



**Daffodil**  
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Thesis Paper On

**“PRIVACY-PRESERVING SOFTWARE SYSTEMS AND USER DATA  
PROTECTION IN BANGLADESH: A SURVEY-BASED ANALYSIS”**

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## APPROVAL

This thesis titled on “**PRIVACY-PRESERVING SOFTWARE SYSTEMS AND USER DATA PROTECTION IN BANGLADESH: A SURVEY-BASED ANALYSIS**”, submitted by Toha Younus (ID: 201-35-3015) to the Department of Software Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of Bachelor of Science in Software Engineering and approval as to its style and contents.

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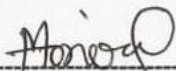
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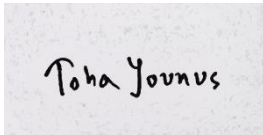


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## DECLARATION

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## Abstract

The advent of the digital age has brought about numerous opportunities and challenges in terms of data privacy, especially in developing countries like Bangladesh. This research aims to address the limited usage of privacy-preserving software systems (PPSS) in the country by examining the current landscape and practices of user data protection. By collecting survey data from various demographic groups, the study investigates the level of awareness and understanding of data privacy threats, as well as the concerns and preferences of users. Through an extensive survey involving 84 participants, the research analyzes the unique obstacles faced by Bangladesh, such as the absence of comprehensive data protection laws and low levels of awareness. The findings not only shed light on the barriers to PPSS adoption but also offer practical recommendations for policymakers, organizations, and developers. By bridging the gap in understanding user motivations and decision-making processes, this study contributes to the broader discussion on data privacy. The insights gained from this research empower individuals to comprehend and safeguard their data, make informed choices regarding technology, and actively participate in a more secure and fair digital future.

**Keywords**— Privacy-Preserving Software Systems, Data Protection, Bangladesh, User Awareness, Data Privacy Threats, Survey Analysis

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# CHAPTER 1

## INTRODUCTION

In the rapidly evolving digital environment of Bangladesh, this study examines the complex dynamics surrounding the adoption of Privacy-Preserving Software Systems (PPSS) and the protection of user data. The absence of comprehensive data protection laws and a lack of awareness among users emphasize the critical importance of fully understanding the changing nature of data privacy [11]. Recent incidents, such as security breaches on Facebook [12] and a government portal leak affecting millions, underscore the urgency of addressing these challenges [17].

Driven by the need to bridge the gap between awareness and adoption, this research strategically establishes objectives to assess levels of awareness, analyze user concerns, and identify barriers that hinder widespread adoption of PPSS. The focus on the 20-30 age group highlights the significance of understanding the preferences and behaviors of most users in the digital landscape (Table 1).

The research questions delve into nuanced aspects of data privacy, investigating the current levels of awareness of PPSS among internet users in Bangladesh, variations in user concerns based on demographics, and the identification of key obstacles to PPSS adoption. This systematic approach guides the exploration of the research landscape (Table 1).

The survey design and quantitative analysis employed in this methodological approach aim to provide a comprehensive understanding of prevalent attitudes and practices concerning data privacy in Bangladesh. By incorporating variables such as public Wi-Fi usage, password management, and privacy settings on social media platforms, a more detailed analysis of user behavior can be conducted, allowing for a nuanced examination (Table 3).

Within the literature review, this research is situated within the broader context of data privacy studies in Bangladesh, highlighting the persistent challenges despite the increasing awareness [1] [5]. The identified research gap emphasizes the necessity for a deeper understanding of user motivations and decision-making processes regarding the adoption of privacy protection and security measures (PPSS), an area that has not been adequately addressed in existing studies. As the research progresses, its objective is not only to provide valuable insights into the complexities of data privacy in Bangladesh but also to offer actionable recommendations for policymakers, organizations, and developers [8]. The aim is to foster a secure, knowledgeable, and reliable digital environment in Bangladesh, empowering users to navigate the intricacies of the digital age with confidence.

## **1.1 Background**

The digital age presents both opportunities and challenges for data privacy. As individuals increasingly interact online, their personal data becomes vulnerable to misuse. Privacy-preserving software systems (PPSS) offer a promising solution by enabling data analysis without compromising individual privacy. However, their adoption, particularly in developing nations like Bangladesh, remains limited due to factors such as limited awareness, technical complexities, and lack of data protection regulations. This research aims to investigate the current state of PPSS adoption and user data protection practices in Bangladesh, providing valuable insights for enhancing privacy safeguards in this dynamic context.

## **1.2 Problem Around the world**

- The global average cost of a data breach reached \$4.24 million in 2021, according to the Cost of a Data Breach Report 2021 released by IBM and the Ponemon Institute, a 10% increase from the previous year.
- In early 2018, news broke that malicious actor has infiltrated the world's largest ID database, Aadhaar, exposing information on more than 1.1 billion Indian citizens including names, addresses, photos, phone numbers, and emails, as well as biometric data like fingerprints and iris scans.
- The United States is among the worst hit. Internet-connected computers are attacked every 39 seconds in the US and 45 per cent of Americans have had their personal information compromised by a data breach in the last five years. In 2019, the US had the highest average cost per data breach in the world, at \$8.64 million, and healthcare data breaches alone affected 40 million people—a number that's growing with the ongoing COVID-19 pandemic.

## **1.3 Problem In Bangladesh**

- Lack of Comprehensive Data Protection Laws: Despite the rapid digitization in Bangladesh, there are no comprehensive data protection laws in place. This lack of regulatory framework poses a significant risk to user data privacy and security.



- **Low Awareness of Data Privacy:** There is a general lack of awareness about data privacy among users and developers in Bangladesh. Many users are unaware of their data rights and the potential risks associated with the misuse of their personal data.
- **Proposed "Data Protection Act, 2022":** The proposed "Data Protection Act, 2022" by the Government of Bangladesh has been criticized for potentially infringing on people's right to privacy. The act is said to use vague and overbroad provisions to enable and legitimize intrusive actions by authorities, such as granting access to encrypted communication on personal devices both physically and remotely.
- **Exemption of Authorities from Liability:** The proposed "Data Protection Act, 2022" exempts authorities from civil, criminal, and any other legal proceedings for harm caused to people in the course of its actions. This exemption could potentially lead to gross human rights violations.
- **Contradiction with International Obligations:** The proposed "Data Protection Act, 2022" violates Bangladesh's constitutional and international obligations, including the International Covenant on Civil and Political Rights, to which it is a state party.
- Facebook compromised three million Bangladeshi citizens' data in 2022.
- A security researcher discovered a Bangladesh government web portal that exposed the personal information of about 50 million citizens, including their birth registration records, phone numbers and national identity numbers.
- According to the 12th International Conference on Business Information Security, Bangladesh is among the 19% of countries that do not have specific privacy policies.
- As reported by TechCrunch, a Bitcrack Cyber Security researcher, Viktor Markopoulos, became aware of the leak on June 27 and made a signal to the country's digital government computer incident response team (CERT). The data includes contact information and national ID card numbers and could be used to modify or delete birth registration applications.

## 1.4 Research Objectives

The research objectives for the study on "Privacy-Preserving Software Systems and User Data Protection in Bangladesh: A Survey-Based Analysis" are:

### General Objective:

- To investigate the current state of Privacy-Preserving Software Systems (PPSS) adoption and user data protection in Bangladesh.

### Specific Objectives:

- Assess the awareness and understanding levels of data privacy threats and PPSS among Bangladeshi internet users, considering demographics and internet usage patterns.
- Analyze the primary concerns and preferences of Bangladeshi internet users regarding data protection and privacy control, identifying variations across different user profiles.
- Identify key factors hindering the wider adoption of PPSS in Bangladesh, categorized as technical, financial, legal, and cultural.
- Formulate actionable recommendations for policymakers, organizations, and developers to address challenges and promote PPSS implementation, contributing to enhanced data privacy safeguards in the digital landscape of Bangladesh.
- These objectives collectively aim to provide a comprehensive understanding of the state of data privacy in Bangladesh, offering insights into user awareness, concerns, and obstacles to PPSS adoption.

## **CHAPTER 2**

### **LITERATURE REVIEW**

The existing body of literature on data privacy in Bangladesh presents a diverse range of studies that collectively contribute to our understanding of the complexities and dynamics within the digital realm. This comprehensive review consolidates the key findings from seminal works that address various aspects of data privacy, thereby establishing a foundation for the current research on Privacy-Preserving Software Systems (PPSS) and User Data Protection. Study titled "Data Privacy on the Internet: A Study on Awareness and Attitudes among the Students of the University of Chittagong in Bangladesh" sheds light on the levels of awareness and attitudes among university students, underscoring the necessity for targeted interventions within educational institutions. Delves into the intricacies of privacy concerns in the context of shared mobile device usage in their study titled "Digital Privacy Challenges with Shared Mobile Phone Use in Bangladesh." This research uncovers the interpersonal dynamics and privacy implications that arise from the prevalent practice of sharing mobile phones. In the broader domain of cybersecurity awareness, [3] work provides an "Overview of Challenges and Strategies" in Bangladesh. This study explores the multifaceted challenges faced by individuals and organizations, offering valuable insights into the broader landscape of cybersecurity in the country.[4] Present a comprehensive analysis of "Cyber Security in the Globalized World: Challenges for Bangladesh" from a global perspective. By situating Bangladesh within the larger context of global cybersecurity challenges, the authors highlight the interconnected nature of threats in an increasingly digitized world. In a more focused study, [5] delve into the domain of education with their research on "Privacy, Security and Usability Comparison of Online Learning Platforms in Developing Countries: A Study on Bangladeshi Universities." This study evaluates online learning platforms, identifying gaps in privacy, security, and usability. It specifically addresses the unique challenges faced by students and educators in Bangladesh.[6] concentrate on the vulnerabilities encountered by youth in "Mobile and Internet Communication: Privacy Risks for Youth in Bangladesh." This study acknowledges the distinct privacy risks associated with young individuals' engagement in mobile and internet communication. It emphasizes the necessity for targeted protective measures to address these risks. Expanding the discourse on internet privacy, [7] conduct a study on "User Privacy & Security in Internet: A Concern for Bangladesh." This research explores the broader landscape of user privacy and security concerns in the internet ecosystem, providing a holistic view of the challenges faced by users in the country. Together, these studies offer a nuanced understanding of the data privacy landscape in Bangladesh. They underscore the importance of tailored interventions to address the unique contextual challenges in the country. However, despite the breadth of these contributions, a research gap remains, particularly in comprehending user motivations and decision-making processes regarding the adoption of Privacy-Preserving Security Solutions (PPSS). This research aims to bridge this gap by providing detailed insights and actionable recommendations to enhance data privacy safeguards in Bangladesh.

## CHAPTER 3

### METHODOLOGY

Our research endeavor in Bangladesh focused on unraveling the complexities of data privacy. To capture a comprehensive understanding of user perspectives and experiences, we meticulously crafted our methodology. At the core of our approach was a carefully designed questionnaire, which served as a tool to delve into the consciousness of 84 participants from diverse age groups, occupations, and educational backgrounds (Table 1).

When constructing our survey, we aimed to go beyond a mere series of questions. Instead, we embarked on a thoughtful exploration of participants' comprehension of data privacy threats, their concerns, and their preferences. To ensure clarity and inclusivity, we crafted the questions in a manner that avoided technical jargon, enabling individuals from various walks of life to engage meaningfully.

The selection of our 84 participants was a random occurrence; it was based on the information provided by individuals who filled out the questionnaire form. We intentionally chose individuals who represented the diverse fabric of Bangladesh, encompassing different age categories, professions, and educational levels, as indicated in the responses to our questionnaire (Table 1). This purposive sampling strategy aimed to capture a nuanced understanding of how different segments of the population perceive and engage with data privacy.

Throughout the data collection process, ethical considerations were of utmost importance. We provided participants with transparent information and diligently sought their consent. Privacy was a paramount concern, aligning with the very essence of our exploration. Although the number of participants may seem modest, this deliberate approach allowed us to conduct a deep dive into their responses, ensuring a qualitative exploration of attitudes towards data protection.

Once the data was collected, our subsequent stage involved transforming the raw responses into meaningful insights. To aid in the visualization and analysis of the data, we employed visual aids such as tables. These tools not only enhanced clarity but also facilitated the identification of patterns within the data. By adopting this methodical approach, we were able to gain a richer understanding of the complex landscape of data privacy in Bangladesh.

Our methodology can be described as a directed investigation, an expedition into the complex network of strategies for safeguarding data. Rooted in ethical principles, mindful of individual differences, and supported by a meticulously designed survey, our approach strived not only for comprehensive coverage but also for profound comprehension. Throughout this endeavor, our objective was not solely to acquire information, but to gain insight - a crucial element in unlocking the possibilities for a future in Bangladesh that prioritizes privacy.

## CHAPTER 4

### RESULTS AND DISCUSSION

Table 1: Demographic Information in Bangladesh

<b>Variables</b>	<b>Categories</b>	<b>Percentage</b>
What is your age group?	Below 20	17.9
	20-30	66.7
	31-40	15.5
	41-50	0
	Above 50	0
What is your gender?	Male	60.7
	Female	39.3
	Prefer not to say	0
What is your occupation?	Student	66.7
	IT Professional	19
	Non-IT Professional	7.1
	Self-employed	6
	Other	1.2
What is the highest level of education you have completed?	High School or lower	21.4
	Bachelor's Degree	60.7
	Master's Degree	8.3
	Doctorate Degree	3.6
	Other	6

Table 2: Awareness of Privacy-Preserving Software Systems (PPSS)

<b>Variables</b>	<b>Categories</b>	<b>Percentage</b>
Have you ever heard of privacy-preserving software systems?	Yes	34.5
	No	56
	Not sure	9.5
Have you ever used any software or online service that said it would keep your data private?	Yes	60.7
	No	38.1
	Not sure	1.2
How important do you think it is to keep your data private when using digital services?	Not at all important	6
	Somewhat important	32.1
	Very important	38.1
	Absolutely essential	23.8

Table 3: Usage of Privacy-Preserving Software

<b>Variables</b>	<b>Categories</b>	<b>Percentage</b>
Do you know about any laws or rules in Bangladesh that protect your data privacy?	Yes	31
	No	63.1
	Not sure	6
Have you ever had any problems with your data privacy while using a digital service or software in Bangladesh?	Yes	55.4
	No	42.2
	Prefer not to say	2.4
Do you think Bangladesh's digital services and software systems need to do more to improve data privacy?	Yes	72.3
	No	20.5
	NOT SURE	7.2

Table 4: Data Privacy Practices

<b>Variables</b>	<b>Categories</b>	<b>Percentage</b>
When you use a public Wi-Fi network, do you take any measures to protect your data privacy? (For example, use a VPN)	Yes	26.2
	No	69
	Not sure	4.8
Where do you usually type your password when using a digital service or software?	In public places	4.8
	At home or in private places	31
	Both	64.3
How often do you change your passwords for the digital services or software you use?	Never	15.7
	Once a year	36.1
	Every 6 months	38.6
	Monthly	9.6
Do you use different passwords for different digital services or software?	Yes	45.2
	No	50
	Not sure	4.8

Table 5: Social Media and Data Privacy

<b>Variables</b>	<b>Categories</b>	<b>Percentage</b>
Do you use any social media platforms?	Yes	82.1
	No	16.7
	Not sure	1.2
Do you share personal information (like your full name, address, phone number, etc.) on social media?	Yes	70.2
	No	26.2
	Not sure	3.6

Do you know how to check and change your privacy settings on the social media platforms you use?	Yes	67.9
	No	31
	Not sure	1.2
Do you know how to delete your data from the social media platforms you use?	Yes	56
	No	39.3
	Not sure	4.8

The investigation conducted on data privacy awareness and practices among internet users in Bangladesh, specifically focusing on Privacy-Preserving Software Systems (PPSS), has provided valuable insights from various perspectives. The analysis of demographic factors such as age, gender, occupation, and education levels has revealed intricate patterns in the level of awareness and engagement with PPSS. Within the age group of 20-30 (Table 1), which represents a crucial cohort in digital interactions, it is concerning to note that only 34.5% expressed familiarity with PPSS, while a significant 56% remained unaware (Table 2). This significant gap in awareness highlights the urgent need for targeted educational initiatives. Interestingly, the study also found that only 60.7% of participants reported using software that purportedly safeguards their data, indicating potential disparities between user perceptions and actual privacy practices (Table 2). This finding suggests that individuals may not fully understand the extent to which their data is being protected, or they may have misconceptions about the effectiveness of the software they are using. The research also shed light on the varying perceptions regarding the importance of data privacy. While 38.1% of respondents considered it very important and 23.8% deemed it absolutely essential (Table 2), a concerning 6% indicated that data privacy holds no importance. This poses a significant challenge for advocacy efforts, as there is a need to raise awareness and educate individuals about the importance of safeguarding their personal information. Furthermore, more than half (55.4%) of the participants reported encountering problems with data privacy while using digital services or software in Bangladesh (Table 3). This highlights the real-world implications of privacy challenges faced by users and emphasizes the need for stronger data protection measures. Additionally, a significant majority (72.3%) of the respondents expressed the belief that digital services and software systems in Bangladesh need to do more to enhance data privacy (Table 3). This aligns with global concerns about the adequacy of data protection measures in the digital age and underscores the importance of addressing these concerns at a national level. Examining password and social media practices provided further insights. For example, 26.2% of participants reported taking measures to protect their data privacy on public Wi-Fi networks, indicating a noteworthy proportion with proactive privacy habits. However, it is concerning that 4.8% of respondents were unsure whether they undertake any protective measures, suggesting potential gaps in knowledge or practices (Table 4). This highlights the need for comprehensive education and awareness campaigns to ensure individuals have the necessary knowledge and skills. In the realm of password management, a significant majority of 64.3% of individuals reported typing their passwords in the comfort



of their own homes or in private settings. However, a concerning 4.8% admitted to typing their passwords in public places, which raises valid security concerns. On a positive note, 38.6% of respondents change their passwords every six months, contributing to the promotion of good cybersecurity practices. Conversely, a worrisome 15.7% never change their passwords, thereby posing a potential security risk. Furthermore, the study reveals that a prevalent practice among individuals is the use of different passwords for various digital services, with 45.2% adopting this approach (Table 4). This highlights a conscious effort to enhance security measures in password management. Shifting the focus to social media practices (Table 5), it is evident that these platforms hold a significant influence in the digital landscape, as 82.1% of respondents utilize social media platforms. This widespread usage emphasizes the pervasive nature of social media in today's society. However, it is worth noting that a noteworthy 70.2% of individuals share personal information on these platforms, which signals potential privacy risks. While a considerable percentage of 67.9% claim to possess knowledge on how to check and modify privacy settings on social media, a concerning 56% express uncertainty regarding the deletion of their data from these platforms (Table 5). This uncertainty highlights the need for further education and awareness regarding privacy settings and data management on social media platforms. In conclusion, this study sheds light on the intricate landscape of data privacy awareness, practices, and challenges in Bangladesh. The findings emphasize the necessity for targeted educational campaigns, user-friendly privacy tools, and policy interventions to bridge knowledge gaps, enhance privacy practices, and safeguard user data in the ever-evolving digital environment.

Tables:

Table 1: Demographic Information in Bangladesh

Table 2: Awareness of Privacy-Preserving Software Systems (PPSS)

Table 3: Usage of Privacy-Preserving Software

Table 4: Data Privacy Practices

Table 5: Social Media and Data Privacy

Reference: Survey data collected through a questionnaire distributed to internet users in Bangladesh as part of the study on Privacy-Preserving Software Systems and User Data Protection.



## DISCUSSION

The analysis of Privacy-Preserving Software Systems (PPSS) and user data protection in Bangladesh, conducted through surveys, presents a detailed account of the challenges, perceptions, and practices surrounding digital privacy in the country. This comprehensive exploration, which combines survey responses (Tables 1-5) and insights from the literature review, delves into various aspects that shape the landscape of data security [11]. Demographic information such as age, gender, occupation, and education level provide deeper insights into how different groups perceive and engage with data privacy concerns (Table 1). These variables offer valuable information for developing targeted policy recommendations and educational campaigns that cater to the specific needs of diverse demographic segments. The findings of the study highlight a crucial need for increased awareness and education [1], particularly among individuals aged 20-30. Alarming, 63.1% of this age group lack awareness of data protection laws in Bangladesh [9] (Table 3). This knowledge gap emphasizes the urgency of tailored educational programs that provide essential information about individuals' rights and the risks associated with data misuse. It is evident that there is a significant disparity between the perceived importance of data privacy (38.1%) and the actual utilization of privacy-preserving tools (60.7%). This incongruity presents a pivotal opportunity for interventions that not only emphasize the significance of data privacy [8] but also facilitate accessible means to effectively implement it (Table 2). When examining user experiences, (Table 3) highlights the prevalence of data privacy issues, with 55.4% of individuals encountering problems while using digital services in Bangladesh [2]. This underscores the pressing need for robust data protection measures and signifies an opportunity for businesses and service providers to enhance their security protocols. Furthermore, the overwhelming consensus (72.3%) that digital services need to do more to improve data privacy reflects a collective call for industry-wide improvements (Table 3). (Table 4) provides valuable insights into user behaviors related to data protection on public Wi-Fi networks and password management. It is concerning that only 26.2% of respondents take measures to protect their data on public Wi-Fi networks, indicating a potential lack of understanding or awareness. This presents an opportunity for targeted education initiatives to bridge this gap. Furthermore, the data reveals that only 56% of participants are aware of how to delete their data from social media platforms (Table 5). This highlights the need for enhanced digital literacy programs to ensure that individuals have the necessary knowledge and skills to manage their online presence effectively [5]. Lastly, Table (1-5) captures respondents' perspectives on key aspects, including their level of concern regarding data privacy and their willingness to adopt Privacy Protection and Security Solutions (PPSS). The varying levels of concern among different age groups, genders, and occupations emphasize the importance of adopting a nuanced approach to address the diverse needs and expectations of different user segments. In conclusion, this survey-based analysis sheds light on the complex landscape of data privacy in Bangladesh. It highlights the challenges, perceptions, and practices that shape the digital

environment. The identified gaps and opportunities call for a comprehensive approach that encompasses education, regulation, and technological advancements. As Bangladesh continues its digital journey, the insights from this research serve as a valuable guide for policymakers, businesses, and educators to navigate towards a more resilient, informed, and privacy-conscious digital future.

## CHAPTER 5

### SOCIAL IMPLICATIONS OF THE STUDY

The implications of our survey-based analysis have far-reaching effects that extend beyond the protection of individual data, impacting various crucial aspects within society. The findings highlight the urgent need for improved digital literacy, particularly among individuals aged 20-30 (Table 1), as a significant portion of this demographic lack's awareness of data protection laws (63.1%) (Table 3). It is imperative to implement tailored educational initiatives to bridge this knowledge gap and ensure that everyone has equal access to the advantages of digitalization. The noticeable gap between the perceived importance of data privacy and the actual utilization of privacy-preserving tools indicates a demand for enhanced security protocols by businesses. This study serves as a valuable resource for businesses aiming to align their practices with user expectations, thereby contributing to a more secure digital environment. Insights gained from the study regarding data privacy issues (55.4%) and user dissatisfaction (72.3%) underscore the necessity for change, fostering a collective effort to improve industry standards and regulatory frameworks (Table 3). Equipped with detailed demographic insights, policymakers can develop targeted policies that address the specific concerns of different user segments, thereby promoting a more inclusive regulatory landscape. On a broader societal scale, the study emphasizes the significance of robust data protection regulations and highlights the risks associated with the absence of comprehensive laws in Bangladesh. The proposed "Data Protection Act, 2022," which has faced criticism for potential privacy infringements, calls for a delicate balance between safeguarding individual privacy and establishing effective regulatory frameworks [11]. In conclusion, the social implications of this study extend across various domains, including education, business practices, policymaking, and the overall fabric of society. By unraveling the dynamics of data privacy in Bangladesh, this research equips stakeholders with actionable insights, guiding them towards a future where privacy plays a paramount role in shaping a secure, equitable, and progressive digital society.

## CHAPTER 6

### CONCLUSION

The analysis conducted on Privacy-Preserving Software Systems (PPSS) and the protection of user data in Bangladesh, based on surveys, has resulted in a comprehensive understanding of the current situation. The research has delved into the intricacies of data privacy awareness, user practices, and the socio-legal context in Bangladesh, revealing a nuanced perspective. After careful examination of the extensive data set and gathered insights, several key findings have emerged. Primarily, the survey brings to light the urgent need for comprehensive data protection laws in Bangladesh. The absence of such legal frameworks poses a significant threat to user privacy. The proposed "Data Protection Act, 2022" is under scrutiny due to potential privacy infringements [11], highlighting the crucial intersection where legislation and individual rights converge. Policymakers are urged to refine and implement laws that not only safeguard user data but also align with international standards and uphold constitutional rights [8]. Furthermore, the research highlights a notable disparity between the perceived importance of data privacy and the actual adoption of privacy-preserving measures. Although a significant percentage of individuals acknowledge the significance of keeping their data private while using digital services, the adoption of privacy-preserving software systems remains limited. This calls for a shift in user education and awareness campaigns, specifically tailored to address the unique concerns and requirements of diverse demographic groups. The discussion at hand carries significant societal implications, as businesses hold a crucial position in molding user experiences and impacting data protection measures. The study brings into focus the obligation of businesses to give priority to and establish strong security protocols. Moreover, the research emphasizes the wider ramifications of data breaches and privacy violations, as demonstrated by the instance of Facebook compromising the data of three million Bangladeshi citizens in 2022 [12]. By providing practical insights, this study empowers policymakers, businesses, and individuals to navigate the constantly evolving digital realm.

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