (Husain, 2024). It enhances the significance of this system by offering accurate and real-time information, enabling law enforcement agencies to undertake proactive measures against trafficking (Hubanova et al., 2021). Despite the advancement in technology and policy, there is still a

substantial gap in the research and implementation of these measures, as there is a need for more empirical studies to consider the direct impact of the integrated border security system and advanced technology on human trafficking. The necessity of the adoption of advanced technology in border security systems is indisputable. It offers substantial potential to improve the efficacy of the Border Security System by developing detention and prevention capacities. However, there is a paucity of research papers that explore the mediating role of advanced technology in enhancing the efficiency of integrated Border Security Systems in lessening trafficking operations. This paper, therefore, proceeds to undertake a comprehensive analysis to realise the extent up to which an integrated border security system and advanced technology can play a vital role in reducing human trafficking in Bangladesh. This paper also aims to discover the mediating role of advanced technology in enhancing the stance of an integrated border security system in combating human trafficking.

II. LITERATURE REVIEW AND DEVELOPMENT OF CONSTRUCTS

A. Integrated Border Security Systems

According to Wagh et al. (2023), a border security system is a comprehensive framework designed to monitor and safeguard a nation's border, incorporating a wide range of technology to protect and policies against terrorism, trafficking, illegal immigration, and other threats. The authors also highlighted the key components of this system, including physical barriers such as fences and vehicle barricades, the incorporation of advanced surveillance technology such as drone cameras rather than systems, and satellite imagery/infrared technologies to identify suspicious activities. The integrated border security system in Bangladesh, especially through initiatives such as the Comprehensive Integrated Border Management System (CIBMS), presents a substantial advancement in maintaining the complex challenge of the Bangladesh border. Technology integration and strategic policies of a promising solution, effective implementation, and commonness are essential to understanding their full potential. The integrated border management system is essential in enhancing border security through adverb surveillance technology. This system inbox deployment of thermal images, infrared and laser-based intruder alarms, aerostats for aerial surveillance, and attended ground sensors, solar systems, and radars to protect the rivers on the border (Press Information Bureau, 2019). According to the Economic Times (2019), the deployment of the system in regions like the border areas of Bangladesh highlights its strategic significance. The paper also highlighted that electronic service systems along the Bangladesh border have begun to enhance monitoring and management capacities, ascertaining comprehensive coverage and realty monitoring. For the success of an integrated border security System, effective governance is essential. Wong Villanueva et al. (2020) stressed that to enhance the effectiveness of security measures and improve relations between neighbouring countries, transparency, accountability, and community improvement in border management are

integral. According to Mahbub-ul Alam (2023), integrated border management practice is substantially challenging. The study showcases a detailed examination of the issues and the requirement for a coordinated approach to enhance border security. The heightening dynamics of Bangladesh border issues are discussed by Dinesh Mahur (2014), who emphasises the need for integrated border management to address historical and current challenges. The study underscores the steps taken to resolve these issues and the significance of a joint and integrated approach. Das et al. (2024) discuss the experience of people living along the Bangladesh border and its impact on border security measures. This paper focused on the need for integrated border management to ascertain the security aspect of Bangladesh. On the other hand, the issue of smuggling along the Bangladesh border and its implications has been exhaustively evaluated by Saraf Wasima (2024), who highlighted the need for integrated border management to tackle it effectively. Md Mahbub-ul Alam (2014) posited that the contemporary management of the Bangladesh-India border needs major improvement, emphasising the significance of a joint integrated Border Management policy. The authors highlighted that effective governance and cross-border cooperation are essential for the success of an integrated Border Security System. All border security enhancement through the implementation of Advanced technology Civilspedia (2023) stated that the government had established integrated check posts (ICPs) at the Atki location along the borders to streamline better management and monitoring of cross-border activities. Bangladesh has initiated an integrated border protection grade to control illegal immigration and smuggling (New Indian Express, 2017). Rather (2013) underscored that The Indian Bangladesh border governance encounters several issues encompassing illegal immigrant smuggling and the presence of enclaves; therefore, the uncertainty in the border facilitates cross-border infiltration and crime necessity of a comprehensive governance approach to address these challenges that leads to the implementation of effective management and cooperation between India and Bangladesh to establish integrated security system. Implementing an integrated border security system not only developed security but also stimulated legitimate trading and movement that contributed to the economic growth in the border region (Hossain & Islam, 2020). According to the Economic Times (2019), an advanced integrated Border Security System diminishes the economic burden led by illegal activities and thereby fosters economic development. The deployment of technology to boost the efficiency of the integrated Border Security System complemented by the Governance of Border Management in Bangladesh requires coordinated endeavour among various government agencies and security forces (Wong Villanueva et al., 2020).

B. The Use of Advanced Technology in Combating Human Trafficking

Application of Advanced technology is excruciatingly essential in the combat of human trafficking. Artificial intelligence is particularly essential as it can assist in tracking the location of abusers and victims through distinctive lens identifiers in mobile phones and machine

learning algorithms assessing online commercial sex ads to detect potential human trafficking activities (Pimentel, 2024). Technology initially used for trafficking is being repurposed as rigorous instruments to combat it, as evidenced by different counter-trafficking applications (Latonero, 2012). According to Bondarenko et al. (2020), the primary objective of integrating cutting-edge technology in law enforcement and crime prevention is leveraging the scientific and industrial capabilities to ensure coordination and introduction among all levels of border security. The introduction of automated security and crime evolution systems in cities, along with said digital technology and international best practices, substantially enhances border security (Hubanova et al., 2021). Technology's dual role in both combating and encouraging human trafficking underpins its significance. On one hand, traffickers capitalised on advanced technology to evade detection, but on the other hand, identical technologies offer solid means to counter trafficking-related crimes (Montasari & Jahankhani, 2021). The COVID-19 pandemic has exacerbated economic vulnerability, increasing trafficking risk in Bangladesh (bdnews24.com, 2022). With the utilisation of technology, human traffickers are able to exploit advanced measures to remotely control their victims using GPS location apps or receive or move illegitimate make a profit through cryptocurrency and instantly communicate with accomplices (Inter-Agency Coordination Group against Trafficking in Persons, 2019). The incorporation of technological innovation in association with comprehensive efforts by the private and public sectors is integral to combating human trafficking (Bangladesh Iom, 2022). AI technologies such as machine learning and data analytics are substantially operational in assessing substantial datasets to detect patterns indicating trafficking activities (Kim & Lee, 2019). These technological interventions are highly proactive in identifying anti-trafficking organizations, enabling law enforcement agencies to stay ahead of the traffickers' evolving strategies. Johnson and Davis (2021) highlight the significance of natural language processing (NLP) in examining textile data to extract meaningful information and detect potential trafficking indicators. Anderson and Turner (2021) exemplify the integration of NLP-driven insights, showcasing the practical efficiency of linguistic analysis in fighting human trafficking. The author uncovered the hidden connection and activities related to trafficking, focusing on the importance of linguistic analysis in both steering preventive efforts. Smith and Brown (2020) underscore the collaboration between linguistics, data scientists, and anti-trafficking experts to foster the full potential of NLP in preventing human trafficking. In Bangladesh, law enforcers can employ AI Technology tailored to local requirements, ensuring that anti-trafficking initiatives can be adapted to the evolving practice of traffickers. Data analysis and tracking are Pivotal in combating human trafficking, as suggested by ICAT (2021). Johnson and Smith (2022) emphasise the integration of machine learning, data analytics, and real-time data sharing in combining human trafficking. The author focused on machine learning algorithms, automating the analysis of a large data set, detecting patterns indicative of trafficking activities, and establishing a predictive model to

anticipate human trafficking. The AI and machine learning applications leveraging social media analysis and image technology are instrumental in pinpointing and competing against human trafficking and preventing crimes. (Catherine et al., 2024).

C. Human Trafficking

The Nexus between human trafficking, money laundering, and arms smuggling process is a multifaceted threat to national security in Bangladesh. The region's complex geopolitical landscape, particularly along the Bangladesh-Myanmar and India border, serves as a critical transit route for these interconnected criminal activities (Harun-Or-Rashid, Ahamed and Rahman, 2020). The intricate associations between these forms of trafficking aggravate the challenge for law enforcement and border control agencies. Human trafficking in Bangladesh is deeply intertwined with other illicit activities. The United Nations Office on Drugs and Crime (UNODC) underpins clandestine organisations of human trafficking and migrant smuggling, which are often linked to drug and arms trafficking in the network (UNODC, 2023). The paper also states that the interconnection complicates the endeavour to combat this crime as each type of trafficking assists and facilitates the other. Drug trafficking, as a significant part of this Nexus, is not only a stand-alone crime but also a financial engine for other forms of trafficking. The profits from drug trafficking are often laundered through various financial channels in terms of arms smuggling and human trafficking operations (Singh and Nunes, 2013). The cycle of crime and finance is a major security concern as it undermines national stability and public safety.

According to the United Nations (2000), Human trafficking is the recruitment, transportation, or receipt of individuals by means of coercion or threat, exploiting the susceptibilities of individuals for mischievous intentions Such as organ removal, prostitution, and servitude. Victims of human trafficking fall for various subpopulations across two dimensions: The individual targeted and the type of trafficking experienced. The primary types of trafficking include commercial sex, coerced labour, forced servitude, and domestic violence in a study of 551 victims conducted by Gabriele et al., (2014). A large group of individuals experiences sexual exploitation (68.5%), Followed by involuntary labour (24.5%), coerced marriage (7.7%), and petty crimes (6.3%). The second dimension comprised of targeted videos that include domestic or International victims, minors, individuals with a disability, and children of traffic victims (Pascual-Leone et al., 2016). The removal of organs is excluded from some country's definition of human trafficking. For example, Bangladesh passed the Prevention and Suppression of Human Trafficking Act in 2012, which did not add the term removal of organs as part of human trafficking. The Act describes human trafficking as the deporting and trading of a deceived person individual inside or outside the country for sexual and labour exploitation or another form of exploitation purposes (Government of Bangladesh, 2013.). Human trafficking is modern slavery and a preponderant concern for human security in developing countries such as Bangladesh.

Bangladesh, despite being a small country, has a substantial share of trafficking victims in South Asia. Around 32000 Bangladeshis are trafficked yearly (United States Department of State, 2020). A number of research articles on human trafficking in Bangladesh have emerged over the years. Hossain (2009, June 9) describes in his interview that from 1999 to 2009, approximately 300000 Bangladeshi children women Aged between 12 and 30 were trafficked to India alone, and About 2 lakh Bangladeshi girls and women were sold in Pakistan. Over the past 47 years, millions of women, children, and men have been trafficked to different countries. Chowdhury (2004) describes that the South Asia Gulf region trafficking route Is substantially active in human trafficking, affecting Bangladesh with traffickers using 20 entry and exit points through 16 southern and south-western districts near the Indian border. The author identified active routes, including Dhaka-Mumbai-Karachi-Dubai. Ruhi (2003) underscores trafficking's substantial security constant for its uncontrollable nature and need for transnational crimes and illegitimate migration. According to Islam (2019) approximately 5367 men, 1138 women, and 5:35 minors had been traffic from January 2013 to June 2018. the author highlighted that approximately 6% of the Global human trafficking victims originate from South Asia, especially from Bangladesh and India, and the conviction rate of Bangladesh is located in the country for traffic. Paul and Hasnath (2000) highlight the harsh experience of traffic victims returning to Bangladesh, Showcasing the consequences of trafficking, such as inhospitable working conditions, widespread sexual abuse among female migrants, and falsified travel documents. The author also describes the cruel experiences of traffic victims, identifying weaknesses in national and regional responses to trafficking in Bangladesh and South Asia.

III. DEVELOPMENT OF HYPOTHESIS

A. Integrated Border Security Systems (IBSS) and Human Trafficking (HT)

Radko Hokovský (2021) explores the integrated system of Border Management in the Schengen area and its implication for completing human trafficking and suggests that the integrated system of Border Management has a substantial negative impact on human trafficking. The UNODC paper discusses the process in which countries respond to human trafficking by enhancing the border control mechanism and improving the protection system, suggesting that integrated border security has a positive impact on mitigating human trafficking (United Nations Office on Drugs and Crime, 2019). Whereas DHS (2020) outlines the role of US Customs and border protection in preventing human trafficking through advanced border security measures and found a strong effect of integrated border security systems on reducing human trafficking. While there are papers that outline the insignificant impact of an integrated system of Border Management on managing human trafficking, for example, Manjarrez and Rojek (2020) give border security as an intricate process addressing activities like illegal crossing and human trafficking. This paper highlighted the completely that can limit the effectiveness of Border Security measures in reducing

human trafficking. De Azevedo Drummond (2021) shares identical findings suggesting that encompass every type of trafficking activity and male of substantially reduced trafficking. While some of the studies highlight the positive impact of integrating border security on reducing human trafficking, other research indicates substantial limitations and involuntary implications. On the basis of the evidence showcasing an assertive relationship between an integrated border Security system and the reduction of human trafficking, the following hypothesis has been developed:

➤ *H1: Integrated Border Security Systems (IBSS) have a significant negative impact on Human Trafficking.*

B. The Use of Advanced Technology (UAT) and Human Trafficking (HT)

A number of papers have ascertained the Robust positive impact of advanced technology on mitigating human trafficking. In a study, Dawap et al., (2020) explained ICT a Curse or a Blessing for combating human trafficking and also suggested that ICT mechanisms enhance law enforcement capacities, improving victim identification and facilitating international cooperation. A comparable discovery is examined in a Theorising Human Trafficking, Modern Slavery, and Technology paper, where Milivojevic et al., (2020) analyse the relationship between human trafficking models slavery and advanced technology and arrive at a conclusion that advanced technology including biometric identification. Data Analytics and digital platforms are critical in disrupting trafficking networks and protecting victims. Furthermore, Shekhar & Vincent (2022) Examined the evolution of combatting human trafficking by offering tools for enhanced detection and prevention. The author shows that technology can advance the capacity to monitor trafficking activities and coordinate Rapid responses. Another paper, Trends, Challenges, and Opportunities in Human Trafficking and Technology, discusses the dual role of technology in human trafficking. This paper acknowledges the challenges in incorporating technology in human trafficking and presents opportunities for utilising technology to combat trafficking effectively, such as data analytics and international cooperation (ICAT, 2021). There have been several papers that exemplify the Ineffectiveness of Advanced model technology in reducing human trafficking activities. Middleton (2022) Under Prince, the initial negative impacts of technology on anti-trafficking efforts highlight how the digital age has enabled traffic to recruit and sell victims more effortlessly, leading to the online platform. The authors state that modern technology has intensified the likelihood of Human trafficking across borders utilisation of online classified social media platforms to advertise and expert victims in the guise of legitimate employment opportunities. At the same time, Corinna-Tri (2021) noted that technology could be a powerful tool for anti-trafficking initiatives exported by traffickers. The author highlighted the cases where advanced technology, such as AI and data analytics, intended to monitor and prevent trafficking, have been circumvented or manipulated by traffickers. Correspondingly Álvarez (2022) examines the dual impact of modern technology and human trafficking, recognising both its concessions and detrimental

effects. The paper highlighted how modern technology facilitates the coordination of trafficking activities, making it easing for traffickers to recruit, transport, and exploit victims across borders. Several studies have highlighted both the positive and negative impacts of advanced modern technology on human trafficking. While some research underscores how technology enhances law enforcement capabilities and international cooperation in combating trafficking, other studies reveal that traffickers exploit digital platforms and advanced technologies to facilitate and expand their operations, thereby complicating anti-trafficking efforts. Upon evaluating the findings of previous research, despite underlying drawbacks and ineptitudes of modern technology in anti-human trafficking endeavours, the significant effect of mitigating trafficking operations has been realised, and thereby, the following hypothesis has been constituted.

➢ H2: The Use of Advanced Technology (UAT) has a significant negative impact on Human Trafficking.

C. The Mediating Effect of Use of Advanced Technology (UAT)

The integration of advanced technology substantially Mediated the relationship between the border security system and human trafficking. Technology material surveillance has increasingly been used to protect and rescue victims of trafficking, depicting its crucial role in mitigating this pervasive issue (Milivojevic et al., 2020). According to Musto & boyd (2014) human trafficking is progressively being conceptualised as technology predicament, thereby

necessitating the inclusion of innovative solutions to combat this widespread crime. The Nexus between irregular immigration and accelerating border control is intricately linked to the deployment of Advanced Communication Technology. Contemporary border management increasingly depends on sophisticated technological instruments to thoroughly monitor and control the movement of dodgy individuals, thereby extenuating the incidence of human trafficking (United Nations Office on Drugs and Crime, 2011).While Antonopoulos et al., (2020) stress that the internet and digital technologies are essential in the prevention process of human smuggling and trafficking, facilitating law enforcement agencies with powerful tools to track, monitor, and deter trafficking. Lennerfors and MURATA (2019) highlights the interdependence between border commons and Technology-mediated actions. This perspective underscores the significance of the incorporation of technology to enhance Border Security measures and prevent human trafficking. The author underpins the deployment of advanced technology such as AI and data analytics to improve the identification and tracking of traffickers and victims, making the Border Security System more effective. Drawing upon prior research, it is positive that the utilisation of Advanced technology serves as a critical mediator that advances the interplay between the border security framework and human trafficking dynamics, thereby following hypothesis has been established.

H3: The Use of Advanced Technology mediates the relationship between Integrated Border Security System and Human Trafficking.
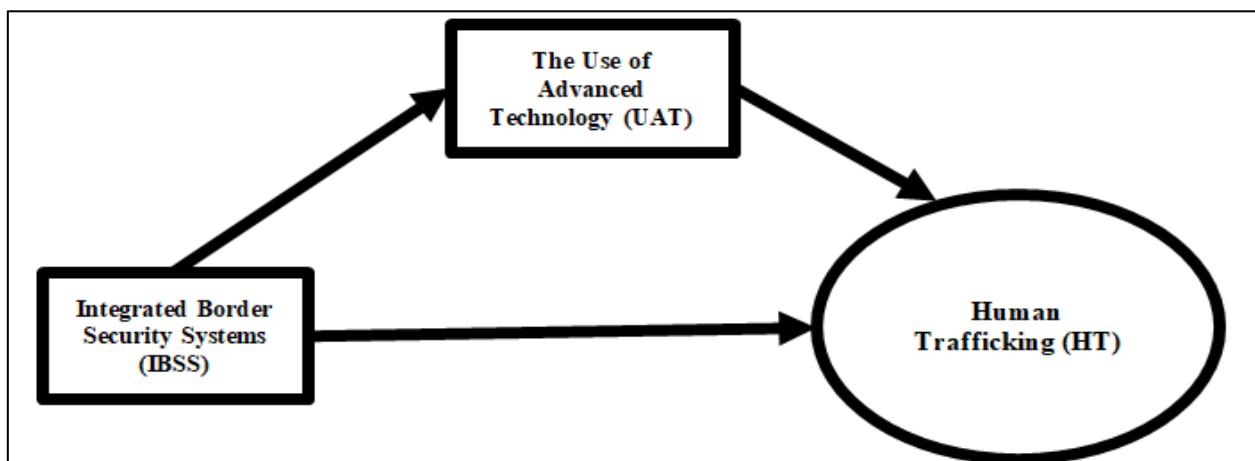

Fig 1 Conceptual Framework

IV. METHODOLOGY

A. Data Collection and Sampling

This research population consists of government officials from law enforcement agencies responsible for overseeing and controlling human trafficking in Bangladesh, such as Bangladesh Police, Border Guard Bangladesh (BGB) and different Intelligence Agencies. The population also includes different NGOs and non-profit organisations engaged in human traffic prevention action. Given that the accurate number of populations involved in Anti-human trafficking operations is unknown, only individuals directly

handling anti-human trafficking actions are taken into account. Utilising a non-probability purposive sampling method, the survey questionnaire was distributed to 500 respondents following their consent. Out of 500 responses initially collected, 17 responses were invalid due to missing data and issues with data normality (Hair Jr et al., 2017; Shan et al., 2013). Consecutively, this paper focuses on 483 valid responses for data analysis interpretation. A sample size of 200 is assumed to be sufficient for ensuring sample education, and 483 valid responses are considered robust for statistical assessment conducted within the structural equation modelling (SEM) framework (Kline,2015).

Furthermore, the sample size for 483 considerably exceeds the requisite criterion, stipulating that there should be at least ten-fold in the number of paths contributing to the endogenous variables. The substantial excess validates the suitability for sophisticated partial least square (PLS) analysis (Joe F. Hair, 2011).

B. Measurement Instrument

To achieve the research objective of this study, data collection employed a multi-item measurement approach for the construct. A standard questionnaire was meticulously established and grounded in prior research utilising a 5-point likert scale measurement ranging from strongly disagree to strongly agree. For the construction of integrated border security systems, use of advanced technology and human trafficking, 6 items were referenced for each construct to ensure comprehensive measurement.

C. Data analysis technique

Two sophisticated statistical tools were employed to ascertain the reliability and validity of the result for the analytical rigout and to ascertain the reliability and validity of the result. The statistical package for social science (SPSS25) is used to generate descriptive statistics and initial data validation, and SmartPLS4 is used for the in-depth investigation of measurement and structural models. Moreover, partial list square equation modelling (PLS-SEM) was utilised to dissect the hypothesised relationship between dependent and independent variables and to assess their validity and reliability rigorously. PLS-SEM is highly loaded for its professionals in handling multivariate data assessment for instrument modelling (Reisinger & Mavondo, 2007), and SEM is highly regarded for its capacity to articulate the dimension of the designed construct (Hair et al., 2010).

V. DATA ANALYSIS AND RESULTS

A. Demographic Profile

This demographic analysis provides information about the 483 respondents who were surveyed. The survey primarily included young adults aged between 21 and 30 (48.45%), with significant representation from those aged between 31 and 40 (33.54%). The gender distribution was 5.80% female and 94.20% male. Among the respondents 57.56% has graduation degree and 42.44% has post-graduation. Experience levels varied, with 37.27% having 1 to 5 years, 27.12% having 11 to 15 years, and 24.02% having 6 to 10 years of experience.

Table 1 Demographic Analysis

	Category	Frequency N=483	Per cent
Age Group	21-30 years	234	48.45%
	31-40 years	162	33.54%
	41-50	46	9.52%
	Above 50 years	41	8.49%
Gender	Female	28	5.80%
	Male	455	94.20%
Education Level	Graduation	278	57.56%
	Post-Graduation	205	42.44%
Experience	1-5 years	180	37.27%
	6-10 years	116	24.02%
	11-15 years	131	27.12%
	16-20 years	31	6.42%
	More than 21 years	25	5.18%

Table 2 Item Loading, Convergent Validity, and Reliability

Constructs	Items	Loading Value	CA	rho_A	CR	AVE
Integrated Border Security Systems (IBSS)	IBSS1	0.726	0.712	0.726	0.856	0.555
	IBSS2	0.772				
	IBSS4	0.810				
	IBSS5	0.756				
	IBSS6	0.815				
Use of Advanced Technology (UAT)	UAT1	0.771	0.745	0.747	0.873	0.567
	UAT2	0.763				
	UAT3	0.897				
	UAT4	0.799				
	UAT5	0.819				
Human Trafficking (HT)	HT1	0.728	0.723	0.728	0.859	0.588
	HT3	0.892				
	HT4	0.789				
	HT5	0.803				
	HT6	0.769				

B. Measurement Model

➢ *Convergent Validity:*

Convergent validity has been meticulously evaluated to ascertain the internal coherence of the items devised to gauge the latent constructs. This validity measurement ensures that items are exclusively assessing that designated latent variables without conflation with another latent construct. Cronbach's Alpha (CA), Composite Reliability (CR), and Average Variance Extracted (AVE) have been conducted to measure the convergent validity of the variables because these tests are able to validate the convergent validity of the items concerning the respective loading values. The assessment of the loading value of IBSS, UAT, and HT produced less than the required threshold of 0.70, and one item from each contract was eliminated to obtain the cut-off point of 0.50 as suggested by Hair et al. (2010). As the items have more than the cutoff point of 0.5 of AVEs, they hold sufficient convergent validity (Hair et al., 2019; Henseler et al., 2014). The CA (Cronbach's Alpha) value should be 0.70, as suggested by Nunnally (1978), to suggest a positive reliability rate. Each of the constructs holds a CA value higher than the cut point of 0.70, indicating a sufficient reliability rate. CA values of IBSS, UAT, and HT are 0.712, 0.745, and 0.723. Whereas the CR values of the constructs are also consistent, ranging between 0.856 and 0.873, which are higher than the threshold value of 0.70 (Hair et al., 2019). Table 2 shows Dijkstra–Henseler's indicator rho_A coefficients value range between 0.726 to 0.747, which is above the threshold .70.

Therefore, it can be concluded that both items and construct have shown positive reliability, adhering to the criteria.

➢ *Discriminant Validity:*

Table 3 showcases the assessment of the convergent validity indicating the reliability between items and constructs, and their discriminant variable was examined to demonstrate the extent to which each construct is discrete from another construct (Hulland, 1999). The square root of the Average Variance Examined from the variable should be more than its correlation coefficient with other constructs. Based on this evaluation, each construct should present a significant degree of validity with its own measure formulated to examine the variable (Fornell & Larcker, 1981). The result of Table 2 shows all the values of the construct below the diagonal line and less than the value of the diagonal line (square root of AVE), which indicates a satisfying result (Hair et al., 2019). Another assessment for measuring the discriminant validity of the variable is the Heterotrait Monotrait ratio (HTMT) shown in Table 4 (Hair,Ringle, & Sarstedt, 2011). This measurement suggests the constructs have a cutoff value less than 0.85, as recommended by (Kline,2015; Hair et al,2017). However, in some cases that threshold value is assumed to be 0.90 (Henseler et al., 2014). The variable's discriminant validity was sufficient as the HTMT ratio of the variables showcased in Table 4 reached the threshold value of 0.85. Consequently, it can be concluded that the variables have satisfactory validity and reliability for examining the structural model.

Table 3 Correlation among Constructs (Fornell & Larcker)

	IBSS	UAT	HT
IBSS	**0.756**		
UAT	0.545	**0.736**	
HT	0.469	0.578	**0.728**

Table 4 Heterotrait Monotrait (HTMT) Ratio

	IBSS	UAT	HT
IBSS			
UAT	0.688		
HT	0.559	0.677	

C. Structural Model

Table 5 Outcome of Direct Path Analysis

Hypothesis	Path	β	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values	Result
H1	IBSS -> HT	- 0.157	0.061	4.052	0.000	**Supported**
H2	UAT ->HT	- 0.132	0.074	2.165	0.030	**Supported**

Table 6 Results of Specific Indirect Effect

Hypothesis	Path	β	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values	Result
H3	IBSS -> UAT -> HT	- 0.051	0.023	2.266	0.000	**Supported**

Table 7 Results of Total Path Analysis

Path	β	Standard deviation (STDEV)	T statistics (O/STDEV)	P values	Result
IBSS -> HT	-0.208	0.061	4.052	0.000	**Supported**

Structural models are assessed to examine causal relationships among variables showcased in the conceptual framework. Table 5 demonstrates all the construct, standard deviation, T value, and P values. The P value is the measurement that showcases the significance of the hypothesis relationship among the dependent and independent variables. In the table, the P value is significant at the level of 0.05 (p<0.05). The β value represents the degree to which the dependent variable negatively changes when that independent variable fluctuates. Here, IBSS (H1: IBSS→HT,β=-0.157, Standard Deviation (SD)= 0.061,t= 4.052 and p= 0.000), which suggests a negative relationship between IBSS and HT as its significant value is less than 0.05. On the other hand, (H2: UAT→HT, β=-0.132, Standard Deviation (SD)=0.074, t= 2.165 and p= 0.030) Which indicates a significant negative impact on the dependent variable as a result that observation is substantially significant at the level of 0.05. Therefore, H1 and H2 are accepted.

This paper also examines whether UAT acts as a mediator between predictors and predicted variables. The result of H3 (IBSS → UAT → HT, β- 0.051, STDEV 0.023, T statistics 2.266 and P value 0.000), which established a substantial mediation effect between IBSS and HT, is shown in Table 6. Table 7 displays the value of the total path coefficient of the constructs (dependent and independent), which is exhibited as the mediator intervention. UAT has a complete mediation effect between IBSS and HT as the path coefficient has decreased the total effect to β- 0.051 and remained significant as P value =0.000. Therefore, H1, H2, and H3 are accepted and reinforced by consistent data with predicted consequences.

VI. FINDINGS AND DISCUSSION

The evaluation of integrated Border Security System (IBSS) On human trafficking (HT) unveiled a substantial negative relation. It is evident from the path coefficient (β = -0.157, p=0.000) that robust border security measures substantially mitigate the incidence of human trafficking. This finding is consistent with Hokovský (2021), which emphasises the negative effect of integrated management on human trafficking within the Schengen area, and DHS (2020), Which underpinned the effectiveness of US customs and border protection advanced measures in preventing human trafficking. Border Security is integral for robust Anti-Trafficking Management, which is a challenge in South Asian countries such as Bangladesh (Sharmin & Rahman, 2017). The findings outline that it is necessary to undertake stringent measures to reinforce advanced Border Management in Bangladesh to enhance the Border Security System. In the context of Bangladesh, Border Security plays a pivotal role in mitigating trafficking activities by controlling illegal cross-border movement and disrupting traffic in the network. The negative relationship between IBSS and HT establishes that Bangladesh requires a security framework. The country can prevent traffickers from exploiting its border by integrating sophisticated surveillance and monitoring systems (Antonopoulos et al., 2020) ;(De Azevedo Drummond, 2021)

The second hypothesis suggested that advanced technology substantially negatively impacts human trafficking, which is supported by the data with a path coefficient (β = -0.132, p= 0.030). The findings align with those of Dawap et al. (2020), who found that advanced technology positively impacts law enforcement capacities, victim identification, and international cooperation. Similarly, Milivojevic et al. (2020) revealed that advantages, including data analytics and digital platforms, are essential in disrupting trafficking networks and protecting victims. For Bangladesh, the application of advanced technology, such as AI, data analytics, and digital surveillance, can substantially enhance its exertions. These modern technologies can enhance the detection and monitoring of trapping activities, develop rapid response and coordination among law enforcement agencies, and intensify the protection and support systems of the victims. Despite challenges such as the potential exploitation of technology by traffickers, the overall impact of advanced technology is profoundly positive in combating human trafficking, which negates the findings of Shekhar & Vincent (2022) and Middleton, (2022). The mediation analysis represents that advanced technology enhances the efficacy of the border security system in combating human trafficking. This finding coheres with the conclusions of Lennerfors and MURATA (2019) and Musto and Boyd (2014), Underscoring that human trafficking is increasingly viewed as a technology and issue necessity eating innovative solution. Bangladesh border security framework needs to be updated by incorporating biometric identification and real-time data sharing among law enforcement agencies significantly in hand border control measures. The mediation effect of advanced technology strength and the relationship between the border security system and the reduction of human trafficking signifies that it is critical to address the pervasive impact of advanced technology on developing the existing Border Security issues (ICAT,2021; Álvarez 2022). These findings by Gregory et al. (2023) underscore the significance of addressing vulnerability through integrated technology solutions that endow the mediation effect of advanced technology. Given the Bangladeshi-specific context, the finding accentuates the critical requirement for integrated approach incorporation with strengthening border security and advanced technology to fight against human trafficking effectively. The country's border with India and Myanmar is particularly vulnerable to cracking activities due to porous Borders and social and economic challenges. The utilisation of advanced surveillance and monetary technology at the control border can substantially mitigate underlying risks.

VII. LIMITATIONS AND FUTURE RESEARCH DIRECTION

The data collection was confined to a specific group of responder specification, and NGOs involved in anti-human trafficking efforts of this inter scope may not have fully covered the perspective of relevant stakeholders such as victims, local community members, and international organisations, which could have occurred more comprehension understanding of the issue. Future

investigations ought to broaden the cohort to include responders from different national and international organisations alongside a more heterogeneous assignment of stakeholders. The cohort size employed in this paper is insignificant in relation to the expensive populace engaged in controlling anti-trafficking efforts in Bangladesh. Subsequent examinations should be conducted using information gathered from a broader and diversified array of respondents to improve the reliability and validity of the findings. The study focused on close-ended questions for data collection that limited the respondents from offering more descriptive answers to the questionnaire, even though this method is effective in conducting quantitative analysis. In future research, researchers can adopt mixed methods by using both open-ended and open-ended questions to gather a more comprehensive and detailed understanding of respondents' suggestions, recommendations, and opinions. This paper also primarily utilised cross-sectional data that offer a brief picture of a scenario at a single point in time. In future research, concerned researchers can adopt longitudinal studies tracking the long-term impact of integrated border security systems and advanced technology on human trafficking and their effectiveness and sustainability.

VIII. IMPLICATIONS AND CONCLUSION

The findings of this paper carry substantial implications for policy development and implementation, highlighting the need for a comprehensive framework that results in the integration of advanced technology into the Border Security System in Bangladesh. Policymakers need to focus on creating adaptable policies that can evolve alongside technological advancement to efficiently combat human trafficking. It is integral that these policies also ascertain the protection of human rights, preventing any infringement due to rising surveillance and security measures. Investment in advanced technology such as biometric identification, data analytics, and real-time data sharing systems is essential, and their four government and international organisations need to collaborate to allocate resources for developing and deploying these technologies, equipping border security agencies with the necessary device to identify and prevent human trafficking. The emphasis on technology advancement underscored the necessity for continuous funding and assistance to retain and update these systems. In addition, the utilisation of advanced technology required specialised training and capacity building for border security personnel. And therefore, training program needs to be designated to enhance the technical skill of law enforcement agencies ensuring that they can efficiently operate and maintain advanced technology. International collaboration and information sharing emerge as a critical aspect in the fight against human trafficking. As Bangladesh shares land with India and Myanmar, these neighbouring countries need to enhance cooperation through shared intelligent best practices and coordinated operations. Moreover, community engagement is also an essential tool to mitigate trafficking cases. Education programs need to be disseminated effectively to empower communities to recognise and report trafficking

activities, thereby strengthening the overall security framework. In conclusion, the integration of advanced technology into the Border Security System represents an essential strategy for fighting against human trafficking in Bangladesh. This paper reflects on the fact that while technologies hold substantial promise in enhancing the identification and prevention capacity of the Border Security System their implementation must be accompanied by comprehensive policies, sufficient training, international cooperation, and community engagement. The balanced approach facilitates not to violate human rights that may sustain in the long term.

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