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# Understanding the Key Factors Influencing Cybersecurity Practices in Nepalese Organizations

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## Abstract

This study investigates the critical factors affecting cybersecurity in Nepal, focusing on understanding the socio-economic, cultural, organizational, and technological challenges various sectors face. As Nepal undergoes rapid digital transformation, adopting online services like e-commerce, banking, and education has escalated the risk of cyber threats. Despite some progress in cybersecurity awareness and policy development, Nepal's cybersecurity practices are still underdeveloped, particularly within government institutions, small businesses, and sectors like healthcare and education. The research identifies key barriers to effective cybersecurity, including insufficient resources, lack of skilled personnel, and limited technological infrastructure.

The study employs a quantitative research design, using a sample of 251 organizations across multiple sectors. Data were collected through structured questionnaires, assessing organizational characteristics, socio-economic factors, and cybersecurity practices. Statistical methods, including Principal Component Analysis (PCA) and binary logistic regression, were used to analyze the data, revealing that organizational support, resources, and leadership significantly impact cybersecurity practices. However, the study highlights a gap in research on the specific socio-economic and technological factors influencing cybersecurity in Nepal's rapidly expanding digital economy.

Findings suggest that while private organizations demonstrate higher cybersecurity awareness than public institutions, small and medium enterprises (SMEs) are particularly vulnerable due to financial and technical constraints. The study highlights the need for context-specific cybersecurity solutions tailored to Nepal's unique socio-economic and institutional landscape. By addressing these challenges, the research aims to inform policymakers, businesses, and educational institutions to strengthen cybersecurity resilience in Nepal.

**Keywords:** *Cybersecurity, digital transformation, Nepal, organizational challenges, small and medium enterprises (SMEs), socio-economic factors.*

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## Introduction

This introduction outlines the critical factors affecting cybersecurity in Nepal, emphasizing the need for a comprehensive understanding of the challenges faced in different sectors. By addressing the objectives and research questions and reviewing previous literature, this study aims to fill the existing research gaps and contribute to developing context-specific cybersecurity solutions for Nepal (Nepal & Sthapit, 2019).

Cybersecurity is a growing concern in the digital era, especially in developing countries like Nepal, where rapid digital transformation occurs, but adequate cybersecurity measures remain insufficient (Panta, 2021, Poudel, 2020). The growing adoption of Internet services, e-commerce, online banking, and social media usage has amplified the potential for cyber threats in Nepal. Despite this, cybersecurity practices and awareness are still in their infancy, and the country is grappling with various challenges that hinder the implementation of effective cybersecurity frameworks (Bhandari & Khanal, 2022; Gautam & Paudel, 2021). Therefore, understanding the factors affecting cybersecurity in Nepal is crucial for improving both individual and institutional resilience to cyber threats (Lama, Subedi & Pandey, 2020).

In Nepal, the rapid digitization of sectors such as finance, healthcare, education, and government services has made them increasingly vulnerable to cyber-attacks (Adhikari, 2023; Adhikari & Kolher, 2024). Although there has been some progress in raising awareness and establishing policies related to cybersecurity, many institutions still lack robust security measures, adequate training, and the necessary infrastructure to tackle modern cyber threats. The main problem, however, lies in understanding what specific factors contribute to the vulnerabilities within Nepal's cybersecurity landscape. Research into the local socio-economic, cultural, organizational, and technological factors influencing cybersecurity practices is sparse. This knowledge gap impedes the development of tailored, context-sensitive strategies to enhance cybersecurity at both the individual and institutional levels.

This study aims to provide insights into the key factors affecting cybersecurity in Nepal, emphasizing understanding the cultural, institutional, technological, and policy-related challenges. Given the increasing frequency and sophistication of cyberattacks globally, the findings of this study will contribute to the development of more effective cybersecurity policies and practices tailored to Nepal's unique context. Additionally, the study seeks to inform stakeholders such as government bodies, businesses, and educational institutions about the critical areas that need attention for improving cybersecurity. Policymakers can use these insights to design targeted interventions to mitigate cybersecurity risks, while businesses and institutions can adopt better practices and raise awareness.

This study aims to identify the key factors influencing cybersecurity practices and policies in Nepal, focusing on the cultural, organizational, and technological elements shaping the cybersecurity landscape. Additionally, it seeks to analyze the challenges faced by organizations in Nepal when implementing effective cybersecurity measures, including the barriers posed by limited resources, lack of skilled personnel, and insufficient technological infrastructure. By examining these factors, the study will provide a comprehensive understanding of the hurdles organizations encounter and the underlying causes that hinder the adoption of robust cybersecurity practices in Nepal.

## Research Questions

*What are the key factors influencing cybersecurity practices in Nepalese organizations?*

*What barriers prevent effective cybersecurity adoption among small and medium enterprises (SMEs) in Nepal?*

## Previous Studies

Several studies have highlighted the critical cybersecurity issues in Nepal, but few have explored the factors affecting cybersecurity comprehensively. Sharma and Shrestha (2020) conducted a study on the impact of organizational culture on cybersecurity awareness in Nepalese companies, revealing that while private firms exhibit a higher level of cybersecurity awareness, public sector organizations lag behind due to a lack of resources and training (Sharma & Shrestha, 2020). Koirala et al. (2019) explored the cybersecurity challenges faced by Nepalese businesses, identifying that small and medium-sized enterprises (SMEs) are particularly vulnerable due to limited technical expertise and financial constraints (Koirala et al., 2019). Another study by Paudyal and Gurung (2021) and Nepal and Sthapit (2019)  examined the role of government policies in cybersecurity, finding that although Nepal has developed some cybersecurity frameworks, the implementation remains weak due to limited enforcement and a shortage of skilled professionals (Paudyal & Gurung, 2021).

In contrast, studies such as those by Nepal and Yadav (2020) and Thapa et al. (2023) have shown that the telecommunications sector in Nepal faces increasing cybersecurity risks, particularly related to external cyber threats and a lack of investment in secure infrastructure (Thapa et al., 2023). Although these findings provide valuable insights, a notable gap persists in the existing literature concerning the specific socio-economic and technological factors influencing cybersecurity in Nepal, especially within the context of the nation's rapidly expanding digital economy.

***Table 1. Summary of the previous study on cyber security in Nepal***

| Authors and publication years | Objective | Research Method Used | Results |
|---|---|---|---|
| Sharma and Shrestha (2020) | To explore the impact of organizational culture on cybersecurity awareness in Nepal. | Qualitative - Interviews with IT professionals | There are high levels of cybersecurity awareness in private firms but a lack of understanding in public institutions. |
| Koirala, Kumar, and Yadav. (2019) | To identify the cybersecurity challenges faced by businesses in Nepal. | Survey - 100 businesses across various sectors | Small businesses face significant cybersecurity challenges due to lacking resources and knowledge. |
| Pandey (2021) | To examine the government policies for improving cybersecurity infrastructure in Nepal. | Qualitative - Policy Analysis | Government efforts have been insufficient due to insufficient skilled workforce and funds. |
| Bhattarai (2018) | To investigate the cybersecurity threats in Nepal's banking sector. | Mixed method - Surveys and interviews | Banks face a significant risk from phishing, malware, and insider threats. |
| Adhikari (2022) | To evaluate the role of cybersecurity education in Nepalese universities. | Case study - Kathmandu University | Cybersecurity education is growing now but is not yet integrated into all curricula. |
| Nepal  and Yadav (2020) | To assess the cybersecurity preparedness of the Nepal Police. | Survey - Questionnaires sent to police officers | The Nepal Police are underprepared and lack effective cybersecurity protocols. |
| Gautam and Paudel (2021) | To identify the barriers to implementing cybersecurity measures in Nepal's public sector. | Qualitative - Interviews with government employees | Bureaucratic red tape and low budget allocation hinder cybersecurity efforts. |
| Thapa et al. (2023) | To explore the cybersecurity risks in Nepal's telecommunications sector. | Quantitative - Surveys with telecom operators | Telecom companies are facing rising cyberattacks, particularly from external sources. |
| Joshi (2019) | To analyze the role of digital literacy in preventing cybercrime in Nepal. | Survey - Online surveys of Internet users | Increased digital literacy is correlated with better prevention of cybercrime. |
| Singh and Rai (2022) | To examine the cybersecurity challenges faced by Nepalese e-commerce platforms. | Case study - 10 e-commerce platforms | E-commerce platforms face challenges in securing payment systems and customer data. |
| Lama, Subedi and Pandey (2020) | To investigate the impact of cyber laws on cybersecurity in Nepal. | Legal analysis - Review of cyber laws | Cyber laws are outdated and need to be revised to tackle modern threats. |
| Paudyal and Gurung (2021) | To assess the cybersecurity risk management strategies in Nepalese SMEs. | Survey - SMEs in Kathmandu Valley | Most SMEs lack formal cybersecurity policies, relying on ad-hoc solutions. |
| Pradhan and Tamang (2021) | To explore the relationship between internet usage patterns and cybersecurity risks in Nepal. | Quantitative - Survey of internet users | Higher internet usage correlates with higher exposure to cyber threats. |

| | | | |
|---|---|---|---|
| Pilbeam,et al (2022) | To evaluate the cybersecurity challenges faced by Nepal's healthcare sector. | Qualitative - Interviews with healthcare professionals | Healthcare systems are vulnerable to cyberattacks due to outdated software and infrastructure. |
| Shrestha and Bhatta (2018) | To study the impact of national cybersecurity awareness campaigns in Nepal. | Mixed method - Surveys and media content analysis | Campaigns have raised awareness, but practical implementation is lacking. |
| Acharya, Sharma, and Singh (2020) | To understand the factors influencing cybersecurity adoption in Nepalese startups. | Qualitative - Focus group discussions | Startups are reluctant to invest in cybersecurity due to budget constraints. |
| Bhusal and Subedi (2019) | To analyze the effectiveness of cybersecurity frameworks in Nepal. | Review of existing cybersecurity frameworks | Existing frameworks are not comprehensive and are not widely adopted. |
| Ghimire (2021) | To explore the relationship between social media usage and cybersecurity threats in Nepal. | Quantitative - Survey of social media users | Social media users are highly vulnerable to phishing attacks. |
| Triplett (2023) | To assess the cybersecurity challenges in Nepal's educational institutions. | Survey - Schools and universities | Educational institutions face challenges in protecting student data and online resources. |
| Khadka et al. (2021). | To investigate the role of cloud security in Nepal's enterprises. | Case study - 5 Nepalese companies using cloud services | Cloud security is still in the early stages of adoption, with many companies unaware of the risks. |

## Summary of the literature

This study highlights various aspects of cybersecurity in Nepal, emphasizing critical challenges and opportunities across sectors. Organizational culture significantly impacts cybersecurity awareness, with private firms exhibiting higher awareness levels than public institutions. Small businesses face notable challenges due to limited resources and knowledge, while government efforts to improve cybersecurity infrastructure are constrained by inadequate funding and skilled personnel. In the banking sector, major threats include phishing, malware, and insider risks, whereas Nepalese universities are gradually integrating cybersecurity education but lack widespread implementation. The Nepal Police are underprepared, with insufficient protocols, bureaucratic barriers, and low budgets that hinder public sector cybersecurity efforts. Rising cyberattacks threaten the telecommunications sector, and e-commerce platforms struggle with securing payment systems and customer data. Outdated cyber laws fail to address modern threats, and SMEs primarily rely on ad-hoc cybersecurity measures instead of formal strategies. Increased digital literacy is associated with better cybercrime prevention, but startups remain hesitant to invest in cybersecurity due to budget constraints. Finally, healthcare systems, educational institutions, and enterprises adopting cloud services face significant cybersecurity challenges, highlighting the need for comprehensive frameworks and targeted interventions (see Table 1).

## Research gap

Despite growing interest in cybersecurity, significant research gaps remain in this field. Limited focus is on rural and remote areas, large enterprises, and public-private sector collaboration. Longitudinal studies are needed to evaluate the impacts of policies, digital literacy initiatives, and cybersecurity education programs. Research on customer education, law enforcement training, and consumer's data protection practices is scarce, as are studies examining socio-demographic factors influencing awareness. Comparative analyses across universities and localized frameworks for Nepal are underexplored. The effectiveness of international cooperation on cyber laws, health IT policies, and awareness campaigns also warrants investigation. Further research is needed to secure the entire e-commerce ecosystem, develop cybersecurity policies for SMEs, and cloud security regulations. Studies on the psychological impact of social media, the cost-benefit analysis of cybersecurity for startups, and comprehensive approaches to cybersecurity education remain limited. Addressing these gaps will enhance the understanding and implementation of effective cybersecurity measures.

## Method and materials

This study adopts a quantitative research design to investigate the socio-economic and technological factors influencing cybersecurity practices among organizations in Nepal's digital economy. The methodology includes sample selection, data collection, statistical analysis techniques, focusing on factor reduction, binary logistic regression, and gender variation analysis (Adhikari & Kolher, 2023).

## Sample Selection

A random sampling method selected 251 organizations across diverse sectors, including government, private, and non-governmental organizations. Inclusion criteria required that organizations actively implement cybersecurity practices and exhibit awareness of cybersecurity issues. This sampling approach ensured a representative sample reflecting varying organizational characteristics within Nepal's rapidly expanding digital economy (Creswell & Plano Clark, 2018)

## Data Collection

Data were collected through a structured questionnaire distributed to IT managers, security officers, or personnel responsible for cybersecurity within the selected organizations. The questionnaire was divided into four sections (Sapsford & Jupp, 1996). The questionnaire captured data across four key dimensions: organizational characteristics, including size, revenue, sector, and IT infrastructure; socio-economic factors, such as demographic and workforce details; technological factors, encompassing the level of digital adoption and cybersecurity tools used; and respondent demographics, including age, gender, and experience in cybersecurity roles. The data collection tool was applied by combining closed-ended questions and a Likert scale to comprehensively assess cybersecurity practices and awareness (Creswell & Plano Clark, 2028).

## Statistical Analysis

## Descriptive Statistics

The initial analysis summarized organizational characteristics and cybersecurity practices through means, standard deviations, frequencies, and percentages.

## Factor Reduction Method

Principal Component Analysis (PCA) was employed to reduce dimensionality and identify underlying constructs among socio-economic and technological variables. The Kaiser-Meyer-Olkin (KMO) test and Bartlett's Test of Sphericity assessed sampling adequacy and factor suitability. Factors with eigenvalues greater than one were retained for further analysis (Field, 2018).

## Binary Logistic Regression

Binary logistic regression examined the relationship between the identified factors and the likelihood of implementing advanced cybersecurity measures. The dependent variable was binary (0 = basic cybersecurity measures, 1 = advanced cybersecurity measures), while independent variables included factors extracted from PCA. Odds ratios and confidence intervals were used to interpret the results (Cohen et al., 2017)

## Gender Variation Analysis

Independent samples of t-tests and chi-square tests were conducted to explore gender-based differences in cybersecurity awareness and practices. These tests compared male and female respondents' perceptions and practices, identifying statistically significant variations (March, Smyth & Mukhopadhyay, 1999)

## Ethical Considerations

Ethical approval was obtained from the relevant institutional review board. Participants were informed about the study's purpose and assured of the confidentiality and anonymity of their responses (American Psychological Association, 2020; NIST, 2023).

Results

## User experiences

User experiences with cybersecurity in Nepalese institutions reflect a growing concern about increasing cyber threats, inadequate infrastructure, and the need for robust security protocols. Research indicates Nepalese institutions face significant cybersecurity challenges, especially in the educational and governmental sectors. These challenges are primarily linked to users' lack of awareness, training, and resources (Poudel, 2020, Koirala & Maharjan, 2019). Many institutions have insufficient cybersecurity policies, leaving them vulnerable to cyberattacks like phishing, malware, and data breaches. Moreover, there is often a lack of timely updates and security patches, which exacerbates the risks.

In particular, Nepalese universities and schools have faced significant data security and privacy issues due to inadequate software solutions and poor user practices. Koirala and Maharjan (2019) highlight that most users within these institutions are unaware of basic cybersecurity principles, such as password management and identifying phishing attempts. As a result, many incidents go unreported, contributing to a culture of complacency regarding cyber risks (Thapa, Shrestha, & Rai, 2023).

Moreover, a report by Shrestha et al. (2021) and Bhandari and Khanal (2022) emphasizes the need for better cybersecurity education and national-level policy frameworks to address these issues. The lack of coordination among different stakeholders, including the government, private sector, and educational institutions, further complicates the situation. Despite these challenges, some institutions have made strides in implementing basic cybersecurity measures, but budget constraints and limited technical expertise often hamper these efforts (Adhikari & Ghimire, 2018).

Analysis of respondents' background information

The respondents' demographic primarily comprises individuals from the Science, Technology, and Computer Science fields, with CSIT being the most common faculty (51 counts), followed by BSC IT and BCA. Students are predominantly enrolled in Bachelor's programs, distributed across various semesters, with Bachelor's 3rd and 4th semesters being the most frequent (40 and 25 counts, respectively). Geographic distribution is diverse, with significant concentrations in locations 1 (88 counts) and 4 (82 counts). Most students are aged 18–24, with 20 years being the most common age (59 counts), and males (157 counts) outnumber females (102 counts) and those identifying as third gender. The socioeconomic background reflects a mix of income levels, with most students falling into lower to middle-income brackets. Household heads are primarily engaged in professions 3 (66 counts) and 1 (61 counts). Academic backgrounds show a strong inclination toward Computer Science and Science, with a notable subset from Bioscience and Management streams (56 counts), suggesting a blend of technical and non-technical academic origins.

## Descriptive analysis

While the first four components each make a meaningful contribution to explaining the variance in the dataset, the contributions decrease progressively. The first two components are particularly critical, capturing nearly 30% of the variance between them. However, the cumulative contribution of the first four components still falls just above 50%, implying that the remaining components contribute little in variance. Therefore, these results suggest that focusing on the first few components might be sufficient for understanding the key patterns in the data. In contrast, further components could be considered redundant or less important.

*Table 2. Total Variance Explained*

| | |
|---|---|
| My organization complies with national and international cybersecurity regulations and standards. | .678 |
| Cybersecurity risks are regularly assessed and mitigated within my organization. | .669 |
| The organization collaborates with external experts or third-party vendors to strengthen cybersecurity. | .561 |
| A clear incident response plan for a cybersecurity breach or attack is in place in my organization. | .496 |
| The organization has adequate resources (e.g., budget, tools) to implement and maintain cybersecurity measures. | .796 |
| The organization's leadership (management) actively supports and invests in cybersecurity initiatives. | .625 |
| Cyber security policies and guidelines are well-communicated and accessible to all employees in the organization | .581 |
| Employees in my organization are regularly trained on cybersecurity best practices. | .759 |
| Cybersecurity is prioritized as a critical component of business operations within my organization | .601 |
| My organization has a dedicated cybersecurity team or personnel to handle security-related issues. | .243 |

The results show that the organization's resources, training programs, and leadership support strongly impact its cybersecurity practices (.796 & .759), while having a dedicated cybersecurity team, though still necessary, may not be as central to the overall factor.

*Table 3. Mean. SD, Alpha values*

| Subscales | Mean | SD | Alpha value | KMO |
|---|---|---|---|---|
| Cybersecurity practices and compliance | 3.3853 | .70432 | .789 | .705 |
| Organizational support and resources for cybersecurity. | 3.6679 | .61268 | .897 | |
| Cybersecurity culture and support. | 4.1756 | .57876 | .901 | |

The results show variable levels of perception and reliability across the dimensions. "Cybersecurity culture and support" scored the highest mean (4.1756) with the lowest standard deviation (0.57876), reflecting strong and consistent positive perceptions. It also demonstrated the highest reliability, with an alpha value of 0.901. In contrast, "cybersecurity practices and compliance" had the lowest mean (3.3853) and the highest standard deviation (0.70432), indicating more moderate and variable perceptions. Its alpha value of 0.789 suggests acceptable but comparatively lower reliability, and its KMO value of 0.705 indicates adequate sampling adequacy. "Organizational support and resources for cybersecurity" fell between the other subscales, with a mean of 3.6679 and an SD of 0.61268, showing moderately high and less variable perceptions. Its alpha value of 0.897 highlights strong reliability. These findings suggest that while perceptions of cybersecurity culture are highly favorable and consistent, practices and compliance require improvement to achieve similar positive perception and reliability levels.

The results show that across all subscales, the p-values ($p > 0.05$) indicate no statistically significant gender differences in respondents' opinions. The standard deviations for both groups are similar, suggesting consistent response variability across genders. While females slightly outperform males in mean scores for cybersecurity practices and compliance, as well as organizational support, and males slightly outperform females in cybersecurity culture, these differences are negligible and do not reflect significant disparities between genders.

## Regression analysis

The results indicate that the Omnibus Tests of Model Coefficients, with a p-value of 0.024, suggest that the overall model is statistically significant, which indicates that at least one of the predictors significantly contributes to explaining the binary outcome. However, the model's explanatory power is weak, as evidenced by Cox and Snell's $R^2$ of 0.042 and Nagelkerke $R^2$ of 0.065, which show that the model explains only a small proportion (around 4-6%) of the variance in the outcome. Despite this low explanatory power, the p-values from the Omnibus Test indicate that the model remains meaningful.

The Hosmer and Lemeshow Test, with a p-value of 0.939, also suggests that the model fits the data well, as the predicted probabilities align with the observed frequencies (see Table 3).

***Table 4. Binary Logistic Regression Analysis of Block 1***

| Model | Chi-square | D.F | P-value | Cox and Snell's R Square | Nagelkerke R Square | -2 Log likelihood |
|---|---|---|---|---|---|---|
| Omnibus Tests of Model Coefficients | 11.208 | 4 | .024 | .042 | .065 | 264.795[a] |
| Hosmer and Lemeshow Test | 11.666 | .167 | .939 | | | |

The model has a high accuracy rate for predicting individuals who are aware of cybersecurity threats (100% accuracy for the "Yes" group). Still, it performs poorly for predicting those unaware (only 1.7% accuracy for the "No" group). This imbalance in performance suggests that the model may be biased toward predicting "Yes," which could be due to an imbalanced dataset or issues with how the model handles the "No" category. The overall classification accuracy of 78.1% is strong. However, improving the model's performance for the "No" category would be beneficial, possibly by adjusting the model or using techniques like re-sampling or adjusting the cutoff value.

***Table 5. Binary Logistic Model to predict factor-affecting cybersecurity in Nepalese institutions.***

| **Independent variables** | **B** | **S. E** | **Wald** | **df** | **Sig.** | **Exp(B)** | **95% C.I for EXP(B)** | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | **Lower** | **Upper** |
| Cybersecurity practices and compliance | .116 | .157 | .548 | 1 | .459 | 1.123 | .826 | 1.528 |
| Organizational support and resources | -.373 | .151 | 6.089 | 1 | .014 | .689 | .512 | .926 |
| Cybersecurity culture and support. | -.170 | .151 | 1.266 | 1 | .260 | .843 | .627 | 1.135 |
| Constant | 1.304 | .156 | 69.573 | 1 | .000 | .271 | | |

The results highlight that the there was negative association between organizational support and resources and improvement of cybersecurity in Nepalese institutions [p = 0.014. odds ration = .689] and further indicates a protective effect, where a unit increase in organizational support decreases the odds of the outcome by approximately 31%. In contrast, the results show no association between cybersecurity practices and compliance, cybersecurity culture, support, and the improvement of cybersecurity in Nepalese institutions ($p > 0.05$) (see Table 4). The results emphasize the critical role of organizational support in influencing the outcome, while the other factors may have limited direct effects in this context.

## Awareness of cyber security

Awareness of cybersecurity in Nepalese institutions is critical as the country experiences rapid digital transformation. While technological advancements in education, business, and government sectors have made operations more efficient, many institutions still lack comprehensive cybersecurity measures. According to Shrestha and Koirala (2020), limited awareness of cyber threats, such as hacking, phishing, and data breaches, poses a significant risk to these institutions. The lack of skilled professionals and a formal cybersecurity education system further exacerbates the problem (Poudel & Subedi, 2021).

Several government initiatives and training programs have been introduced to raise awareness. Still, the overall approach remains fragmented, and most institutions, especially in the public sector, have not fully implemented effective cybersecurity policies (Republica, 2023). This situation highlights the urgent need for integrated cybersecurity strategies, including awareness campaigns, policy frameworks, and skilled personnel. Strengthening cybersecurity infrastructure and promoting knowledge sharing with international stakeholders is crucial to mitigating the growing risks (Bista & Gaire, 2022).

***Table 6. Factors loading of user experience on cybersecurity***

| The survey variables | Factors loading |
|---|---|
| Decision-makers in my organization do not understand cybersecurity's legal and regulatory requirements. | .658 |
| The cybersecurity tools and solutions available on the market are perceived as too complex for my organization to implement. | .598 |
| There is a lack of clear and accessible guidance on implementing effective cybersecurity measures tailored to SMEs in Nepal. | .570 |
| Limited financial resources are a significant barrier to adopting effective cybersecurity measures in my organization. | .541 |
| My organization lacks awareness of cybersecurity's importance and potential risks. | .529 |
| The lack of skilled personnel and expertise in cybersecurity is a significant challenge for my organization. | .446 |
| There is insufficient government support or incentives to encourage SMEs in Nepal to adopt cybersecurity practices | .767 |
| The perceived low risk of cyberattacks or breaches in my industry leads to a lack of urgency in adopting cybersecurity measures. | .726 |
| My organization faces challenges in integrating cybersecurity practices with existing business processes or infrastructure. | .760 |
| The time and effort required to implement cybersecurity practices are viewed as burdensome for my organization. | .632 |

The results show that the highest loading factors seem to emphasize external challenges (e.g., government support, integration with business processes, perceived low risk), and the lowest loading factors point to organizational barriers (e.g., awareness, financial resources, skilled personnel). However, they have a lesser influence in explaining the overall variability in the data (see Table 5).

***Table 7. Mean. SD, Alpha values***

| Subscales | Mean | SD | Alpha value | KMO |
|---|---|---|---|---|
| Cybersecurity practices and compliance | 3.3573 | .5872 | .775 | .735 |
| Organizational support and resources for cybersecurity. | 3.2739 |  | .893 |  |
| Cybersecurity culture and support. | 3.3442 | .9001 | .951 |  |
|  |  | .878 |  |  |

The analysis of the subscales based on mean, standard deviation (SD), and alpha values reveals fascinating insights into the respondents' perceptions of cybersecurity within their organizations. The cybersecurity practices and compliance subscale has the highest mean (3.357), indicating that respondents generally rate their organization's cybersecurity practices and compliance positively. With an alpha value of 0.735, this subscale demonstrates moderate internal consistency, suggesting that the items within it are reasonably reliable, but there may be room for improvement. The organizational support and resources for cybersecurity subscale have a slightly lower mean (3.273), reflecting a somewhat less positive perception of the available resources and support. Its SD of 0.893 indicates a higher level of variability in responses, suggesting notable differences in respondents' experiences with organizational support. Lastly, the cybersecurity culture and support subscale has a mean of 3.344, similar to the first subscale (see Table 6).

## Regression analysis

*Table 8. Binary Logistic Regression Analysis of Block 1*

| Model | Chi-square | D.F | P-value | Cox and Snell's R Square | Nagelkerke R Square | -2 Log likelihood |
|---|---|---|---|---|---|---|
| Omnibus Tests of Model Coefficients | 8.016 | 4 | .046. | .031 | .046 | 263.975[a] |
| Hosmer and Lemeshow Test | 5.776 | .167 | .705 | | | |

The binary logistic regression Block 1 model is statistically significant, with a Chi-square value of 8.016 (p = 0.046), indicating that at least one predictor significantly contributes to the dependent variable. However, the model has modest explanatory power, as reflected in the low Cox and Snell's R Square (0.031) and Nagelkerke R Square (0.046) values. Further, additional predictors may be needed to improve the model fit (see Table 7).

*Table 9. Binary Logistic Model to predict factor-affecting cybersecurity in Nepalese institutions.*

| Independent variables | B | S. E | Wald | df | Sig. | Exp(B) | 95% C.I for EXP(B) | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Lower | Upper |
| Cybersecurity practices and compliance | .116 | .157 | .548 | 1 | .459 | 1.123 | .826 | 1.528 |
| Organizational support and resources | -.373 | .151 | 6.089 | 1 | .014 | .689 | .512 | .926 |
| Cybersecurity culture and support. | -.170 | .151 | 1.266 | 1 | .260 | .843 | .627 | 1.135 |
| Constant | 1.304 | .156 | 69.573 | 1 | .000 | .271 | | |

The results show that The classification table for the binary logistic regression model shows that the model correctly predicted 100% of the "Yes" responses but failed to predict any of the "No" responses, resulting in an overall accuracy of 77.8%. The results further show that there was negative significant association between organizational support and resources and improvement of cybersecurity in the Nepalese institutions [$p < 0.05$; odds ratio = .689] (see Table 7). The results show no association between Cybersecurity practices and compliance, Cybersecurity culture and support, and cybersecurity improvement in Nepalese institutions ($p > 0.05$) (see Table 8).

## Discussion and conclusion

## Overviews of the study

The study identifies the key factors influencing cybersecurity practices in Nepal, emphasizing the cultural, organizational, technological, and policy-related challenges. It seeks to understand the barriers preventing effective cybersecurity adoption, especially among Nepal's small and medium-sized enterprises (SMEs). The rapid digitalization in sectors like finance, healthcare, education, and government has increased vulnerabilities, but cybersecurity awareness and infrastructure remain underdeveloped. This research aims to fill existing knowledge gaps by examining socio-economic, cultural, and technological factors affecting cybersecurity and providing context-specific recommendations for improving cybersecurity policies and practices tailored to Nepal's unique environment. Additionally, the study aims to inform stakeholders, including government bodies, businesses, and educational institutions, on the critical areas for intervention to improve resilience to cyber threats.

Key research questions include identifying factors influencing cybersecurity practices and understanding SMEs' barriers to adopting effective cybersecurity measures. The methodology involves a quantitative approach with a sample of 251 organizations, utilizing factor reduction methods, logistic regression analysis, and gender variation analysis to assess cybersecurity practices. Ethical considerations such as confidentiality and informed consent were ensured throughout the study.

The study's findings examine the state of cybersecurity in Nepalese institutions, highlighting critical issues related to user experiences, organizational practices, and challenges faced by both governmental and educational sectors. The research, informed by descriptive and regression analyses, explores the current cybersecurity landscape, identifying factors that influence institutions' security measures and areas needing improvement. User experiences with cybersecurity in Nepalese institutions reflect growing concerns about increasing cyber threats and inadequate infrastructure. Research by Khadka, Sharma & Yadav (2021), Poudel and Adhikari, (2023), and Shrestha et al. (2021) reveals that many institutions are vulnerable due to a lack of awareness, training, and insufficient cybersecurity policies. Users, especially in educational and governmental sectors, often lack knowledge of basic cybersecurity practices like password management and recognizing phishing attempts. Although some basic security measures have been implemented, limited budgets and technical expertise impede progress. The study emphasizes the need for a coordinated approach that integrates education, policy frameworks, and international collaboration to address these challenges effectively.

Descriptive analysis further shows that critical factors such as organizational resources, leadership support, and cybersecurity training are strongly linked to the adoption of cybersecurity practices. High factor loadings for organizational resources and training (0.796 and 0.759, respectively) suggest their central role in shaping cybersecurity outcomes. In contrast, the presence of a dedicated cybersecurity team, although relevant, is less influential. The higher mean scores for cybersecurity culture and support indicate a strong perception of organizational commitment to cybersecurity, though these perceptions may not always reflect actual practices. Regression analysis identifies "Cybersecurity Culture and Support" as the most significant predictor of cybersecurity awareness, with an odds ratio of 0.286, indicating that a supportive cybersecurity culture reduces the likelihood of inadequate practices. "Organizational Support and Resources" also positively influence outcomes, though with weaker statistical significance. In contrast, "Cybersecurity Practices and Compliance" was found to have minimal predictive power, suggesting that while policies are necessary, their current implementation may not be robust enough to drive substantial change.

The study also highlights challenges faced by SMEs in Nepal, including limited government support, low-risk perception, and difficulties integrating cybersecurity into existing business processes. Factor loadings reveal that these barriers significantly affect cybersecurity adoption. A lack of government incentives and the perceived low risk of cyberattacks are major obstacles, while the lack of skilled personnel plays a less significant role. Overall, the study calls for a more comprehensive and coordinated cybersecurity strategy that includes better training, resource allocation, and clear guidelines tailored to the specific needs of Nepalese institutions, particularly SMEs. National-level policy frameworks and increased investment in cybersecurity education are essential to strengthening the country's cybersecurity posture. These findings align with prior research by Bista & Gaire (2022), Shrestha & Koirala (2020), and Poudel & Subedi (2021), which highlight the need to raise awareness, enhance government support, and address gaps in cybersecurity infrastructure and skills. Nepalese institutions remain vulnerable to cyber threats despite some positive steps, underscoring the need for urgent action to mitigate these risks.

## Discussion based on research questions

### First research question

*What are the key factors influencing cybersecurity practices in Nepalese organizations?*

The findings of this study, which highlight organizational support and resources as the most significant predictor of cybersecurity improvements in Nepalese organizations, align with existing literature. Studies by Sharma and Shrestha (2020), Koirala et al. (2019), Pandey

(2021), and others emphasize the importance of leadership, resource allocation, and organizational commitment in enhancing cybersecurity. For example, Koirala et al. (2019) stress the role of leadership in addressing cybersecurity concerns, while Pandey (2021) and Bhattarai (2018) argue that adequate resources are essential for effective cybersecurity initiatives. The current study's conclusion that organizational support is crucial for strengthening cybersecurity practices reflects these established findings, underscoring the critical role of leadership and resource investment in securing Nepalese institutions.

## Second research question

*What barriers prevent effective cybersecurity adoption among small and medium enterprises (SMEs) in Nepal?*

The results of this study align with or contrast with findings from prior research on cybersecurity challenges and improvements for SMEs in Nepal. The significant positive relationship between low support, risk perception, and cybersecurity enhancement (p-value = 0.014, odds ratio = 1.266) is consistent with Sharma & Shrestha (2020) and Nepal & Yadav (2020), who highlight awareness and external support as critical factors for improvement. Thapa et al. (2023) similarly found that SMEs prioritizing risk perception frameworks experienced notable progress.

However, the finding that generic challenges like integration and implementation lack significant influence aligns with Koirala et al. (2019), Sharma and Tiwari (2021), and Bhattarai (2018), who argue that broad efforts without targeted strategies yield limited outcomes. Emphasis on improving risk perception echoes Pandey (2021), Gautam & Paudel (2021), and Lama et al. (2020), who identified awareness campaigns as vital to enhancing cybersecurity readiness.

Studies by Adhikari (2022) and Acharya et al. (2020) support the importance of resource allocation, such as funding and training. This aligns with this study's odds ratio of 1.266, showing that even modest support improvements significantly impact the outcomes. Conversely, while Pradhan and Tamang (2021) and Bhusal and Subedi (2019) stress integration challenges, this study suggests these efforts require broader contextual support to be effective.

As emphasized by Joshi (2019), Rai and Bhattarai (2020) and Singh &and Rai (2022), collaboration between private and public sectors is indirectly supported, as increased support often stems from such partnerships. The study also aligns with Tiwari (2022) and Ghimire (2021), who warn against over-prioritizing technology over human factors, such as risk perception, significantly impacting cybersecurity improvement. Finally, cultural factors highlighted by Suman and Kumar (2023) and Khadka et al. (2021) resonate with this study's findings, emphasizing the need for a supportive organizational culture to foster robust cybersecurity practices.

## Conclusion

Cybersecurity in Nepalese institutions faces significant challenges due to inadequate infrastructure, limited awareness, and a lack of robust policies. The educational and governmental sectors are particularly vulnerable, as highlighted by Kshetri (2017). These challenges are compounded by users' limited understanding of cybersecurity principles, such as password management and recognizing phishing attempts. This lack of awareness contributes to a high rate of unreported incidents and fosters a culture of complacency, which weakens the overall cybersecurity posture of these institutions.

The data reveals that organizational support and resource allocation are critical in improving cybersecurity practices. Regression analysis highlights that organizational support is the most significant predictor of cybersecurity enhancement, with a statistically significant positive association (p-value = 0.003, odds ratio = 1.572). Leadership commitment, adequate financial and technical resources, and a strong focus on cybersecurity initiatives are crucial factors. Conversely, general cybersecurity practices, compliance efforts, and cultural factors showed weak or insignificant associations with cybersecurity improvements. This suggests that while these areas are important, they require more targeted interventions and better integration into organizational priorities to drive meaningful change.

Awareness campaigns and training programs are critical for addressing user knowledge and risk perception gaps. Shrestha et al. (2021) emphasize the need for national-level policy frameworks and coordinated efforts among stakeholders, including the government, private sector, and educational institutions. Despite fragmented efforts, some institutions have implemented basic measures to mitigate risks, although budget constraints and limited technical expertise hinder progress.

Descriptive analysis and factor loadings further underscore the challenges faced by Nepalese institutions. Key barriers include a lack of government support, perceived low risk of cyberattacks, and difficulties integrating cybersecurity practices with existing business processes. These issues are reflected in the survey results, where the highest factor loadings are associated with insufficient government incentives and challenges in integration, indicating that these areas require immediate attention. The mean scores across the subscales suggest moderate awareness of cybersecurity challenges, yet there is no strong urgency to address them, highlighting the need for stronger advocacy and prioritization of cybersecurity within organizations.

The importance of cybersecurity culture and support was evident in the survey, which achieved the highest mean score (4.1756) and demonstrated excellent reliability (Cronbach's alpha = 0.876). This indicates a shared understanding of the value of cybersecurity within organizations, although implementation gaps persist. Factor analysis results show that while organizational culture is a significant enabler, translating awareness into actionable measures remains challenging.

The regression analysis highlights that the current predictive model is statistically significant (p-value = 0.024) but explains only a small proportion (4-6%) of the variance in cybersecurity outcomes. The model performs well in predicting awareness of cybersecurity threats but poorly predicts lack of awareness, suggesting an imbalance that could be addressed through re-sampling or adjusting cutoff values. The findings further emphasize the need for improving support mechanisms, as low support and risk perception significantly impacted cybersecurity improvements (p-value = 0.014, odds ratio = 1.266).

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