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With great enthusiasm, we present the first edition of Orchid Insights: A Multidisciplinary Journal of Orchid College. It is a peer-reviewed journal, committed to promoting quality research across various fields, including science, technology, management, and social sciences. It aims to provide a platform for researchers, scholars, professionals, and students to share their innovative ideas, critical analyses, and empirical findings. Interdisciplinary studies have become increasingly significant in addressing complex global issues, and Orchid Insights seeks to promote such studies by inviting submissions that bridge multiple disciplines. This inaugural issue demonstrates the journal's commitment to diversity and academic rigor, with research articles covering information technology, workplace dynamics, business management, ICT applications, and Nepali literature. Having two Nepali literature articles also bears witness to our commitment to cultural and intellectual diversity. We take the pleasure of extending our heartfelt thanks to authors, reviewers, and editorial team whose efforts have made this publication possible to be released. We also appreciate the

Principal, Director and administration of Orchid International College for their support and management in launching this journal. As we set out on this academic journey, we welcome constructive feedback and anticipate future contributions that will enrich scholarly discourse. We hope this inaugural issue inspires further research and dialogue within and beyond our academic community.

Editor-in-Chief

Orchid Insights: A Multidisciplinary Journal of Orchid College

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Age Diversity Management and Bridging Generational Gaps for Organizational Productivity: A Theoretical Study

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Abstract:

In today's increasingly age-diverse workforce, organizations are encountering both challenges and opportunities in managing generational differences. This study investigates the impact of age diversity management on organizational productivity, focusing on strategies that bridge generational gaps between Baby Boomers, Generation X, Millennials, and Generation Z. Through a comprehensive review of literature and empirical analysis, this research explores how effective age diversity management contributes to employee engagement, collaboration, and overall productivity. It highlights the importance of fostering an inclusive work environment that values the unique strengths of each generation. The study further discusses the role of leadership in facilitating cross-generational collaboration and the potential for innovation through diverse perspectives. By addressing generational differences and promoting inclusivity, organizations can harness the potential of a multi-generational workforce to enhance productivity and drive sustainable growth. The findings provide practical insights for HR professionals and organizational leaders aiming to optimize workforce diversity for competitive advantage.

Key Words: Age diversity, generational gaps, organizational productivity, workplace diversity, Generational theory, Human resource management

1. Introduction:

In the rapidly evolving landscape of the modern workplace, age diversity has emerged as a pivotal aspect shaping organizational dynamics and performance. With multiple generations coexisting within workforces, organizations are increasingly recognizing the potential benefits of leveraging age diversity to drive innovation, enhance problem-solving capabilities, and foster a culture of inclusivity.

The presence of distinct generational cohorts, including Baby Boomers, Generation X, and Millennials, brings diverse perspectives, values, and communication styles to the workplace. Baby Boomers (cohort born between 1946 and 1964), are often characterized by a strong work ethic and value loyalty and stability in their careers. Generation X (born between 1965 and 1980), is known for its entrepreneurial spirit and preference for work-life balance. Millennials (born between 1981 and 1996), prioritizes flexibility, collaboration, and social responsibility in their work environments.

Despite the opportunities presented by age diversity, organizations face challenges managing generational differences and harnessing the full potential of their diverse workforce (Notter and Grant, 2013). This study explores the dynamics of age diversity management, seeking to uncover factors that influencing organizational productivity and effectiveness.

By examining the attributes of different generational cohorts, the study aims to provide strategies for bridging generational gaps and fostering synergy among employees (Helyer citation). A deeper understanding of these dynamics can help organizations cultivate collaboration, innovation, and resilience, driving sustainable growth in the modern workplace.

The workplace today includes the primary generations (Baby Boomers, Generation X, and Millennials), each bringing unique perspectives shaped by their societal, technological, and cultural contexts. Effectively managing these generational differences is crucial for optimizing productivity and fostering a harmonious work environment. Research shows that both intrinsic and extrinsic motivational factors significantly influence decision-making across these groups (Lester et al., 2002).

Navigating the complexities of multi-generational workforces requires a nuanced understanding of the diverse needs and preferences of each cohort. Studies indicate that generational differences can manifest in various ways, ranging from communication styles and work habits to attitudes towards authority and technology adoption (Branscum and Sciaraffa, 2013).

Consequently, managing generational diversity goes beyond simply accommodating the needs of older workers; it involves creating an inclusive environment where employees of all generations feel valued, respected, and empowered to contribute their unique perspectives and talents.

Despite the potential benefits of a multi-generational workforce, conflicts and tensions can arise due to misaligned expectations and value systems. Research underscores the importance of proactive interventions to mitigate such conflicts and maintain organizational cohesion and productivity (Hillman, 2014).

By implementing age-inclusive policies, fostering intergenerational mentorship and collaboration, and providing opportunities for continuous learning and development, organizations can leverage the strengths of each generation and create a culture of mutual respect and understanding. In doing so, they can enhance organizational productivity, innovation, and adaptability in an ever-changing business landscape (Hillman, 2014).

In today's diverse workplace, having a mix of different age groups can be a positive factor for improving organizational productivity. When multiple generations work together, organizations can benefit from the unique perspectives, experiences, and skills that individuals of different ages bring (Wolff et al., 2016). Research suggests that teams with age diversity tend to be more creative, innovative, and effective at problem-solving because of the varied approaches and insights contributed by members from different age groups (Twenge et al., 2012). Age diversity also creates opportunities for knowledge sharing and mentorship, allowing organizations to tap into a wealth of collective wisdom and expertise.

However, age diversity also presents significant challenges that can hinder organizational productivity despite the potential benefits. Studies have highlighted the existence of generational gaps in workplace values, communication styles, and work preferences, which can lead to conflicts, misunderstandings, and decreased cohesion among team members (Twenge et al., 2012). Moreover, age discrimination and stereotypes remain prevalent in many workplaces, impeding opportunities for collaboration, advancement, and engagement among employees of different age groups.

The purpose of this study is to provide a comprehensive understanding of how age diversity influences organizational performance and to identify strategies for leveraging diverse age groups to foster collaboration and productivity. It addresses three key questions: (1) How does age diversity affect organizational performance? (2) What primary challenges do organizations face in managing age diversity in the workplace? (3) What strategies are most effective in bridging generational gaps and promoting collaboration to boost productivity?

The study draws on three key theoretical frameworks: Socio-emotional Selectivity Theory (SST), Generational Theory, and Contingency Theory to explore the dynamics of age diversity and its

implications for organizational productivity. SST suggests that emotional satisfaction becomes a priority as individual's age, influencing workplace interactions (Carstensen, 1992). Generational Theory adds context by highlighting how historical and cultural shifts shape generational perspectives (Howe et al., 2008). Contingency Theory emphasizes the need for organizations to adapt their strategies to diverse generational needs to foster collaboration and enhance productivity (Donaldson, 2001).

2. Materials And Methods:

The methodology of this study includes a thorough and systematic approach to identify, select, and analyze scholarly articles on age diversity management. This technique aimed to offer detailed insights into practical strategies for bridging generational gaps and promoting organizational efficiency in varied workplace situations by drawing on well-established theoretical frameworks and empirical studies.

The methodology involves an extensive literature review and discussions with experts to identify key themes and emerging issues related to age diversity management and its impact on organizational productivity. The theme was then developed, focusing on the challenges and opportunities of managing age diversity, which led to the selection of a specific research topic aimed at exploring gaps in existing studies and their implications for workplace productivity.

A systematic search strategy was developed to identify scholarly articles related to age diversity, generational differences, and organizational productivity from reputable academic databases like Scopus, Web of Science, and Google Scholar. Only peer-reviewed articles authored by recognized scholars and indexed in reputable databases such as Scimago and ABDC were included, while non-academic sources and substandard journals were excluded. The selected articles were organized in an Excel sheet, detailing key information such as the article title, authors, publication year, journal name, methodology, key findings, and theoretical frameworks for systematic analysis.

An empirical review of selected articles provided Comparative analysis of methodologies and key findings related to age diversity management. This analysis identified strategies, such as mentoring programs and flexible work arrangements, which can bridge generational gaps and foster innovation. By promoting intergenerational collaboration and creating inclusive environments, organizations can better leverage the strengths of their diverse workforce to drive sustainable growth.

Empirical Analysis:

The empirical review of this study integrates insights from a range of scholarly articles, providing a comprehensive understanding of age diversity management and its impact on organizational effectiveness.

S.N	Author	Topic	Findings	Theory
1	Hans-Georg Wolff et al. (2016)	Managing Age Diversity in the Workplace: The Role of Organizational Justice Perceptions and Leader Behavior In Enhancing Organizational Commitment	Positive correlation between organizational justice perceptions, leader behavior, and organizational commitment across age groups	Organizational justice theory, leadership theory
2	Jean M. Twenge and Stacy M. Campbell (2008)	Generational Differences in the Workplace: A Review of the Evidence and Directions for Future Research	Identified generational shifts in work values and attitudes	Generational theory, workplace diversity theories
3	Jean M. Twenge et al., (2012)	Generational Differences in Work Values: Leisure and Extrinsic Values Increasing, Social and Intrinsic Values Decreasing	Found shifts in work values among generations, with increasing emphasis on leisure and extrinsic rewards	Generational theory, work motivation theories
4	Jeyaraj Vadiveloo and Wendy Amey (2019)	Generational Differences in the Workplace: A Review of the Empirical Evidence and Implications	Reviewed empirical evidence on generational differences in various workplace aspects	Generational theory, organizational behavior theories
5	Jamie Notter and Maddie Grant (2013)	Managing Multigenerational Workforces: Strategies and Frameworks for Success	Identified successful management strategies for multigenerational workforces	Leadership theories, organizational change theories
6	Donaldson, L. (2001)	The contingency theory of organizations	Contingency Theory proposes that organizational practices should be contingent upon environmental factors and internal conditions.	Contingency Theory
7	Howe et al., (2008)	Generations of Americans: A Big Picture Look at the Future of Higher Education	Generational Theory: historical events and cultural shifts shape generational values, behaviors, and attitudes.	Generational Theory
8	Lester, S. W et al., (2002)	The antecedents and consequences of group potency: A longitudinal investigation of newly formed work groups	Group potency predicts team performance and member satisfaction over time.	Socioemotional selectivity theory
9	Branscum et al., (2013)	Teaching future educators to understand and bridge generational gaps	The study explores strategies for bridging generational gaps in educational settings.	Generational Theory
10	Hillman et al., (2014)	Generational conflict in the workplace	Generational differences may lead to conflict in the workplace.	Generational Theory

Wolff et al. (2016) emphasized the importance of fair treatment and effective leadership in managing age diversity, finding that equity and respect enhance organizational commitment and productivity.

Twenge et al. (2012) highlighted the challenges of managing generational diversity, stressing the need for inclusive practices to foster team collaboration and improve organizational productivity.

Vadiveloo and Amey (2019) identified key areas of divergence and convergence among age groups, providing recommendations for fostering collaboration in multigenerational teams to optimize productivity.

Lester et al. (2002) explored factors influencing team effectiveness, showing how age diversity can impact teamwork and productivity in organizations.

Branscum and Sciaraffa (2013) examined strategies for improving collaboration among educators from different generations, offering insights for managing age diversity and boosting productivity.

Hillman (2014) addressed generational conflict in the workplace, emphasizing the importance of managing age differences to reduce conflict and improve organizational effectiveness.

Carstensen (1992) supported socioemotional selectivity theory, showing how emotional satisfaction influences workplace interactions and the importance of understanding emotional needs for effective age diversity management.

Donaldson (2001) introduced contingency theory, highlighting the need for flexible strategies that adapt to generational preferences to maximize productivity and inclusivity in organizations.

Howe et al. (2008) examined the impact of generational differences on higher education, stressing the need to adapt teaching methods to diverse learning styles for effective age diversity management.

Notter and Grant (2013) provided practical strategies for managing multigenerational workforces, offering recommendations to leverage the strengths of different age groups and improve organizational performance.

The conceptual framework of the study draws upon Buss's (1974) generational theory, which posits that individuals' behaviors and perspectives are influenced by the historical and social context of their generational cohort. Mannheim's perspective further underscores how shared experiences within generational cohorts shape self-awareness and societal attitudes. Additionally, Lester et al. (2002) highlight generational cohort theory as a social structure that distinguishes individuals based on the period in which they were born.

This framework provides a lens through which to examine the complexities of multigenerational workplaces and the challenges faced by managers in fostering collaboration and productivity across different age groups (Howe et al., 2008; Lester et al., 2002). By integrating these theoretical perspectives, the study aims to elucidate the underlying factors contributing to generational differences in the workplace and propose strategies for effective age diversity management.

Operational Definitions:

Baby Boomers (Boomers): Individuals born between 1946 and 1964, constituting a significant generational cohort characterized by their experiences, values, and social influences (Lester et al., 2002).

Generational cohort: An age group of individuals who share common birth years, geographical location, and significant life events, contributing to the formation of distinct generational identities (Lester et al., 2002).

Generation X (Gen X, Gen Xers, latchkey kids): Individuals born between 1965 and 1979, representing a unique generational cohort marked by their upbringing, cultural influences, and societal experiences (Lester et al., 2002).

Millennials (Generation Y, Gen Y): Individuals born between 1980 and 1999, characterized by their digital nativism, diverse perspectives, and unique approach to work and life (Lester et al., 2002).

3. Results And Discussion:

This study offers comprehensive insights into the complexities of age diversity management and its influence on organizational productivity. The research reveals that while age diversity introduces a variety of skills, experiences, and perspectives that can significantly enhance organizational performance, it also presents challenges related to managing the differing needs, values, and expectations of various generational cohorts. These differences can create potential friction in areas like communication, work habits, and motivation. However, when organizations adopt strategies that are specifically designed to cater to these diverse needs, such as phased retirement plans, flexible work schedules, and cross-generational mentorship programs, they can effectively harness the strengths of each age group. This not only promotes collaboration but also enables the transfer of knowledge between younger and older employees.

Moreover, the findings underscore the pivotal role of fair treatment, inclusivity, and strong leadership in fostering a productive work environment. Leaders who prioritize equity and ensure that all employees feel valued, regardless of their age, contribute to higher levels of organizational commitment and engagement.

The study emphasizes that creating a workplace culture where respect and recognition are central leads to increased innovation, resilience, and long-term success. By addressing the unique challenges of managing a multigenerational workforce, the report suggests that organizations can turn age diversity from a potential obstacle into a key driver of growth. Ultimately, the findings highlight the importance of embracing age diversity management as a strategic priority for cultivating a more harmonious and productive workplace.

4. Conclusion:

The study shows that effective age diversity management is a crucial factor in enhancing organizational productivity by harnessing the unique skills, perspectives, and experiences of a multigenerational workforce. Addressing the diverse needs, expectations, and preferences of employees from different generational cohorts—such as Baby Boomers, Generation X, and Millennials—creates a more inclusive and dynamic workplace. Organizations that accommodate these generational differences through strategies like flexible work arrangements, phased retirement, and adaptive schedules foster an environment where all employees feel respected and motivated to contribute their best.

However, challenges such as communication gaps, differing work styles, and generational stereotypes can hinder productivity if not properly managed. The study emphasizes that targeted strategies, including fair and inclusive leadership, mentoring programs, and policies that promote equity, are essential in

mitigating these challenges and turning diversity into an asset. Leaders who prioritize inclusivity and fairness enable knowledge sharing, collaboration, and innovation, ensuring that generational differences enhance rather than disrupt organizational cohesion.

Ultimately, the research underscores the importance of making age diversity management a strategic priority. Organizations that embrace age diversity will be better positioned to adapt to changing business environments, innovate, and remain competitive. By effectively managing the varied strengths of a multigenerational workforce, companies can drive long-term success, resilience, and sustained growth. In doing so, they position themselves to thrive in a rapidly evolving landscape, leveraging the collective wisdom of their employees to enhance teamwork and productivity.

5. Funding Statement:

This study did not receive funding from any specific grant or funding agency.

6. Completing Interest:

The authors confirm that they have no competing interests to declare.

7. Acknowledgement:

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The Impact Study of Liquidity Analysis on Profitability of Nabil Bank Limited

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Abstract:

This study examines the impact of liquidity analysis on the profitability of Nabil Bank Limited over a five years period (2018/19-2022/23). Liquidity management is critical for financial institutions as it ensures operational stability while maintaining profitability. This research employs key liquidity indicators such as the Current Ratio, Quick Ratio and Loan-to Deposit used to measure profitability. The findings reveal that Nabil Bank maintains a strong liquidity position, with an average current ration of 2.36 and an LDR of 84.96%, indicating effective liquidity management. However, the study identifies a negative correlation between liquidity and profitability, as both ROA and ROE exhibit a declining trend over the study period. While higher liquidity enhances short-term financial stability, excessive liquidity may hinder profitability by limiting investment opportunities. The study suggests that an optimal balance between liquidity and profitability is essential for long term financial sustainability. Given the study's reliance on secondary data and a limited timeframe, future research should incorporate primary data and a broader sample to enhance the findings.

Key Words: Assets utilization, banking sector, Commercial banks, financial performance, Nepalese banking industry.

1. Introduction:

The liquidity of an organization is considered as the most important component for it to pay its current liabilities. It includes payment of obligation and the other financial expenses which are considered as short term (Pandey and Budhathoki, 2020). There is an inverse relationship between liquidity and profitability; increasing one often requires sacrificing the other. Liquidity is the ease of converting assets into cash without impacting market price (Hayes, 2023a). It involves managing current assets and liabilities. A firm that meets financial obligations promptly is deemed liquid, enhancing its reputation (Kaodui et al., 2020). Liquidity analysis assesses a company's ability to cover short-term obligations using liquid assets.

Profit is a financial benefit that is realized when the amount of revenue gained from a business activity exceeds cost and taxes needed to sustain the activity (B. Adhikari, 2024). Profitability suggests the capability of the company in earning income on its property. Profitability is defined as an ability to make profit from all the business activities of an enterprise (Khati, 2020).

In other words, it is an ability of a company to generate revenues in excess of its expenses. Furthermore, profitability is a reflection of how banks are operating under a given environment.

Liquidity is essential for business survival, requiring a balance to ensure profitability and operational effectiveness (Pandey & Budhathoki, 2020). Excess liquidity reduces profitability, while inadequate liquidity disrupts operations. The Nepal Commercial Bank Act 2031, 1(f) defines liquidity as including bank vault cash, deposits, and specified liquid assets, with minimum stock ratios regulated by Nepal Rastra Bank (Bhusal, 2022).

According to Gautam (2020), liquidity is a financial institution's ability to meet cash and collateral obligations without incurring significant losses. It reflects the ease with which securities can be converted into cash without impacting their market value. Liquidity depends on the balance between cash assets, quickly convertible assets, and liabilities due for payment. It also indicates a company's capacity to meet short-term obligations like bills and payroll, as well as long-term commitments like loan repayments. Key factors influencing liquidity include asset quality,

funding sources, and market conditions.

Shafana (2015) noted that holding a high proportion of current assets strengthens liquidity but may reduce profitability. Umobong (2015) emphasized that a firm's survival depends on generating profits and attracting investors. Lartey, Antwi, and Boadi (2013) described bank profitability as the ability to generate revenue exceeding costs relative to the capital base, essential for a stable financial system. Evaluating past, current, and future profitability is crucial, with revenue and expenses reflected in the income statement.

Nabil Bank is the Nepal's first foreign joint venture bank, began operations in 1984. It was earlier known as Nepal Arab Bank Limited, which was established to offer international-standard banking services. Nabil Bank has over 200 international correspondent banking relationships and a subsidiary, Nabil Investment Banking Ltd., for investment services. It acquired Nepal Bangladesh Bank in July 2022 and introduced "n bank", a neo-banking virtual service, in December 2022. With a mission to be the "1st Choice Provider of Complete Financial Solutions, for all its stakeholders; Customers, Shareholders, Regulators, Communities and Staff".

This Bank renders services such as:

- Loan, advance, and overdraft
- Agency services
- Clearing services
- Foreign currency exchange
- Deposits
- Guarantees
- Credit cards
- Telebanking
- Remittance service
- SWIFT service
- Deposit locker
- ATMs

Few studies have examined the impact of liquidity on Nabil Bank's profitability, but they lack recent data from its annual reports. Liquidity management is critical for banks, as inadequate liquidity signals financial trouble (Rose, 1999). Liquidity refers to assets readily convertible to cash for meeting obligations, either stored on the balance sheet or available through purchased funds. Both liquidity surplus and deficit indicate financial health issues (Sthapit & Maharjan, 2012).

The study tries to addresses the research questions related to Nabil Bank's liquidity position, the impact of liquidity on its profitability, and the relationship between liquidity and profitability.

Table 1: Empirical Review: Liquidity Analysis and Profitability

S.N	Author	Topic	Findings
1	Pradhan & Shrestha (2016)	The impact of liquidity on the profitability	A positive relationship between liquidity, loans, and profitability, with fluctuating liquidity ratios over time.
2	Abdullah and Jahan (2014)	The effect of liquidity on the profitability of five Bangladeshi private commercial banks	Using regression analysis, they found no significant relationship between liquidity and profitability.
3	Shrestha (2017)	Liquidity management and profitability in Nepalese commercial banks	No significant impact of liquidity measures such as the credit deposit ratio (CDR) and cash reserve ratio (CRR) on profitability.
4	Ibrahim (2017)	Liquidity on five Iraqi banks	Used OLS model and found that liquidity positively impacted profitability, as increased liquidity ratios improved the return on assets (ROA).
5	Lartey, Antwi & Boadi (2013)	Relationship between liquidity and profitability in seven Ghanaian banks	Declining trends in both and a weak positive relationship between liquidity and profitability.
6	Paul, Bhowmik & Famanna (2020)	Liquidity's effect on the profitability of 40 Bangladeshi banks	Certain liquidity measures, such as LDR and DAR, significantly influenced profitability, while others did not.
7	Rijal (2022)	Study on liquidity ratios of NABIL and Everest Bank	Certain liquidity ratios positively influenced profitability, while others had a negative impact.
8	Adhikari (2020)	Liquidity and profitability indicators in 27 Nepalese banks	No significant association between liquidity and profitability.
9	Mishra (2019)	Liquidity and profitability relationship among 10 leading Nepalese banks	ADBL and NABIL had better liquidity and profitability compared to others.
10	Nimer, Warrad & Omari (2015)	Liquidity on Jordanian banks	Liquidity, measured by the quick ratio, significantly influenced profitability, represented by ROA.
11	A. Adhikari (2010)	Financial performance of Nepal Bank Limited and NABIL Bank	Nepal Bank excelled in liquidity, NABIL showed superior profitability.

This study has some limitations, which include:

- a) The study is based on secondary data.
- b) It analyzes and evaluates the data of the last five years only.
- c) Only a few ratios are used for analysis.
- d) Only the annual data is used for analysis, although monthly data is needed.

2. Methods And Methodology:

This study have utilized secondary source of data published as annual audit reports, journals and other reports related to Nabil bank. Data were obtained through internet sources and the official website of Nabil Bank. Among the 20 commercial banks operating in Nepal, Nabil Bank Limited was selected as the sample for this study, given the impracticality of analyzing the entire banking sector. The research is based on a sample of five fiscal years' annual reports of the bank.

The primary objective of this study was to conduct a systematic and empirical analysis of the liquidity position of Nabil Bank Limited and its impact on the profitability. Liquidity management is represented by key financial indicators, including the Cash-Deposit Ratio (CDR), Credit-Deposit Ratio (CRDR), and Investment-Deposit Ratio (DR), which serve as independent variables. Profitability is measured using Return on Assets (ROA) and Return on Equity (ROE) as dependent variables (Mishra & Pradhan, 2019).

To assess the liquidity position, the study employs three key liquidity ratios: the current ratio, quick ratio, and cash ratio. It is assumed that understanding the relationship between liquidity and profitability contributes to effective working capital management and profit maximization. The study considers the following financial indicators:

1. Current Ratio:

$$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

2. Quick Ratio:

$$\text{Quick Ratio} = \frac{\text{Quick Assets}}{\text{Current Liabilities}}$$

3. Net Working Capital(NWC):

$$\text{NWC} = \text{Current Assets} - \text{Current Liabilities}$$

4. Credit-to-Total-Deposit Ratio:

$$\text{Credit-to-Total-Deposit Ratio} = \frac{\text{Total Credit}}{\text{Total Deposits}}$$

The impact of Liquidity on profitability of Nabil bank is analyzed using both financial and statistical tools. Under financial tools, liquidity and profitability ratios are examined to assess the bank's financial position and the effect of liquidity on profitability.

Under financial tools, the study used two different types of ratios (Liquidity Ratios and Profitability Ratios) to analyze the liquidity and profitability position along with the impact of liquidity on profitability of the bank.

Liquidity ratios measure the firm's short-term solvency and its ability to meet current obligations. These ratios provide insight into the bank's financial health by evaluating its capacity to fulfill short-term liabilities (Gautam, 2020).

The statistical methods employed in the study include:

- a) Arithmetic Mean
- b) Standard Deviation
- c) Coefficient of Variation
- d) Correlation Coefficient

By integrating financial and statistical analysis, this study aims to provide a comprehensive evaluation of the relationship between liquidity management and profitability in Nabil Bank Limited.

Data Summary and Presentation:

Current Ratio: The current ratio measures the relationship between a bank's current assets and current liabilities, reflecting its ability to meet short-term obligations. A higher ratio generally indicates a stronger liquidity position.

Table 2: Ratio of current assets to current liabilities

Year	Current Assets	Current Liabilities	Current Ratio
2018/19	594,457,319	308,193,548	1.93
2019/20	911,090,132	450,988,821	2.02
2020/21	1,291,777,136	359,394,225	3.59
2021/22	1,606,662,960	498,432,011	3.22
2022/23	1,606,662,960	545,317,347	2.95
Mean			2.36
S.D.			0.74
C.V.			31.34

(Source: Annual report of Nabil bank, 2022/23)

The current ratio shows a generally strong liquidity position. It increased from 1.93 in 2018/19 to a peak of 3.59 in 2020/21, before slightly declining to 2.95 in 2022/23. Despite the slight drop, the bank maintained a healthy average current ratio of 2.36, indicating that it had Rs 2.36 in current assets for every Rs1 in current liabilities. The coefficient of variation (31.34%) suggests moderate variability, which is acceptable.

Current Assets vs. Current Liabilities: The ratio of current assets to current liabilities is important in determining a company's ongoing ability to pay its debts as they are due.

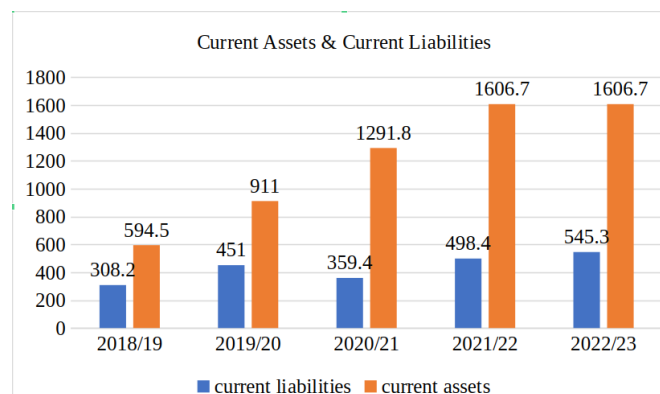


Figure 1: Current Assets vs. Current Liabilities

Current assets steadily increased from Rs 594.5 million in 2018/19 to Rs 1606.7 million by 2021/22, remaining constant thereafter. Meanwhile, current liabilities fluctuated, starting at Rs 308.2 million in 2018/19, dropping in 2020/21, and then rising again to Rs 545.3 million in 2022/23. This fluctuation indicates dynamic financial management, with assets consistently surpassing liabilities, ensuring strong liquidity.

Overall, Nabil Bank demonstrated strong short-term financial stability, despite minor variations in the current ratio and liabilities.

Quick Ratio: The quick ratio, also called an acid-test ratio, measures a company's short-term liquidity against its short-term obligations.

Table 3: Quick Ratio Analysis for Different Years

(Rs. in million)

Year	Current Liabilities	Quick Assets	Quick Ratio
2018/19	308.2	594.5	1.93
2019/20	451.0	911.0	2.02
2020/21	359.4	1291.8	3.59
2021/22	498.4	1606.7	3.22
2022/23	545.3	1606.7	2.95
Mean			2.36
S.D.			0.74
C.V.			31.34

(Source: Annual report of Nabil bank, 2022/23)

Loan to Deposit Ratio: Loan to deposit ratio measures the bank's capability to fulfill its financial obligations through deposits, it is calculated as total loan divided by total deposits, and banks with lower loan to deposit ratio tend to have higher liquidity.

Table 4: Loan to Deposit Ratio

(Rs. in billion)

Year	Total Loans	Total Deposits	Loans to Deposits Ratio (%)
2018/19	331.1	403.1	82.14
2019/20	300.2	329.6	91.08
2020/21	206.6	228.0	90.61
2021/22	153.9	193.04	79.72
2022/23	133.56	164.37	81.26
Mean			84.96
S.D.			5.44
C.V.			6.41

(Source: Annual report of Nabil Bank, 2022/23)

Liquidity Performance: Nabil Bank has maintained strong short-term liquidity over the years. The current ratio increased from 1.93 in 2018/19 to 2.95 in 2022/23, averaging 2.36, indicating the bank's ability to meet short-term obligations. Similarly, the quick ratio peaked at 3.59 in 2020/21 before slightly declining to 2.95, ensuring a stable liquidity position. The loan to deposit ratio (LDR) fluctuated between 79.72% and 91.08%, averaging 84.96%, which suggests a balanced approach to lending while maintaining sufficient liquidity. Despite minor fluctuations, Nabil Bank has effectively managed its liquidity, ensuring financial stability and operational efficiency.

Return on Assets: Return on Assets is a profitability ratio that provides how much profit a company can generate from its assets.

Table 5: Return on Assets

(Rs. in billion)

Year	Net Income	Total Assets	Return on Assets (%)
2018/19	4.24	201.14	2.11
2019/20	3.46	237.68	1.46
2020/21	4.53	291.24	1.56
2021/22	4.26	419.82	1.01
2022/23	6.40	481.20	1.33
Mean			1.49
S.D.			0.40
C.V.			26.77

(Source: Annual report of Nabil Bank, 2022/23)

Return on Equity (ROE): Return on equity (ROE) is a measure of a company's financial performance. It is calculated by dividing net income by shareholders' equity. Return on equity is considered a gauge of a corporation's profitability and how efficiently it generates those profits. It indicates how effectively management is using a company's assets to create profits.

Table 6: Return on Equity

(Rs. in billion)

Year	Net Income	Total Equity	Return on Equity (%)
2018/19	4.24	23.19	18.28
2019/20	3.46	25.86	13.38
2020/21	4.53	34.01	13.32
2021/22	4.26	52.98	8.04
2022/23	6.40	56.91	11.25
Mean			12.85
S.D.			3.73
C.V.			29.04

(Source: Annual report of Nabil Bank, 2022/23)

Profitability Performance: While the bank has maintained strong liquidity, its profitability has shown a declining trend. The return on assets (ROA) decreased from 2.11% in 2018/19 to 1.33% in 2022/23, averaging 1.49%, indicating reduced efficiency in utilizing assets to generate profit. Similarly, the return on equity (ROE) declined from 18.28% to 11.25% over the same period, with an average of 12.85%, reflecting decreasing shareholder returns. The negative correlation between liquidity and profitability suggests that higher liquidity does not necessarily lead to better financial performance. However, the positive correlation between LDR and profitability highlights the importance of balanced lending strategies. To improve profitability, the bank should focus on optimizing asset utilization, cost control, and revenue diversification to sustain long-term financial growth.

Correlation Analysis: The correlation analysis examines the relationship between liquidity and profitability indicators at Nabil Bank Limited. A negative correlation (-0.58) exists between the return on assets (ROA) and both the current ratio and quick ratio, indicating that higher liquidity does not necessarily enhance profitability. Similarly, the return on equity (ROE) has a negative correlation (-0.64) with the current and quick ratios, suggesting that as liquidity increases, profitability decreases. However, a positive correlation is observed between the loan to deposit ratio and both ROA (0.17) and ROE (0.27), implying that an increase in lending activities contributes to improved profitability. These findings confirm that liquidity has both positive and negative effects on profitability, highlighting the importance of maintaining a balanced financial strategy.

3. Study Findings:

Table 7: Summary of the ratios calculated

Date	Current Ratio	Quick Ratio	LDR	ROA	ROE
2018/19	1.93	1.93	82.14	2.11	18.28
2019/20	2.02	2.02	91.08	1.46	13.38
2020/21	3.59	3.59	90.61	1.56	13.32
2021/22	3.22	3.22	79.72	1.01	8.04
2022/23	2.95	2.95	81.26	1.33	11.25
Mean	2.36	2.36	84.96	1.49	12.85
S.D.	0.74	0.74	5.44	0.40	3.73
C.V.	31.34	31.34	6.41	26.77	29.04

Nabil Bank has maintained a strong liquidity position over the past five years, with the current ratio rising from 1.93 in 2018/19 to 2.95 in 2022/23, averaging 2.36, which is considered healthy. The quick ratio mirrors this trend, as the bank lacks prepaid expenses and inventories, ensuring stable short-term liquidity. The loan to deposit ratio (LDR) fluctuated between 79.72% and 91.08%, averaging 84.96%, indicating an optimal balance between lending and liquidity.

However, the bank's profitability has declined, with return on assets (ROA) dropping from 2.11% to 1.33% over the period, averaging 1.49%, signaling a decrease in asset utilization efficiency. Similarly, return on equity (ROE) fell from 18.28% to 11.25%, averaging 12.85%, reflecting reduced shareholder returns. The correlation analysis indicates a negative relationship between liquidity (current and quick ratios) and profitability (ROA: -0.58, ROE: -0.64), suggesting that increased liquidity does not necessarily enhance profitability. However, a positive correlation exists between LDR and profitability (ROA: 0.17, ROE: 0.27), implying that increased lending contributes to improved returns. To address declining profitability, the bank should optimize asset utilization and implement strategies for sustainable financial growth.

4. Conclusion:

This study examined the relationship between liquidity and profitability of Nabil Bank Ltd. using data from 2018/19 to 2022/23. Findings indicate that liquidity significantly impacts profitability, with current and quick ratios consistently above 2.0, reflecting strong liquidity management. The bank also maintained a

healthy loan-to-deposit ratio, ensuring sufficient liquidity for withdrawals.

Despite stable liquidity, ROA and ROE showed a declining trend, suggesting that while the bank remained profitable, asset and equity utilization efficiency varied. The study found a negative relationship between liquidity ratios (current and quick ratios) and profitability (ROA, ROE), while loan-to-deposit ratio positively correlated with profitability. These findings support the study's hypotheses.

However, reliance on secondary data and a limited five-year period restricts the study's depth. Future research should incorporate primary data sources such as surveys and interviews and extend the study period for more robust insights. Additionally, including more financial ratios (e.g., EPS, cash ratio) and advanced statistical methods like regression analysis could enhance understanding of liquidity-profitability dynamics.

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The authors confirm that they have no competing interests to declare.

6. Completing Interest:

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Exploring the factors of Workplace Environment Influence Employee Engagement Level: A Thematic Case Study of University Grants Commission, Nepal

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Abstract:

The study focuses on exploring the role of information communication technology (ICT) in enhancing student learning within Nepal's higher education system. It reviews several studies on factors influencing the global adoption of ICT and highlights its significance for academic growth and development. The study concludes that ICT can significantly boost academic achievement among university students. However, the successful deployment of this technology depends on user acceptance. The research found that factors such as social influence, accessibility, computer self-efficacy, infrastructure, and enjoyment significantly impact the perceived ease of use of ICT systems. Effective use of ICT in the teaching-learning process requires support and knowledge from experts and peers. Students utilize ICT to enhance their education in both virtual and physical classrooms. The findings highlight the potential of ICT to transform the teaching-learning process, promoting a more interactive and engaging educational experience.

Key Words: Employee Engagement, Workplace Environment, Work Engagement, Motivation, Job Performance

1. Introduction:

Building better performing workplace demands an understanding on how the workplaces affect organization behavior and how these behaviors again drive workplace performance. Indeed, the workplace becomes an essential component of the performance in the relationship of employees, work, and the workplace (Joroff et al., 2003). Hughes and Parkes (2007) in a survey reported that nine out of ten workers believed that quality of work place affects the attitude of employees and increases their productivity.

While a positive work environment is important for an organization to produce better outcomes, employee engagement also has an impact on a company's overall output (Bakker, 2011). Career opportunities, benefits, corporate responsibility, coworkers, employee health and well-being, intrinsic motivation, manager, managing performance, middle management, organizational reputation, pay, people or HR practices, physical work environment, recognition, resources, retirement savings, senior leadership, work-life balance are among the 21 key drivers or components, to enhance employee engagement (Mishra et al., 2014). Therefore, managers and the entire company must endeavor to ensure that workers are interested in their work environment, the activities that are arranged by the organization, and their job responsibilities. The senior management

must also make sure that every employee is working in the appropriate capacity. Employees must also be given the opportunity to learn about the company's vision and objective, and any efforts made by them must be recognized and rewarded (Yu and Frenkel, 2013). According to Saks (2006), there is currently a dearth of research on employee engagement, thus more work has to be done in this area. Therefore, the purpose of this study is to investigate how working environment affects employee engagement.

On one hand, the workplace environment and its effects on employees' engagement has been a prominent research topic for private enterprises while on the other hand, public enterprises are still not in a stand to accept that workplace do affects employees' engagement and performance. May be because of this, there is a severe gap in the productivity level of public and private enterprises. The challenge is that, in the shadow of a mediocre and bureaucratic working environment, encouraging employees is not an easy undertaking. Due to their unfavorable working conditions, government personnel have a reputation for being sluggish and apathetic (Wright, 2001), and managers are powerless to change this due to strict civil and public service laws and acts. One of the biggest issues in public management is how managers and institution as a whole not being able to motivate their workers (Behn, 1995). This shows that public enterprises need an immediate intervention to identify whether their employees perceived the

workplace environment favorable or not to and how does it affect the employee engagement. In this background, this study aims to explore the status of workplace environment from the view-point of employee and try to identify its effect in the employee engagement level at UGC, Nepal.

The influence of workplace environment on employee engagement level has always been the issue of research and discussion in the discipline of organizational behavior and human resource management across the globe and Nepal is not an exception. However, very few studies have been done with special focus on a particular organization of public sector. Further, this study is supposed to generate insights that could fill the knowledge gap in the decision-making authorities of the concerned organization so that they can ameliorate their workplace environment and ensure better employee engagement level through policy, managerial and operational interventions in the days to come. Apart from this, this study could be a reference material for capacity development service providers like NASC to endorse case-based teaching-learning approaches in classroom sessions to impart hands-on knowledge and skills in the trainees with evidence informed case study representing diverse spheres of Nepali Public Service and institutions at large.

Operational Definitions:

Employee Engagement:

Despite the fact that there are many definitions of employee engagement, the well-known study by Schaufeli et al. (2002) claims that managers are not always the factors that influence an employee's engagement but rather that engagement is "a more persistent and pervasive affective-cognitive state that is not focused on any particular object, event, individual, or behavior." The opposite of engagement, according to researchers who study "burnout," is said to include "exhaustion, cynicism, and inefficiency" (González-Romá et al., 2006). In contrast, engagement is said to consist of "energy, involvement, and efficiency" and "vigor and dedication" (Schaufeli et al., 2002). Employees that are well balance and are emotionally attached to the organization's vision and mission are more likely to be involved in achieving those goals. A motivated employee will work with a forward-thinking mindset, enhancing the organization's reputation and worth. Employers create cultures that reward high levels of employee engagement, and happy workers are eager to take advantage of all the resources provided by their employers (Kaliannan and Adjovu, 2015). In order to engage employees and link their ambitions with those of the corporation, businesses define well-equipped designs. Employee engagement is a useful strategy for preventing employee burnout and disengagement, as well as for indulging their good feelings and promoting ethical behavior at work.

Workplace Environment:

Employees' desire to continue working for the company is significantly influenced by workplace conditions. Previous research has demonstrated that the work environment is a component that may be utilized to assess each employee's level of involvement within the firm (Popli and Rizvi, 2016). According to research by Miles et al. (2001) and Harter et al. (2002), different features of the workplace might lead to different levels of employee engagement. Management that promotes a supportive work environment is defined as organizations that perform their responsibilities, demonstrate their concern for employees' needs and feelings, provide constructive feedback and allow workers to voice their concerns, develop new skills, and resolve work-related difficulties (Deci and Ryan, 1987). In fact, Kahn (1990) found that supportive and trusting interpersonal relationships as well as supportive management promoted psychological safety. Organizational.

Influence of Workplace Environment in Employee Engagement:

The working environment at a company is significant, according to Garg and Talwar (2017), because it is thought to encourage employees, which leads to improved productivity, stronger business enthusiasm, and deeper customer involvement. It is also thought that when someone feels respected and appreciated at work, they will positively contribute to the success of the company. Because it may reduce turnover rates, a happy environment is always beneficial for both the individual and the company. The working culture, working style, hierarchies, and human resource practices that have been adopted or followed in an organization are all included in the work environment, in addition to work engagement and motivation at the workplace (Agarwal and Mehta, 2014).

Despite the numerous research work on employee engagement and workplace environment, it is yet difficult to contextualized the factors of workplace environment in the public institutions of Nepal and through this study, the researcher try to fulfill this gap. However, the researcher focused on one public institution that is University Grants Commission and try to explore the factors of their workplace environment that is influencing their work engagement.

2. Materials And Methods:

This study employed thematic analysis following the explorative approach outlined by Braun and Clarke (2006), to explore the factors within the workplace environment that affect employee work engagement.

The study population are the employees of University Grants Commission of Nepal. Altogether seven respondents were selected through purposive sampling

considering different department, different age group and years of experience (Creswell et al., 2007). All the respondents were thoroughly interviewed through in-depth semi-structured interview method.

Data collection for the qualitative study were begin after receiving the approval from the UGC, Nepal and participants were informed with consent documents. Following the submission of the informed consent documents, data collection was accomplished through conduction of semi-structured interviews following an interview guide. The researcher used a semi-structured interview schedule as the main instrument for data collection. Semi-structured interviews are commonly used in qualitative research to seek a deeper understanding of the human experience (Bearman, 2019) as it allows the opportunity to develop personalized open-ended questions based on participants' response (Robson, 2016). Interviews with each participant was conducted face-to face. The questions were developed based on the literatures on the factors considered in the conceptual framework.

The research team pre-informed the respondents of the study about the study objective and purpose and received their consent.

In addition to this, the research team mentioned about the professional treatment of the insights and information shared by respondents ensuring confidentiality and anonymity of the respondents. This allowed respondents to open up and freely share their valuable experiences and feelings during the interview sessions.

This study used thematic analysis. This required the transcription of interview recordings and followed coding. Initially, the researcher read and re-read transcripts in order to identify potential themes, which then forwarded to the lead researcher. The second level of analysis involved reviewing these initial codes. The lead researcher reviewed themes prior to defining and naming them. Finally, the themes were finalized and the write-up of the report began.

Findings:

The thematic analysis produced five themes under work environment that influence the employee engagement of UGC. The themes included are: Work Life Balance (WLB), Role Clarity, Team Culture, Rewards and Recognition, and Fairness and Diversity Management at Workplace.

Table 1: Respondent Profile

Respondent	Gender	Position	Age	Nature of Job	Years of Experience	Qualification
1	Male	Officer III	40	Permanent	14	Master in Journalism and Public Administration
2	Female	Assistant I	29	Contract	5	Master in Business Studies
3	Male	Officer II	54	Permanent	20	Masters
4	Male	Officer II	45-50	Contract	10	IT Engineer
5	Female	Assistant II	29	Contract	4	M. Phil in Public Administration
6	Female	Officer III	49	Permanent	20	Master in Public Administration
7	Female	Assistant I	37	Permanent	13	Masters in Sociology

Work Life Balance (WLB):

In UGC the respondents were clear about the healthy work life balance that they have been experiencing till now. The finding also suggested that it depends on the people nature on how they handle the work pressure otherwise the work that are allocated to be done by the staffs are enough to be done within the working hours in UGC.

"As a working mother I never want to take office work at home, and neither the office forced me to do so". (Respondent 6)

The findings also suggested that the employees would be more satisfied if there is a documented provisions for the welfare of employees in terms of WLB. Male and Female counterparts have also given the same response supporting the findings that suggests that work life balance in UGC, Nepal is well maintained however in near future if any imbalance occurs there is no any office provisions in case of work life balance so they are not sure this will prevail for long.

Role Clarity:

The findings of several studies on employee motivation showed that perceived role clarity has many advantages in the form of positive employee outcomes. The findings from the in-depth interview of UGC staffs indicated the struggle to engage and encourage their workers in their work because of the lack of clear job description. UGC has a certain standard job description which sounds charming but is not objectified.

"Our JD is given to us but it very unclear. It considers of superficial things like achieving project goals with utmost efficiency and effectiveness however we are not clear with the project goals. The detailing and simplification of the job description is required for role clarity". (Respondent 7)

Team Culture:

While organizational culture affects the effectiveness of the organization, team culture influences team effectiveness, commitment and work engagement of its team members and this can be seen in UGC as the finding showed that despite organization culture of UGC was not appreciated by many of the staffs, the team culture of one or two division seems to be integrated, valued and as (Costa et al., 2014) mentioned that the team member who feels contributed and valued are also the one who feel inspired, energetic and willing to work with that team even despite possible external setbacks.

"In QAA division, out of 7 members, 5 of us are contract staffs but we never felt that way. We love our work and we perform our work equivalent to permanent employee. Also in case of team cohesiveness our QAA division is considered the best in the organization itself. This is because in QAA our voices are heard, our ideas are respected and roles are clear". (Respondent 2)

Rewards and Recognition:

The finding shows that employees of UGC might lack emotional attachment to the organization which is an important part of engagement as it can be measured by looking on how they feel motivated in their work. Employee tends to be more motivated if they get something that can make them feel more excited in the workplace. So, the vigor of coming to work is highly affected by the lack of formal recognition in an organization. However, the personal character of a person can play a mediating role in case of dedication of performing the work as if an employee is a hard-working person, even in the absence of reward he/she will give his best at work.

"There is no any recognition or rewards based on my performance, instead after giving 9 years of my valuable time in an organization, my office even did not provide me a paid leave when I get an opportunity from to pursue my master degree. What can I expect

ct from this organization, the best employee award is given in roll call based rather than evaluating a performance. This has demotivated me to come to work but if you ask particularly about performing my duties, yet I am doing with my full dedication". (Respondent 1)

Fairness and Diversity Management at Workplace:

"I am academically a sound scholar. I have done my M. Phil in Public Administration. I am highly interested in research and academic work. But the irony is despite working in a academic institution like UGC, just because I am a permanent staff I am not eligible to apply for research grants or PhD fellowship. I don't understand what kind of provision is this. How can institution like UGC can discourage its own staff to pursue for research works". (Respondent 4, Heena)

There is no any seen biasness in terms of diversity in the organization. However, the findings depicted that employees do give sarcastic judgement based on education and ethnicity in UGC which is taken normally in the organization culture.

"As a Newar I am always judged for my accent and I am not given chance to speak in programme or host any event." (Respondent 7)

"People keep telling me that I am not in a right place as per my education. I don't that this there is sincere concern or just trying to let me down". (Respondent 4)

3. Results And Discussion:

The variables of workplace environment are primarily identified through the work environment scale of (Moos2005) while other variables like team culture, rewards and incentives, diversity is equally relevant (Deci and Ryan, 1987). On the other hand, the aspects of employee engagement are adopted from the work engagement scale of Schaufeli and Bakker (2010) that consists of vigor, dedication and absorption. The term "vigor" describes having a high amount of drive, stamina, perseverance, readiness, and mental toughness when working. Being dedicated to one's work and feeling fulfilled, satisfied, and challenged are examples of dedication. Absorption refers to being engaged and fully engrossed in one's work (without knowing the time passing by) and finds it difficult to separate from that task. For this study, only two determinants vigor and dedication were considered.

The researcher explored work life balance as the first theme. Work-life balance (WLB) has been described in a variety of ways over the years. WLB is vital in determining an employee's attitude toward their business and their lives, claims Scholarios and Marks (2004). Timms et al. (2015) looked at WLB as a

potential indicator of job engagement. They also took into account the impact of WLB on work performance, both good and bad and the study demonstrated a relationship between all three aspects of job engagement (i.e., absorption, devotion, and vigor). Our findings of UGC depicted that work place environment is heavily influenced by the informal WLB and it boost the engagement level because of the flexibility and freedom it creates through informal WLB. Most work-life balance policies are organized programs or rules established at the human resources level, with the goal of assisting employees in integrating their paid employment with other vital life responsibilities. Formal policies, such as role induction, can help individuals gain professional awareness and increase work engagement, however, informal practices of work-life balance are more beneficial in creating a balance between paid work and life (Eberman et al., 2019).

In regards to the role induction, the second theme that was develop was role clarity. Rao Jada et al. (2019) correctly said that managers should emphasize creating clear job descriptions as well as communicating to staff members what is expected of them. By frequently outlining job goals and expectations, management may help workers understand their roles better (Hassan, 2013). According to a study by Kundu et al. (2021) on perceived role clarity, innovative work behavior is directly impacted favorably by role clarity, employees have a tendency to act better when they understand their work duties. The unclear JD and key performance indicators have created ambiguity in the job to be performed in UGC resulting in the lower dedication in the staffs. Additionally, Dalal (2018) made the correct point that when employees are unclear about their jobs, they lose energy in bewilderment rather than completing their tasks, which lowers their level of engagement at work.

Team Culture as the another theme refers to members who share the same insights about emergent and simplified sets of norms, values and beliefs developed after mutual interactions and expect the same type of work ability and behavior among its members (Earley and Mosakowski, 2000). Employees who work in the same team interact more frequently, so they can be more influenced by their direct workgroup than by the organization itself (Shin et al., 2015). The QAA team of UGC stood as the instance which shows that stronger the team culture, the greater the team work engagement of its members.

Engagement of the employee cannot be separate from the employees' individual interests. Maslach et al. (2001) have suggested that a lack of rewards and recognition can lead to burnout and appropriate recognition and reward is important for engagement Equity, and in essence - fairness, is a key driver of employee engagement. Other factors that impact perceptions of fairness include; proximity (how close

an employee is to the situation and their level of involvement), expectations and entitlement (Beugré, 1998). Demographic factors also impact perceptions of fairness; level of education, occupational status, occupational tenure and gender where men are more likely to perceive fairness as equity, whereas women are more likely to perceive fairness as equality (Beugré, 1998).

4. Conclusion:

This study proposed to explore the factors of workplace environment that plays role in influencing the engagement level of employees in University Grants Commission, Nepal. UGC Nepal has been a reputed government institution that is also an authorized organization that accredited colleges and universities. It is important for an organization to have a strong human resource management as the function of UGC demands wide range of human resources from academic as administrative view. Effective human resource management is also synonymous effective employee engagement and the literatures suggested that the environment of workplace plays a vital role in the creating the level of engagement of employees in an organization.

The human resource of UGC Nepal has been comprised of permanent and contract employees. This study demonstrated the issues of culture of unfair treatment and biasness on the basis of permanent and contract staff and lack of rewards and recognitions based on the performance result in the lack of motivation and dedication in the employees resulting the low vigor as well. Apart from this, employees are found to be less likely motivated enough to take noble initiatives and are less satisfied with the existing unfair practices of promotion at their perceptual level. Moreover, The lack of succession plan, career grown, reward and recognition are few noticeable issues for an organization because of which organization are not being able to retain talented and intellectual staffs which eventually make the workplace worse. Thus, with this study we can conclude that to create a better workplace environment the system should be developed in such a way that it addressed the issues of employees. A better workplace environment is the result of formal and informal system that addresses the issues of employees because when employees are heard, they are engaged which eventually contributes in the productivity of an organization.

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6. Completing Interest:

The authors confirm that they have no competing interests to declare.

7. Acknowledgement:

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Student Learning through Information Communication Technology: A Review

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Abstract:

The study focuses on exploring the role of information communication technology (ICT) in enhancing student learning within Nepal's higher education system. It reviews several studies on factors influencing the global adoption of ICT and highlights its significance for academic growth and development. The study concludes that ICT can significantly boost academic achievement among university students. However, the successful deployment of this technology depends on user acceptance. The research found that factors such as social influence, accessibility, computer self-efficacy, infrastructure, and enjoyment significantly impact the perceived ease of use of ICT systems. Effective use of ICT in the teaching-learning process requires support and knowledge from experts and peers. Students utilize ICT to enhance their education in both virtual and physical classrooms. The findings highlight the potential of ICT to transform the teaching-learning process, promoting a more interactive and engaging educational experience.

Key Words: Information Communication Technology (ICT), Higher Education, Academic Achievement, User Acceptance.

1. Introduction:

Information and communication technology (ICT) has changed the traditional learning approaches to modern and interactive environment. ICT is central to the educational revolution, driving essential advancements in modern education practices. This means that education is changing every day (Al-Ansi et al., 2019). ICT in education refers to using computers to enhance the teaching-learning process, often requiring assistance from colleagues or professionals. Students utilize ICT to improve their learning both within and outside of the classroom (Capodiecì et al., 2020; Chance et al., 2007; Leidner and Jarvenpaa, 1995).

In the modern world, integrating ICT in education is receiving more attention from all nations globally. Technology occupies a significant role in the teaching process, enhancing informatics as a separate area of study. Since, the internet revolution, technology has significantly influenced teaching and learning abilities. This influence might vary widely depending on the study level and can be either positive or negative depending on how it is used.

Technology in classrooms has not been entirely effective, similar to many attempts at educational reform. There have been many waves of large-scale technological investment to enhance education during the past century, but none of them have had a discernible, long-term effect (Al-Ansi et al., 2019).

In Nepal, e-government has gradually progressed beyond computerizing government agencies to include programs that capture the finer aspects of governance, such as openness, citizen centricity, and service orientation (Pandey and Malla, 2023). Information and communication technologies (ICTs) use electronic means to transfer, modify, and store data. This includes platforms for text messages, emails, video chats, and social networking.

ICTs are used in many devices, such as desktop computers, laptops, smartphones, speakers, recorders, headphones, and others to perform communication and informational tasks (Pandey and Malla, 2023; Shakya and Rauniar, 2002). The Nepalese education system continues to emphasize the use of digitalization in education. The nascent usage of information and communication technology in education has left several faculty members and students feeling uneasy when utilizing the new tools. ICT not only changes the methods of instruction and learning, but it also develops the skill set necessary to succeed in the technological era of today and the future (Bhattarai and Maharjan, 2020).

ICTs are widely used in developed countries and are seen to be essential for fostering social, political, and economic participation in developing countries (Pandey and Malla, 2023). The IT service export market requires a variety of educational backgrounds to meet the diverse needs and demands of the sector. The lack of a trained workforce is one of the biggest

barriers to Nepal's IT sector's growth and development. There is a glaring disparity between the knowledge of the industry and the educational system. Furthermore, there's a good chance that early-stage investment in IT businesses would help Nepal's IT sectors flourish. This kind of financing has the potential to significantly improve Nepal's digital ecosystem (IIDS, 2023).

In Nepal, employees who work overseas as IT service providers often have a bachelor's degree. A wide range of educational backgrounds are beneficial to the IT service export business, varied viewpoints and knowledge together, which is essential to the sector's growth and success (IIDS, 2023). There are currently 110 academic institutions in the nation that offer bachelor's and master's degree programs in IT, such as the Bachelor of Information Technology, Bachelor of Computer Science and Information Technology, Bachelor of Cyber Security and Digital Forensics, Master of e-Governance, and Master of Information Technology Management. In a similar vein, numerous training facilities provide IT-related courses (IIDS, 2023).

The 2019 Digital Nepal Framework states that one of the top development targets in higher education is greater digital integration, which is a positive trend. One way to accomplish this is through the use of smart classrooms. In Tribhuvan University, the Open and Distance Education Center (ODEC) has been undertaking similar initiatives through its mobile learning centers, exam management information system (EMIS), online learning platform, and other initiatives.

Several planning documents and policies highlight the focus on digitalizing education in Nepal. These include the Open Education and Distance Learning Policy 2007, the Directives on Distance Education/Open Learning Program 2007 with its third amendment (2014), the Information and Communication Technology (ICT) in Education Master Plan 2013-2017 (Government of Nepal, Ministry of Education, Science and Technology MoEST), and the Higher Education Policy Framework – 2018 (IIDS, 2023).

A recent Education Policy Document (2020) emphasizes the need to enhance the current model of teacher education by focusing on pedagogical experience and emphasizing ICT and 21st-century skills at all educational levels (ITP, 2023).

Institutions are recognizing the need for IT education in Nepal. The Open and Distance Education Centre (ODEC, TU) is an autonomous academic institution under Tribhuvan University, established in 2015 by an Executive Council resolution. ODEC aims to provide open and remote learning to ensure that the majority of Nepalese students can have access to high-quality higher education. Additionally, by

utilizing open and remote learning modes, it hopes to provide top-notch higher education to a wide range of individuals in Nepal and beyond (Ghimire, 2020).

It is the responsibility of ODEC to arrange and conduct postsecondary education programs on all subjects, approved by the university. Several factors justify the establishment of the Open and Distance Education Center, including the growing demand for distance education both locally and globally, the challenges faced by working professionals with conflicting schedules to attend traditional face-to-face education, the incorporation of information and communication technology (ICT) in teaching methods, and TU's policy to offer dual-mode programs, including blended learning, to cater to a larger population (Ghimire, 2020; Jha, 2020).

Numerous studies worldwide have explored information communication technology (ICT). This study tries to provide a concise overview of review findings related to the use of ICT in Nepal's higher education system. It gives attentions on the current state of research on ICT in global education systems and its importance in assessing research progress. This study primarily examines the work of several studies to underscore the significance of ICT in national and global educational frameworks. This study aims to address several key concerns: What is the current status of research on information and communication technologies in education systems worldwide? Is information communication technology pivotal for evaluating the state of research? It seeks to underscore the significance of information and communication technology (ICT) within both national and global educational frameworks.

2. Literature Review:

Thomas and Allen conducted a study examining the perceptions of potential students entering tertiary education regarding IT as a career at the Australian Catholic University (ACU) National in Melbourne, specifically focusing on those pursuing bachelor's degrees in business and information systems (Thomas and Allen, 2006). The study explored the differences in perceptions between men and women, the similarities in their views, and how these perceptions are formed. According to the report, by the time they reached year 10, most pupils had decided not to continue with IT as a subject.

In 2011, the University of Nagasaki developed a new Web-based course evaluation system (Chatvichienchai, 2011). This paper introduced WCourEva, a novel Web-based course evaluation system designed to fulfill the needs of different university academic units. These needs included customizable surveys for academic units and instructors, improved feedback quality, accurate statistics, and affordable system development and maintenance costs. Furthermore, Parkin et al. (2012) explored the influence of

learning technology on students' engagement with feedback, aiming to assess how a variety of technical interventions could inspire students to engage with feedback and develop activities to improve future learning.

There is a dearth of empirical research, particularly in sub-Saharan Africa, on the relationship between students' experiences using ICT (information and communications technology) devices and applications and their academic achievement (Nketiah-Amponsah et al., 2017). The study reported that ICT could be leveraged to improve academic performance among university students. It is recommended that students use email more regularly for academic purposes to fully appreciate its potential as a tool for improving academic attainment.

Hussain et al. (2017) investigated how information and communication technology affects students' academic achievement and retention in chemistry. Fifty ninth-grade pupils were randomly selected from Kohsar Public School and College Latamber Karak, Pakistan. Sapkota et al. (2018) reported that organizations in both the public and private sectors have been eager to leverage the power of ICT to improve administrative, managerial, and therapeutic outcomes. The new technology's successful adoption was depended on its acceptability by organizational member targets as end users. Ramdoss et al. (2020) also suggested that computer-assisted literacy training improves reading skills in students with intellectual disabilities, despite problems in determining efficacy. The Twenty-six individuals were randomly allocated to either the intervention group or the wait-list control group. The control group received standard reading instruction, while the intervention group received Headsprout Early Reading (HER) intervention instead of further formal reading training.

The rising availability of technologies and web-based resources can be very useful tools, both in the educational and clinical fields, for developing training activities that can also be completed remotely. There are studies in the current literature that investigate the usefulness of internet-based reading comprehension programs for children with reading comprehension impairments, but nearly none of them address distance rehabilitation programs (Capodieci et al., 2020).

In Nepal, Bhattarai and Maharjan (2020) conducted research on students' attitudes towards digital transformation in teaching and learning activities at various levels in the Kathmandu Valley. The findings of the study demonstrated that social influence, accessibility, computer self-efficacy, infrastructure, and enjoyment all had a significant impact on the perceived ease of use of the digital learning system. The digital learning system leverages technology and innovation to transform

traditional learning practices. The study found that integrating digital tools into education made academic activities more engaging, accessible, creative, effective, and productive.

In the twenty-first century, mathematics teachers must be cognizant of digital technology, and ethical, cultural, leadership, and policy issues. The purpose of the study by Khanal et al. (2021) was to investigate the relationship between mathematics teachers' digital awareness and students' achievement at both school and higher education levels in Nepal. They reported that organizations in both the public and private sectors have been eager to leverage the power of ICT to improve administrative, managerial, and therapeutic outcomes. The successful adoption of new technology depended on its acceptability by organizational members as end users.

Information Communication Technology (ICT) in education has made significant contributions to student learning for capacity development. However, Hamza (2021) found that students in Nigerian universities encounter significant hurdles when using ICT to improve their success rates. These hurdles include a lack of internet connectivity, internet facilities, and practical hands-on training on how to use computers, among other things.

Technology integration into teaching and learning activities is crucial for educators and learners to thrive in the information age. A mixed-method approach was used in a study by Mensah et al. (2023) to investigate the impact of ICT use on academic performance among students in second-cycle schools (SCS) in Ghana. The results showed that some teachers' attitudes towards incorporating Information & Communication Technology (ICT) in the classroom as well as students' limited access to internet connections, pose obstacles for to students utilizing ICT capabilities in their learning processes. The success of ICT in SCS education depends on the availability of ICT resources both at schools and occasionally in households. Outside of the classroom, the majority of students utilize printers, digital cameras, social media, laptops, smartphones, and internet/modems.

Information and communication technologies played a crucial role during the pandemic by facilitating advancements in the teaching-learning process. However, some occupations in the health domain continue to oppose this technology, especially at higher levels before graduation. They emphasize the importance of learning acquired through face-to-face interactions and practice (Salinas et al., 2023).

E-Governance in Nepal has evolved beyond the mere computerization of government departments to encompass programs that focus on key governance principles, such as citizen centricity, service orientation, and transparency. This progressive approach to e-Governance has been greatly influenced by lessons learned from earlier e-Government initiatives,

as reported by Pandey and Malla (2023). Information Technology (IT) can help institutions improve their teaching and learning processes in a variety of ways. It enables active participation from both teachers and students by allowing them to interact with ChatGPT for asking questions, receiving answers, improving efficiency, and providing feedback (Sah et al., 2024).

According to several research studies, postgraduate students' ICT aspects substantially and positively impact the learning process at both the undergraduate and postgraduate levels. The only exception is ICT equipment and tools, which had a minimal and negative effect at the undergraduate level. Moreover, undergraduate approaches and processes were helpful, even when the infrastructure of higher education was lacking.

3. Materials And Methods:

The present work has been grounded in comprehensive review of literature, serving as the basis for the entire investigation. A wide array of literature was systematically examined, incorporating diverse sources from both national and international contexts. By carefully selecting materials from various geographical regions, including South and East Asia, Australia, Africa, and several other countries, the study aimed to capture a global perspective on the topic under investigation. This approach allowed for a global perspective on the topic, with a chronological analysis of reports to track developments over time. The review ensured relevance and depth, incorporating the latest findings to support the research aims.

The study examined the role of information and communication technology (ICT) in education, particularly how it affects student engagement and learning. By integrating literature from multiple regions and considering the latest advancements in ICT, the research provided key insights into the educational processes and dynamics in various contexts, strengthening its overall conclusions.

3. Result And Discussion:

The objective of the research was to explore how various technical interventions could motivate students to engage with feedback and develop projects that would improve their future learning experiences. Nketiah-Amponsah et al. (2017) discovered that information and communication technology (ICT) could be employed to assist university students in enhancing their academic performance. However, Thomas and Allen (2006) noted that a significant number of students had opted against pursuing information technology as a field of study by that time. Additionally, Hamza (2021) identified several challenges faced by Nigerian university students in leveraging ICT to improve their success rates.

Despite the difficulties in evaluating its effectiveness, Ramdoss et al. (2020) suggested that computer-assisted literacy training can aid students with intellectual disabilities in becoming more proficient readers. Bhattarai and Maharjan (2020) reported that incorporating digital tools in the classroom improved the effectiveness, productivity, creativity, accessibility, and engagement in academic activities.

Pandey and Malla (2023) highlighted that information technology could benefit educational institutions by enhancing their teaching and learning processes. In this context, ChatGPT, as described by Sah et al. (2024), facilitates communication between teachers and students by enabling them to pose questions, receive prompt answers, obtain feedback, and gain insights into their work.

4. Conclusion:

The study found that successful use of information communication technology in the higher education sector has an impact on students' learning quality both domestically and internationally. The majority of the research findings showed that social influence, accessibility, computer self-efficacy, infrastructure, and enjoyment all had a significant impact on the digital learning system using information communication technology.

Information Communication Technology can assist teachers and students enhance their teaching and learning processes in a variety of ways. It encourages teachers and students to participate by allowing them to connect with advanced technology and ask questions, receive responses, efficiency improvements, and feedback. The influence of learning by information communication technology on students' engagement with feedback attempted to analyze how a variety of technical interventions could encourage students to engage with feedback and generate activities to promote future learning.

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6. Completing Interest:

The authors confirm that they have no competing interests to declare.

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Diversity Management on Workplace Performance and Productivity: A Comprehensive Analysis

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Abstract:

Globalization and technological progression foster organizations to become multicultural and diversified. Organizations witness an increasing multiplicity of workforce diversity. Age, gender, educational background, mother tongue, languages spoken and written, food preferences, culture, religion, celebrations, values, and beliefs are some of the aspects of diversity that exist. The current study explored the potential effects of workplace diversity on employee's performance. Specifically, the study aimed to establish the extent of demographic diversity, the degree of socio-cultural diversity, and how the management of workforce diversity affects organizational effectiveness. The study has been done by literature review on the concepts of workforce diversity management, job satisfaction, productivity, and their interrelationships. Based on the findings, the study concludes that diversity management is a process intended to create and maintain a positive work environment where individual similarities and differences are valued. The study suggested that organizations should design and implement customized diversity programs that meet the specific needs of staff members, departments, or the entire company. Additionally, it was proposed that job applicants should receive fair treatment in hiring and advancement, based on their skills rather than subjective characteristics such as color, religion, national origin, gender, age, sexual orientation, or physical disability.

Key Words: Diversity, Workforce, Individual Work, Employee's performance, Demographic diversity.

1. Introduction:

Cultural diversity in the workplace refers to having employees from various backgrounds, cultures, and perspectives working together. Effective management of this diversity is vital for maximizing productivity and fostering a positive work environment. Promoting open communication and mutual respect among employees regardless of their cultural differences is crucial. This can be achieved through training programs and workshops focused on cultural sensitivity and awareness. By appreciating each other's unique perspectives, teams can collaborate better and generate innovative ideas (Thomas and Stacy, 1991). In today's globalized business landscape, organizations that embrace cultural diversity gain a competitive edge. Understanding the importance of open communication, mutual respect, and inclusive practices is essential for building high-performing teams (Thomas and Stacy, 1991 study offers practical insights on managing cultural diversity through sensitivity training and cross-cultural collaboration (Geert, 1980).

In today's managing workplace diversity crucial for organizational performance and productivity. This paper examines the impact of diversity management on productivity and performance, exploring how companies can embrace cultural diversity while maintaining efficiency. It highlights strategies for creating inclusive workplaces where all employees feel valued and respected (Mor Barak, 2011). By sharing successful practices, the study provides practical insights for businesses seeking to maximize their diverse workforce (Geert, 1980). It also addresses strategies to reduce biases, promote inclusivity, and fostering cultural competence (Orlando, 2000) by investigating best practices from organizations that have successfully managed diversity (Taylor, 1994).

The study aims to offer actionable recommendations for companies to use diversity as a strategic advantage (Scott, 2010), helping them navigate the complexities of workplace diversity to drive innovation and growth (Taylor, 1994). By fostering a culture of inclusion and enhancing employee engagement, businesses can succeed in today's diverse marketplace (Christopher, 2007).

Creating an inclusive workplace involves implementing fair hiring practices, flexible work arrangements, and celebrating cultural differences. When employees feel included and empowered, they are more motivated to contribute their best work. Cross-cultural collaboration and training can bridge cultural gaps and improve productivity, while fostering continuous learning and growth (Thomas and Stacy, 1991). Ultimately, managing workplace diversity not only creates a more inclusive environment but also leverages diversity as a strategic asset for the organization.

In today's workplace, cultural diversity encompassing differences in nationality, ethnicity, religion, and has become widespread and crucial for driving innovation and success (Thomas and Stacy, 1991; Robin and David, 1996). However, managing diversity presents challenges such as language barriers and cultural misunderstandings (Harry, 1994). As globalization continues to grow, the need to balance diversity with productivity has gained increased focus.

Historically, workplace diversity was primarily viewed as a matter of legal and social responsibility, with early efforts concentrating on equal employment opportunities and anti-discrimination policies (Thomas and Stacy, 1991). Over time, this perspective evolved, with diversity now seen as a strategic asset that includes cultural competence and inclusion. Social Identity Theory (Tajfel & Turner, 1979) helps explain how individuals form their self-concept through group affiliations, shedding light on in-group and out-group dynamics in diverse settings. Similarly, Cultural Intelligence Theory (Earley & Ang) stresses the importance of adapting to different cultural contexts for effective collaboration (Christopher, 2007).

The approach to managing diversity has shifted from mere tolerance to fostering inclusive cultures that embrace diverse perspectives, driving innovation and improving performance (Taylor, 1994; Orlando, 2000). Geert's research on cultural dimensions (1980) offers further insights into how cultural values, such as individualism and power distance, influence workplace behavior and interactions.

Changing workforce demographics, including the rise of diverse generation and cultural representation, make inclusive workplace practices essential. Adeniyi et al. (2024) emphasize that diverse workforces enable organizations to attract top talent and ensure long-term sustainability. Okatta et al. (2024) highlight that organizations implementing diversity and inclusion initiatives report increased innovation, improved decision-making and enhanced employee engagement. Diverse teams bring broader perspectives, contributing directly to organizational success. According to Adisa et al. (2024), inclusive adapt better to market shifts and cultures of innovation that

are critical in competitive environments. Leadership commitment is central to successful diversity management. Okatta et al. (2024) stress that organizations with strong leadership support for diversity and inclusion are more likely to realize positive outcomes such as enhanced employee satisfaction and improved financial performance.

In Nepal, diversity management holds particular significance due to workforce disparities, with only 13.9% of women in leadership roles, according to the World Bank. Despite growing recognition of diversity's benefits, challenges such as unconscious bias, lack of inclusive leadership, and resistance to change remain obstacles.

This paper examines the critical role of diversity management in enhancing productivity and performance, addressing the opportunities and challenges faced in today's rapidly changing corporate environment.

Cultural diversity is increasingly common in today's workplaces, with employees from diverse national, religious, and ethnic backgrounds (Thomas and Stacy, 1991). While diversity brings valuable perspectives, it also presents challenges, such as communication barriers due to language and cultural differences (Harry, 1994), and unconscious biases that can lead to unfair treatment and exclusion (Robin and David, 1996; Mor Barak, 2011).

Balancing diversity with productivity can be difficult, as managing diverse teams requires significant resources (Adler, 2008; Geert, 1980). Despite the recognized benefits of diversity, there's a gap between theory and practical strategies for fostering inclusive, productive environments (Homan et al., 2015; Nishii & Rich, 2017).

In Nepal, demographic shifts have made workforce diversity, particularly in the public sector, more challenging, with inadequate diversity management potentially undermining trust and cooperation.

This study aims to explore the impact of age diversity on organizational performance, examining the relationship between diversity management, team productivity, and organizational culture. The research identifies a gap in understanding how generational differences and specific diversity strategies, like unconscious bias mitigation and flexible work arrangements, influence performance, highlighting the need for deeper analysis of these factors.

2. Methods And Methodology:

This study is a literature review on the concepts of workforce diversity management, job satisfaction, productivity, and their interrelationships. It is purely conceptual, relying on journal articles, books, and secondary data. In the following sections, relevant studies are summarized under the headings: the concept

of diversity; advantages and disadvantages of diversity; the concept of workforce productivity; workforce diversity management; diversity management and job satisfaction; and the relationship between diversity management and productivity.

Review Analysis:

The following table shows the primarily reviewed literature and the information gathered on about definition, key findings on relevant topics.

Aspect	Definition	Key Findings	Source(s)
Workforce Diversity	Recognized as an important organizational resource for customer service and maintaining a competitive edge	<ul style="list-style-type: none"> • Diversity involves differences in age, gender, ethnicity, education, etc. • A nurturing environment is necessary to manage these differences. • Embracing diversity fosters mutual respect. 	Kyalo and Gachunga (2015), Omankhanlen and Ogaga-oghene (2011), Emiko and Eunmi (2009), Carrell et al. (2006)
Gender Diversity	Equal representation of different genders in the workplace	<ul style="list-style-type: none"> • Gender diversity fosters cooperation and collaboration. • Mixed-gender groups perform better. • Addressing gender issues enhances workforce diversity. 	Leonard and Devine (2003), Kochan et al. (2003), Eagly and Wood (1991), Emiko and Eunmi (2009)
Age Diversity	Inclusion of different age groups in the workforce	<ul style="list-style-type: none"> • Older workers can be as productive as younger workers. • A heterogeneous age group is more innovative. 	Barrington and Troske (2001), Algahtani (2013), Williams and O'Reilly III (1998)
Education Diversity	Employees having different levels of education	<ul style="list-style-type: none"> • A well-educated workforce leads to higher productivity. • Education impacts efficiency. 	Choi and Rainey (2010), Emiko and Eunmi (2009)
Ethnic Diversity	Inclusion of different ethnic groups	<ul style="list-style-type: none"> • Ethnic diversity supports problem-solving. • Multicultural expectations drive diversity in business. 	Zgourides et al. (2002)

Relationship between Diversity Management and Employee Performance:

1. Independent Variables: Workforce Diversity:

- (a) Gender Diversity
- (b) Age Diversity
- (c) Ethnic Diversity

2. Theoretical Foundations:

- (a) **Social Identity Theory (SIT):**
It examines how individuals categorize themselves and others, impacting intergroup dynamics and workplace cohesion.
- (b) **Knowledge and Information Processing Theory:**
It suggests that diverse knowledge and perspectives enhance learning and problem-solving.
- (c) **Innovation Theory:**
It highlights how diversity fosters creativity and innovation through varied cognitive perspectives.

3. **Dependent Variable:** Employee Performance

4. **Mediating Factors:** Diversity Management Practices

- **Inclusive Environment:**
Creating a workplace culture where all employees feel valued, respected, and heard (Thomas & Ely, 1996).
- **Creative Problem-Solving:**
Leveraging diverse backgrounds and experiences to generate innovative solutions (Cox & Blake, 1991; Esty et al., 1995).
- **Engagement and Motivation:**
Fostering an inclusive atmosphere leads to higher employee engagement and productivity (Khan et al., 2019).

3. Study Findings:

Disparities in gender, age, and ethnicity may not be directly attributable to these characteristics; however, the experiences, perspectives, and skills associated with them can significantly influence employees' approaches to their work. For instance, younger employees are often characterized by their creative thinking and technical proficiency, while more senior employees typically contribute valuable experience and knowledge. Furthermore, interactions among diverse ethnic groups have the potential to enhance creativity through the exchange of varied perspectives. Nonetheless, it is crucial to acknowledge that workplace culture and team dynamics can also substantially impact these outcomes. This framework posits that organizations that actively value and promote diversity are more likely to cultivate an environment that maximizes each employee's potential, thereby enhancing overall productivity and performance.

Key Findings from Literature on Diversity in the Workplace:

Sn	Author	Topic	Findings	Theory
1	Ugwu (2024)	Trends and Strategies for Diversity in the Global Inclusive Workplace	Cross-cultural management by synthesizing theoretical frameworks	Hofstede Global Culture Theory, Trompenaars' Seven Dimensions of Culture model
2	Wei (2024)	Discussion of Cross-Culture Management in Cultural Diversified Workplace	Challenge of cultural diversity	Trompenaars' Seven Dimensions of Culture model
3	Olewiler (2019)	Exploring diversity on workplace	Challenges in managing diversity	Glass ceiling effect
4	Nair and Vahora	Diversity and inclusion at workplace	Cross cultural diversity	Social identity theory
5	Saxena (2018)	Workforce Diversity: A Key to Improve Productivity	Diversity; Interpersonal relations; Workforce; Productivity	Heterogenous
6	S.Ng et al.	Walking the Talk on Diversity: CEO Beliefs	CEOs · HR managers · Sense-making · Moral values · Diversity management	Participants Procedure Data Analysis
7	Felix et al. (2023)	Workplace Diversity and Employee Versatility	Workforce Diversity, Employee Versatility Gender Diversity and Age Diversity	Cross sectional survey research design
8	Ehilebo Joan (2023)	Effect of Workplace Diversity on Employee Performance in DSIBS in Nigeria	Age Diversity, Experience Diversity, Gender Diversity, Employee satisfaction, Employee engagement and performance	

Wei (2024) states the importance of cross-cultural management in multinational companies, emphasizing the role of cultural intelligence, effective leadership, and strong communication skills in enhancing workplace relationships and overall organizational dynamics.

Felix et al. (2023) explores the relationship between workforce diversity and employee adaptability in Nigeria's banking industry, concluding that diversity in gender and age significantly contributes to greater employee versatility.

Nair and Vohra (2015) examines the shifting focus in the discourse on diversity and inclusion, highlighting that while diversity has been extensively studied, the concept of inclusion, especially its connection to leadership, is increasingly drawing attention.

Elvi and Tunjungsari (2021) examines the impact of workplace happiness on employee behavior in managing diversity, finding that female employees generally perceive diversity policies more favorably than their male colleagues.

Shrestha and Parajuli (2021) investigates the relationship between employee diversity and performance in Nepal's commercial banking sector, identifying a strong connection between gender diversity and performance, with age diversity emerging as a significant predictor of success.

Ugwu et al. (2024) explores effective diversity practices in workplaces, proposing that diverse teams improve financial success and operational performance by implementing strategies such as mentorship programs and diversity training.

Tjimuku and Atiku (2024) examines the influence of workplace diversity on productivity in Namibia's state-owned enterprises, finding that age and educational diversity affect performance, whereas gender, ethnicity, and religion have no significant impact.

The Status of Diversity and Inclusion Practices in Nepalese Organization:

Nepal has been emphasizing diversity and inclusion (D&I) for decades, particularly within the political context. However, the practical application of D&I, especially in the private sector, remains limited. Current statistics show that diversity is not well maintained, and there is a notable lack of data regarding workforce diversity in this sector. Despite the development sector's focus on inclusion, significant diversity levels are still lacking.

The government has implemented policies, such as the reservation policy since 2007, aimed at increasing inclusion and diversity. Nevertheless, among the 80,000 civil servants, only 15% are women, and the employment rates of marginalized communities remain low. In the private sector, many corporate houses are predominantly run by male family members, leading to a bleak outlook for workforce diversity.

The benefits of D&I in the workplace are well-documented. Organizations with diverse workforces tend to outperform the average national industries, and companies with a higher proportion of female employees often see improved financial performance. Diversity fosters a culture that enhances creativity and innovation, allowing organizations to develop unique products and services.

In the context of community-based forest management programs, gender mainstreaming has successfully enabled women to participate in and lead community forest user groups. This initiative promotes gender-inclusive policies and practices. However, measuring social differences, including age, caste, class, and ethnicity, is more complex than gender, indicating that further efforts are necessary to enhance social inclusion.

To promote D&I in Nepal's workplaces, organizations should implement policies that advance both gender equity and social inclusion as distinct components of inclusive development. Additionally, at the local level, benefit-sharing mechanisms must be inclusive of caste, class, and gender, particularly within community forest user groups and other locally governed entities.

The Impact of Diversity on Workplace Productivity:

The relationship between diversity and workplace

productivity can yield both positive and negative outcomes, influenced by various factors. A diverse team enhances decision-making by incorporating a wider range of perspectives and ideas, leading to better recognition of potential risks and opportunities. This inclusion fosters employee engagement and job satisfaction, as individuals feel valued and appreciated, ultimately boosting productivity and reducing turnover.

However, diversity can also result in challenges such as diminished social cohesion, ineffective communication, and increased conflicts. These negative effects can be mitigated through effective diversity management, tailored to the specific context of the organization. Support from higher management is crucial to maximize the benefits of diversity while minimizing its drawbacks.

Research demonstrates that diversity can improve performance across various contexts. For example, age diversity has been linked to enhanced operational performance, while pro-diversity climates have led to higher sales outcomes for minority employees. Furthermore, racial diversity within management contributes to improved strategies and implementation, increasing productivity.

Theoretical frameworks, such as Social Identity Theory, suggest that initial contact with diverse individuals may lead to biases and stereotypes that hinder performance. Nevertheless, effective management can transform diversity into a source of creativity and innovation. Encouraging open discussions about cultural backgrounds can help mitigate social categorization's negative effects and foster inclusivity.

Knowledge and Information Processing Theory posits that diversity enriches the resource pool of knowledge, skills, and perspectives. By facilitating knowledge sharing and collaboration, organizations can leverage diversity for competitive advantage and innovation.

Innovation Theory further supports the idea that diverse teams drive innovation by combining unique backgrounds and experiences. Managers can foster an innovative environment by valuing cognitive diversity and encouraging the exploration of different perspectives.

In summary, while diversity presents both challenges and opportunities for workplace productivity, effective management practices can enhance the positive impacts and mitigate the negative ones, ultimately improving organizational performance.

4. Conclusion:

Organization aiming to improve output, encourage creativity, and establish a happy work environment

must manage cultural diversity in the workplace. The study's conclusions highlight the value of inclusive behaviors, respectful communication, and mutual respect in overcoming the challenges brought on by cultural differences. By implementing targeted diversity training, promoting cultural awareness, and adopting effective conflict resolution techniques, organizations can cultivate happy, cooperative teams that leverage diversity as a strategic advantage.

Effective diversity management requires a nuanced approach that acknowledges both the challenges and opportunities that diversity presents. By emphasizing the benefits of diversity and proactively addressing potential hurdles, managers can create an inclusive environment that enhances performance, productivity, and innovation.

This study concludes that, in today's interconnected world, effective diversity management is not just a moral obligation; it is essential for corporate success.

By adopting inclusive policies and viewing diversity as a strategic asset, organizations position themselves for long-term success, competitive advantage, and a positive societal impact.

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6. Completing Interest:

The authors confirm that they have no competing interests to declare.

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Consumer Impulse Buying Behavior for Approach in the Context to Visual Merchandising in Kathmandu

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Abstract:

The primary objective of this study was to examine the relation between visual merchandising dimensions and consumer impulse buying behavior in retail industry of Nepal, to understand which visual merchandising tools and techniques influences the customers most and to highlight the importance of visual merchandising concept in sales and marketing arena which helps to boost sales turnover and also create an appealing store image. The study area for this research was the retail stores of malls in Kathmandu, data were collected from respondents through questionnaire survey method. The sample population for this study was composed of shoppers who visited the malls and retail stores. This study sampled 208 customers visiting the retail stores in malls in Kathmandu city using convenience sampling technique. This study followed descriptive research design and casual comparative research design which assessed and examined the effect of visual merchandising dimensions specifically; product display, form/ mannequin display, lighting & music, shop brands name and promotional signage on consumer impulse buying behavior. Respondents' demographic profile describing the sample population is presented in this study, followed by descriptive statistics for each of the surveys administered. The correlation analysis found that product display, form/ mannequin display, lighting & music and promotional signage had significant relationship with consumer impulse buying behavior. Similarly, regression analysis identified that product display, form/ mannequin display and promotional signage had a significant relation with consumers' impulsivity. It is hence, concluded that consumer impulse buying is significantly impacted by product display, form/ mannequin display and promotional signage. As impulse buying has now been perceived as a common behavior, thus retailers should take the opportunity and benefit themselves from the use of different VM elements which is often termed as 'an art of silent selling'.

Key Words: Product Display, Mannequin Display, efficient of Lighting and Music, Shop Brands.

1.Introduction:

Retailing is a form of business activity, which involves selling goods and services in relatively smaller quantities to the consumer for final consumption rather than resale. Over the years, retailing has grown into a challenging and profitable business with a significant impact on the global economy. It represents the final step in the chain supply and distribution process that eventually ends up on the consumer's shopping cart (Amadeo, 2020). Retailing provides a means for products to get to consumers, whereby, it involves selling of variety of products such as healthcare products, apparels, food and, groceries, electronic products, automobile parts and repair, fitness products, to name a few.

The rise of supermarkets, shopping malls, department stores, and franchise stores have heightened the competition in retail field. As a result of continuous inventions and developments of new technologies, more sophisticated management practices and industry consolidation, the face of retail industry

has transformed leading to improved performance. In present context, the mega malls and supermarkets offer a mix of retail stores, entertainment hubs and food courts, all under one roof which has pushed the concept of one-stop shopping to the extreme (Vault, 2020).

Consumers are one of the key factors that ultimately drives the retail business. A retailer's success depends on understanding consumer behavior, identifying needs, and analyzing decision making pattern. Due to the exponential growth of new technologies, the entry of foreign retail chains and the cutting edge of management practices, competition has intensified. The practice of selling same merchandise every next store at similar price-range has further drove the competitive environment.

Muruganatham and Bhakat (2013) observed factors such as foreign product availability, organized retail growth, lifestyle changes, rising disposable income, and favorable demographics have contributed to impulsive buying behavior among Indian consumers. However, most research on impulsive buying

has focused on American or European consumer context. Very few studies have examined this phenomenon in Nepal and none have explored the relationship between visual merchandising and impulsive buying among Nepali consumers.

Therefore, this study aims to investigate the impact of visual merchandising in consumer impulse buying behavior in the retail industry of Nepal. Furthermore, this research is devoted to address and cover the answers to the following questions:

What is the impact of product display on consumer impulse buying behavior?

Does form/mannequin display play a significant role on consumer impulse buying behavior?

Several studies have explored consumer impulse buying behavior. Solomon (2002) emphasized the importance of understanding consumer behavior for developing strategic marketing plan. Consumer behavior highlights the decision making process exhibited by individuals while valuating, obtaining, utilizing, or discarding products and services (Louden and Bitta, 2002). Consumer behavior is dynamic in nature, it is influenced by many internal factors such as psychological aspects and external factors such as socio-cultural environment and marketing mix (Schiffman & Kanuk, 2007).

Schiffman and Kanuk (2012) stated that consumers are regarded as rational decision-makers, who exhibit certain behaviors in the consumption process including searching, procuring, using, evaluating and finally disposing the product. They also explored the decision-making pattern from pre-purchase evaluation to post-purchase assessment, and how such evaluations shape future purchasing behavior.

Radu (2019) suggested that consumer behavior analysis should focus on understanding how consumers perceive products and brands, the factors influencing their decisions, and the impact of external surroundings such as family, friends, peers, and media.

Peck and Childers (2006) found impulse buying behavior as a persistent aspect of consumer lifestyles, accounting for approximately 30% to 62% of total purchases. This behavior is significant for retailers as it contributes substantially to their profit margins.

Lee and Kacen (2008) explained that retailers actively use strategies like product displays, and store designs to increase the rate of impulse purchases and ultimately driving revenue growth. Pentecost and Andrews (2010) observed that apparel retailers focused on positioning their fashion accessories, strategically, to influence consumers' impulse purchases. Pornpitakpan and Han (2013) emphasized that apparel is the most frequently purchased category in connection with impulse buying.

They argued that impulse purchases of apparel often complement planned purchases, making it a critical segment for retailers to target consumers.

2. Materials And Methods:

A correlational research design has been used to determine the relationship between visual merchandising components (viz. product display, form/mannequin display, lighting and music, shop brands name and promotional signage) and shopper's impulse buying behavior for apparels.

The population under study comprises customers of shopping center of Kathmandu. The study was conducted in Labim mall and Eyeplex in Kathmandu. The purposive sampling technique has been used for the selection of sampling unit for the study.

Using structured questionnaire, primary data were collected to analyze consumer's visual merchandising elements on impulse buying tendency in retail outlets of Kathmandu city. The purposive sampling technique has been used for the study. The collected quantitative data underwent analysis utilizing various statistical tools and techniques such as regression, and ANOVA.

Primary data were collected through distribution of questionnaire to the customer of shopping center of Kathmandu. A survey was used to collect primary data through survey questionnaire via Google Forms, print media, email, and the internet. A total of 250 questionnaire were distributed, only 208 valid responses were obtained and analyzed.

Regression Model:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \epsilon_i$$

Where:

- Y = Dependent variable, i.e., Consumer Impulse Buying Behavior
- β_0 = Intercept of regression
- X_1 = Product Display; β_1 = Regression Coefficient of Product Display
- X_2 = Form/Mannequin Display; β_2 = Regression Coefficient of Form/Mannequin Display
- X_3 = Lighting and Music; β_3 = Regression Coefficient of Lighting and Music
- X_4 = Shop Brands Name; β_4 = Regression Coefficient of Shop Brands Name
- X_5 = Promotional Signage; β_5 = Regression Coefficient of Promotional Signage
- ϵ_i = Error term

Data Presentation and Analysis:

Table 1: Collinearity Statistics

Model	Tolerance	VIF
Product Display	0.672	1.488
Form/Mannequin Display	0.649	1.542
Lighting and Music	0.770	1.299
Shop Brand Name	0.854	1.171
Promotional Signage	0.808	1.237

Dependent Variable: Impulse Buying Behavior
Source: Field Survey 2019

The table 1 reveals the collinearity statistics which presents the outcomes generated highlighting tolerance value and variance inflation factor (VIF). The tolerance values and Variance Inflation Factor (VIF) for all variables fall within acceptable limits (Tolerance > 0.1 and VIF < 10). This indicates the absence of multicollinearity among the predictors. It indicates reliability of the regression coefficients and validates the measurement scales used in the study.

Table 2: ANOVA for Regression Model

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	834.704	5	166.941	18.354	0.000
Residual	1837.277	202	9.095	–	–
Total	2671.981	207	–	–	–

Table 3: Multiple Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	8.881	1.500		5.922	0.000
Product Display	0.154	0.062	0.178	2.497	0.013
Form/ Mannequin Display	0.342	0.080	0.311	4.289	0.000
Lighting and Music	0.158	0.087	0.121	1.825	0.069
Shop Brands Name	0.042	0.098	0.027	0.424	0.672
Promotional Signage	0.145	0.072	0.132	2.032	0.043

Dependent Variable: Impulse Buying Behavior Source: Field Survey 2019

The table 3 shows the results of regression analysis where the beta coefficients and p- values generated from multiple regression test are highlighted. In the regression analysis, the beta coefficients explain the relative importance of the five visual merchandising dimensions (independent variables) to the variance in customer's impulse buying behavior (dependent variable).

From the table 3 the following results were derived:

Form/ Mannequin Display is the most significant predictor ($\beta_2 = 0.311$, $p = 0.000$), which makes the largest contribution in explaining consumer impulse buying behavior.

Product Display ($\beta_1 = 0.178$, $p = 0.013$) and Promotional Signage ($\beta_5 = 0.132$, $p = 0.043$) also have a significant positive impact on impulse buying behavior, both predictors have the p-values less than 0.05. These variables are statistically significant at 5 percent level of significance.

Lighting and Music ($\beta_3 = 0.121$, $p = 0.069$) and Shop Brands Name ($\beta_4 = 0.027$, $p = 0.672$) are not statistically significant, since their p-values exceed 0.05. From the analysis it is concluded that these variables do not meaningfully contribute to the model in explaining consumer impulse buying behavior, and are excluded from further consideration in the regression equation.

Study shows that female customers assess the need requirement of the apparels after looking at it which may entice impulse purchases in comparison to male customers who are more likely to make planned purchases.

The demographic profile analysis with respect to age shows that the majority respondents are from the 25-29 age group (43.27%) followed by 20-24 age group (36.06%). College students and young working employees, highly influenced by visual presentations and displays.

Regarding academic qualification of the respondents, majority of respondents (59.13%) have completed their Bachelor's degree followed by 30.76% with Master's degree and 10.58% with +2-level education. This trend indicates that majority of the respondents are educated and are well aware about influence of visual merchandising attributes and attractions.

It is found that 35.58% of respondents have income below Rs.10,000, followed by 25% of the respondents have income from Rs.26,000 - 50,000. Moreover, 48.08% respondents are dependent on their parents while 51.92% are independent on their own. These findings suggests that younger, educated individuals form a major portion of retail customers are more inclined to impulse purchases.

3. Results And Discussion:

Bhatti and Latif (2013) on 'Role of Visual Merchandise in retailing of supermarkets in Chennai' found the significant impact of visual merchandising elements like window display, forum display, floor merchandising and shop brands name on consumer impulse behavior. However, this current study finds that shop brands names do not have significant impact on impulse buying behavior.

Meenakumari (2013) on 'Role of Visual Merchandise in retailing of supermarkets in Chennai' revealed that all the visual merchandising elements under the study viz. entrance, promotional signage, window display, fixtures, floor space and interiors had a significant impact in impulse purchases; while the current study exhibited that promotional signage have a significant impact on consumer impulse buying behavior. Similarly, in the study conducted by Dash and Akshaya (2016) on 'A Study on the Impact of Visual Merchandising on Impulse Purchase in Apparel Retail Stores' concluded that store layout, mannequin display, and promotional signage had significant positive impacts on impulse purchase.

The results reveal the visual merchandising elements have influencing role on customers' impulse purchases. Retail industry in Nepal especially in Kathmandu have grown rapidly over the time as a

result of market centralization, and consumer behavior has shifted unplanned purchases. However, such types of research study are mostly limited to developed economies while a very few research studies on this subject-matter are found in developing economies. Thus, in context to the Nepali scenario, understanding consumer behavior is crucial for any retailers so as to grab the opportunities through the usage of appropriate amalgamation and synergistic effect of several techniques of visual merchandising and presentation that stimulates impulse buying.

4. Conclusion:

The primary objective of this study was to examine the relation between visual merchandising dimensions and consumer impulse buying behavior in retail industry of Nepal. Specially, it aimed to identify most influential visual merchandising tools and techniques emphasizing their importance in boosting sales turnover and creating an appealing store image. This study assessed and examined the effect of visual merchandising dimensions specifically; product display, form/ mannequin display, lighting & music, shop brands name and promotional signage on consumer impulse buying behavior.

The study's descriptive findings show that visual presentations and displays influenced a major portion of retail customers, young working employees, females than males, and highly educated than less educated individuals. Overall, from this study it can be concluded that Form/Mannequin Display has the strongest influence on consumer impulse buying behavior, followed by Product Display and Promotional Signage. These findings suggest retailers should prioritize these aspects of visual merchandising to maximize impulse purchases. The regression analysis highlights the significant and positive impact of specific visual merchandising elements on impulse buying behavior, offering actionable insights for retailers to enhance store layouts and marketing strategies.

Implications:

The findings of the study contribute to a better understanding of consumer behavior concept in relation to impulse buying behavior of Nepalese customers alongside providing some managerial implications mainly focusing on the retail businesses. The results of this study could benefit the apparel retailers in Kathmandu city because a comprehensive exploration and assessment has been conducted in terms of customer's perception towards visual merchandising and its effects on impulse buying tendency. This research has contributed in the field of marketing thus provides practical implications to the entire apparel industry. The results obtained from this study aids to better understand the perceptions and the behavior displayed by shoppers in the malls.

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6. Completing Interest:

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Exploring Post-Epidemic Marketing Strategies in Higher Education: A Synthesis of Recent Research and Implications

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Abstract:

The increasing number of competitors, commodification of educational value and globalization has pressured those providers to adapt different marketing strategies. This study aimed to explore the marketing activities using 7Ps framework and six-phase thematic analysis to understand what activities influence the post-pandemic enrollment decisions in HEIs. In this regard, this paper uses the six-phase thematic analysis to review the discussion session from the 11 articles published between 2022 and 2024. This paper shows the shift of marketing activities from program, price, place, promotion, people, process, and physical evidence to post-pandemic practice including managerial practices, facilities, financial considerations, programs' feature, branding and media exposures. These are aligning with student needs, program quality and affordability. This study concludes that HEIs must balance both traditional and post-pandemic strategies to enhance students' experience.

Key Words: Marketing activities, higher education, student enrollment, post-pandemic.

1. Introduction:

Education in the modern context viewed and offered as a service product offered to its students as they are the consumers of education provider. The increasing number of competitors, commodification of educational value and globalization has pressured those providers to adapt different marketing strategies (Kasimbara et al., 2024; Subedi, 2019). In this context, Higher Education Institutions (HEIs) offer their programs to influence student's enrollment decision in a systematic way by promising to fulfill prospect students' needs and desires. In this case, HEIs have implemented the educational marketing mix activities to position their offerings strategically in the market. This influence the students' enrollment decision when they search more information regarding their desired program (Mahajan and Gollahit, 2019; Tukur et al., 2019). This involves the placement of different marketing activities in a thematic framework such as product (program), price, promotion, place, process, people, and physical evidence, collectively referred to as 7Ps to draw desired responses from the prospects (Kotler et al., 2016, as cited in Pardiyono et al., 2022). Many studies have concluded that the 7P's has been a key approach to align with other strategies and increase enrollment in HEIs for a long time (Pokhrel et al., 2018). Meanwhile, HEIs and their prospect students have faced pandemic consequences. In this situation, there are limited studies stated whether the same marketing activities were practiced as before pandemic or it has changed during and after crisis. In this context,

this paper is aimed to address raised concern on what marketing activities are being discussed in the post-pandemic articles that influenced HEI's enrollment in the recent years. This paper review pre-pandemic articles through 7Ps framework and then thematically analyze the discussion sections of the articles between 2022 and 2024.

Filip (2012) defines marketing mix as the strategic blend of activities employed by leaders to elicit desired responses from target markets, originating in the 1960s. It works effectively to offer products and services to their specific market segments, traditionally comprising the 4Ps framework (product, price, place, and promotion), expanded in the 1980s after including 3Ps from service sector (people, process, and physical evidence). In this regard, it is evolved with Kotler and Fox revision for education sector by replacing product with program concept. This became an important strategy of leadership and marketing of HEIs in recent the years to offer and influence the student's enrollment choice (Al-Fattal and Ayoubi, 2013; Chawla, 2013; Filip, 2012; Goi, 2009; Ng and Forbes, 2009; Tukur et al., 2019).

Technological advancements in higher education, coupled with growing awareness among parents and students, have made it more challenging for HE institutions to influence enrollment decisions (Subedi, 2019). In higher education, Chawla (2013) stated that students primarily search more information regarding their desired program. They look for program's

features, quality, degree awarded and its benefits, program curricula, brand names, placement facilities, grading given and many more. Tuition fees (Kwang, 2019), admission and examination fees (Chawla, 2013), discounts and scholarships (Pokhrel et al., 2018), flexibilities in payments, efforts and costs for transportation and living nearby, opportunities for getting up and works (Sabir et al., 2013). In this context, HEI leaders seem to convince students that the prices offered are rational and fair enough in terms of quality, values, and facilities (Chawla, 2013).

Easy accessibility to the study site whether in physical classroom or in online modes of delivery, site environment and supporting facilities, accessing road, transportation facility, parking for student's vehicle, and distance from one classroom to another place including lab, canteen or restrooms are other major concerns (Al-Fattal and Ayoubi, 2013; Chawla, 2013; Pokhrel et al., 2018).

Higher Education leaders often offer their program through different promotional activities to communicate, inform and influence their prospects. They develop insights from students' desires, and create limited proposals that are realistically achievable (Ng and Forbes, 2009). Pokhrel et al. (2018) found that many students were influenced by their friends, family and relatives for their program choice. In addition, many other prospects followed the social media, newspapers, college websites, educational events and media such as TV, radio, magazines and word of mouth (Chawla, 2013) such as reference from current students and alumni.

Ng and Forbes (2009) proposed teachers, administrators, support staff and students as People-pillars in educational marketing. Students want to know more about other human pillars, their profile and performance (Chawla, 2013; Goi, 2009; Mahajan and Golahit, 2019; Pokhrel et al., 2018; Tukur et al., 2019). They were significantly influenced with how such human pillar acted.

Educational materials, facilities for teaching learning, accommodations, and recreational activities has influence on enrollment decision (Chawla, 2013; Ng and Forbes, 2009; Pokhrel et al., 2018). Moreover, structure, design, visual appearance, functionality, layout and surrounding contexts of the college premises, buildings, playing area, and classrooms influential. Furthermore, uniforms, publications such as annual reports, calendars, diaries, magazine, and visiting cards significantly influenced prospects. In addition, few students also searched for nearby facilities such as hospitals, banks, offices, and stores.

Higher Education leaders influence their prospect through how they carry out teaching learning process. It has been a mutual relationship between

teachers and students where teacher became guide, supporter, facilitator and mentor for the students (Subedi, 2019). They go beyond contemporary style and focus on skills development such as presentation, problem solving and logical thinking. Moreover, college leaders also highlight on student's performance evaluation processes which now has based on formative assessment. Therefore, such college leaders influence students by explaining how they carry out case studies, projects and research papers to develop the specialist human resource. Moreover, Ng and Forbes (2009) claimed that many students sought information about socialization and administrative processes, and that higher education leaders had to respond.

Hedström and Ylikoski (2014) explain that decision makers have incomplete information for their rational choice. In this context, student's choice for the program offer is a social phenomenon and were not fully informed. This creates an opportunity for HEI leaders to rationally choose marketing activities and guide such potential enrolments. However, a crucial gap exists in our understanding of what marketing activities are in use and influencing the aftermath enrollment season of the COVID-19 led pandemic. To address this gap, this study aims to analyze recently published articles.

2. Materials And Methods:

This qualitative review studies what marketing activities were discussed in the post-pandemic articles published between 2022 and 2024 to influence the enrollment in HEIs. This study reviews the discussion section of the articles because of its richness of data having findings, interpretations, and implications. In this study, articles were freely accessed and downloaded from online platform. This includes Google Scholar, ResearchGate, and Academia while focusing on articles published between 2022 and 2024 with relevant abstracts. The search terms combined higher education, marketing mix, college choice, and enrollment decisions. Citation and reference of good articles opened links for other articles. In this regard, purposefully 11 articles were selected for review, justified by the principle of data saturation and ensures that core themes and patterns are adequately captured without redundancy. A limitation of this review is the potential effect of analysis time on the generalizability of findings. In addition, the quality and range of published articles identified may limit the generalizability of the results.

This article uses the six-phase framework of the thematic analysis approach (Braun and Clarke, 2006). In its first phase of familiarization, the discussion section of the selected articles were taken as transcribed data and thoroughly reviewed. This phase with intense repeated reading of the data supports to gain overall insights and then identifying initial patterns.

In the second phase of generating initial codes, data were coded line-by-line as relevant to the research question.

At this point, initial coding with the help of Microsoft Excel software captured the marketing activities manually which provides foundation for further analysis. Third phase involves identifying themes through its data pattern. In this phase, the initial codes were reviewed and categorized systematically into emerging themes. This involves refining and regrouping of codes to accurately reflect the emerging patterns.

In the fourth phase of reviewing, the identified themes were further refined, and then named for clarity, consistency, and coherence. The entire data set was reviewed to confirm that themes accurately captured the findings. Furthermore, themes with limited supporting data were merged with appropriate theme. The fifth phase is about defining and naming the theme. At this phase, themes were defined and named ensuring accurate data representation. Moreover, each theme received an abbreviated and descriptive name such as 'facilitie's, and 'management practice's. Finally, the findings were written clearly and concisely at sixth phase. This report writing phase emphasizes on marketing activities thematically that were implemented by HEIs to influence student's enrollment decision in the post-pandemic years. In this regard, this six-phase thematic analysis is a comprehensive and rigorous approach to identify key themes (Braun and Clarke, 2006) through studying HEI's influential marketing.

Findings:

Management Practices:

By planning, organizing, implementing, and controlling effective post-pandemic marketing strategies in higher education (Kasimbara et al., 2024), analysts are gaining valuable insights into student behaviors and preferences to increase enrollment rates (Yan et al., 2024). In order to attract potential students and improve service quality in higher education institutions, it is necessary to address marketing mix elements including product quality, affordability, strategic location, promotional activities, skilled human resources, efficient processes, and adequate infrastructure (Kasimbara et al., 2024; Pardiyono et al., 2022). Moreover, mentoring lecturers, supportive department heads, attentive campus staff, helpful library staff, and friendly registration officers were identified as highly influential (Pardiyono et al., 2022). In this regards, division of their task properly as well as supervisory activities while implementing marketing plans and continuous evaluation for improvement ensures marketing effectiveness (Kasimbara et al., 2024).

Facilities:

Students' desires for engagement other than educational program for extracurricular facilities such as athletics and sports found influential (Baliyan and Mokoena, 2024). Campus attractiveness, location, size, and cultural diversity, as well as valuing accessibility, proximity and transportation availability to campus, its facilities and other accommodation, are essential for enhancing the overall decision (Baliyan and Mokoena, 2024; Pardiyono et al., 2022; Rabenu and Shkoler, 2022; Yan et al., 2024). Moreover, on-line study scope and facilities, advanced classrooms, labs and libraries were found to have a high influence while making enrollment decisions (Gurung et al., 2022; Pardiyono et al., 2022; Mahajan and Patil, 2023; Rabenu and Shkoler, 2022, Yan et al., 2024). Meanwhile, there was limited influence observed for safety and security measures among prospect enrollees. Moreover they were focused on choosing local and nearby educational options (Mahajan and Patil, 2023).

Financial Considerations:

Costs related factors including admission and regular tuitions fees have influence over the enrollment decisions. Moreover, financial support and scholarship ensures wider access to higher education and make accessible to underrepresented and economically disadvantaged groups (Gurung et al., 2022; Rabenu and Shkoler, 2022; Yan et al., 2024). In addition, the provision of scholarships from various sources, including governments, institutions and policies, has a significant impact on enrollment decisions by reducing the cost of education and providing financial aid (Zhou and Alam, 2024). Furthermore, such pricing and financial considerations influence post-pandemic decisions (Baliyan and Mokoena, 2024; Gurung et al., 2022; Hung and Yen, 2022; Pardiyono et al., 2022; Rabenu and Shkoler, 2022; Yan et al., 2024; ZZhou and Alam, 2024).

Program Features:

Admissions requirements, such as language proficiency standards has influences on enrollment choices for non-native speakers such as for English language (Zhou and Alam, 2024). In this regard, multiple and diverse academic program offers play an important role in shaping student preferences, emphasizing the need for robust curriculum offerings (Gurung et al., 2022). Effective curriculum delivery, especially through hybrid modes, positively influences sustainability, highlighting the need for adaptive instructional approaches, important in pandemic scenarios (Mahajan and Patil, 2023). Students are also highly influenced by teaching quality and career outcomes perception, such as future employment prospects and graduate employment rates (Baliyan and Mokoena, 2024; Gurung et al., 2022; Le et al., 2022). Furthermore, program offering variables such as quality of academic offerings, its reputation, extracurricular opportunities, have a major impact

on enrollment decisions (Pardiyono et al., 2022; Rabenu and Shkoler, 2022). Perceived benefits of educational investment relative to costs among different student groups (Mahajan and Patil, 2023) and addressing client needs beyond enrollment, ensuring a comprehensive educational experience (Hung and Yen, 2022).

Branding:

Efforts to establish alliances with local to global companies and academic institutions expand outreach and attract students from diverse backgrounds (Kasimbara et al., 2024; Zhou and Alam, 2024). Effective branding and strategic communication attract those students (Yan et al., 2024) while increasing the reputation of such institutions and emphasizing global visibility play an important role in attracting international students as well (Zhou and Alam, 2024). The reputation and image of institutions has a more influence on admissions decisions (Mahajan and Patil, 2023). Strategies based on international experience provide better educational services while maintaining student satisfaction and loyalty (Hung and Yen, 2022).

Media-exposure:

E-exposure on social media and digital platforms act as an important enrollment tool, especially among the younger generation, which urges higher education institutions to adapt and leverage these elements in their admission efforts (Baliyan and Mokoena, 2024; Hung and Yen, 2022; Yan et al., 2024). In addition to the use of innovative marketing strategies, digital and advertising technologies, participation in traditional fairs, taking advice from friends, parents, teachers, and mentors remain decisively influential (Baliyan and Mokoena, 2024; Ley et al., 2023). There have a greater impact by increasing brand perception including exposure on both print and social media (Elpisah et al., 2023; Kasimbara et al., 2024).

3. Results And Discussion:

Education has increasingly transformed into a service product, with higher education institutions adopting marketing strategies to attract students (Kasimbara et al., 2024; Subedi, 2019). To meet the evolving needs and expectations of students, institutions strategically employ elements of the marketing mix, including product (program), price, place, promotion, process, people, and physical evidence (Kotler et al., 2016, as cited in Pardiyono et al., 2022). Institutions focus on developing and offering programs that resonate with students' interests and career aspirations (Al-Fattal and Ayoubi, 2013; Chawla, 2013). They emphasize program features, quality, and relevance to differentiate themselves in the market (Ng and Forbes, 2009; Tukur et al., 2019). Tuition fees, scholarships, and financial aid

significantly impact students' enrollment decisions (Kwang, 2019; Rabenu and Shkoler, 2022). Institutions strive to communicate the value and affordability of their programs to prospective students (Chawla, 2013).

Accessibility, campus environment, and facilities influence students' perceptions of institutions (Al-Fattal and Ayoubi, 2013; Pokhrel et al., 2018). Institutions invest in enhancing physical facilities and online learning environments to cater to diverse student needs (Gurung et al., 2022; Rabenu and Shkoler, 2022). Institutions utilize various promotional activities to communicate their offerings and values to prospective students (Ng and Forbes, 2009; Pokhrel et al., 2018). Strategic branding efforts enhance institutional visibility and reputation (Yan et al., 2024; Zhou and Alam, 2024). Positive interactions with faculty, staff, and peers influence students' perceptions of institutions (Baliyan and Mokoena, 2024; Chawla, 2013). Institutions leverage traditional and digital media channels to engage with prospective students (Baliyan and Mokoena, 2024; Hung and Yen, 2022).

4. Conclusion:

The COVID-19 pandemic had has a transformative impact on the higher education, imposing a review of marketing strategies. Recent studies confirms the continued relevance of the 7Ps marketing mix in influencing student enrollment decisions, with more emphasizes on offering program, price, and promotion along with other place, people, process and physical evidence related activities (Kasimbara et al., 2024; Mahajan and Golahit, 2019; Pardiyono et al., 2022; Pokhrel et al., 2018; Subedi, 2019). However, the pandemic has also stressed the growing influence of online learning opportunities, digital marketing channels, institutional branding and a focus on student's well-being. HEIs need to balance both traditional marketing strategies along with post pandemic approaches such as digitalization, financial assistance, and campus facilities (Gurung et al., 2022; Mahajan and Patil, 2023; Zhou and Alam, 2024). Finally, this study contributes to the HEI domain by providing its findings on what marketing activities are being practiced to address difficulties in student enrollment after the pandemic.

Implications:

The findings of this study offer many implications for HEIs providers who want to improve their marketing approaches and number of enrollment. In order to effectively draw in prospective students, colleges should first give priority to creating programs that are aligning with the students' interests and professional ambitions (Gurung et al., 2022; Tukur et al., 2019). They need to provide financial assistance and scholarships can increase access to higher education, especially for students from low-income backgrounds (Rabenu and Shkoler, 2022; Zhou and Alam, 2024).

Moreover, upgrading on-campus and on-line learning settings, use of social media, and digital marketing tools can raise student's satisfaction, experience and perception toward HEIs and offered program (Baliyan and Mokoena, 2024; Gurung et al., 2022; Hung and Yen, 2022; Mahajan and Patil, 2023). HEIs need to focus on their strategic branding initiatives (Kasimbara et al., 2024; Yan et al., 2024). Active and strong engagement between prospect students, faculties, staffs, and peers have more impact on their enrollment decisions and HEI's organizational culture (Ng and Forbes, 2009; Chawla, 2013). Finally, policymaker, universities and HEIs associations can improve their policies and services toward more student friendly.

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The authors confirm that they have no competing interests to declare.

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Performance Analysis of Canny Edge Detector and Laplacian of Gaussian Edge Detector Algorithms

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Abstract:

The core of image processing lies from the principal to represent the digital image in signals of 2-3 dimensions and applying the techniques of digital signal processing to obtain the diverse parameters related to image. Edge detection is the preprocessing techniques of image processing which includes mathematical methods that aims in identifying the sharp discontinuities in an image. The theme of this article is particularized on the performance analysis among Canny Edge Detection and Laplacian of Gaussian (LoG) Edge Detection algorithms on behalf of their execution time. The result in this study shows that the performance of LoG Edge detection algorithm is better than the performance of Canny Edge detection algorithm on the basis of their execution time.

Key Words: Canny Edge Detector, LoG Edge Detector, Image Gradient, Kernel, Convolution, Sobel Operator, Prewitt's Operator, Gaussian Smoothing.

1. Introduction:

The first stage in many computer vision applications is edge detection. By eliminating unnecessary or unimportant information, edge detection drastically lowers the amount of data and extracts the important information from an image. Object detection in image processing is based on this information (Bhardwaj, 2012).

By eliminating unnecessary or unimportant information, edge detection drastically lowers the amount of data and extracts the important information from an image. Object detection in image processing is based on this information. In computer vision and image processing applications, edge detection is a low-level procedure. Finding and recognizing abrupt changes in an image is the primary objective of edge detection. The sharp variations in pixel intensity that define an object's boundary in a scene are the cause of these discontinuities. Boundaries between various parts in the image are indicated by edges. These boundaries are utilized to distinguish things in order to match and segment them (Kaur, 2011).

There are numerous edge detection operators at one's disposal (Canny, 1986). These operators recognize step, corner, vertical, and horizontal edges. Noise, lighting, objects with similar intensities, and the density of edges in the scene all have a significant impact on the quality of edges that these operators are able to identify. These issues can be

resolved by modifying the threshold settings for what constitutes an edge and a number of other edge detector parameters. These operators are highly susceptible to high frequency contents in edges and noise. Thus, it is necessary to remove noise that could cause distorted and blurry margins.

The main problem with edge detection is determining which image pixel is an edge pixel and which one is not, which can be extremely difficult to do. Thus, the employment of Canny Edge Detector and LoG Edge Detector and their respective performance comparisons are the main objectives of this work.

Edge detection is a process used in image processing to identify and locate sharp discontinuities in an image, which often correspond to object boundaries. Discontinuities are typically identified by sudden changes in pixel intensity, and the goal is to highlight the regions where these changes occur, thus outlining the structure of the objects in the image (Ganesan, 2017).

Steps in edge detection include smoothing, gradient calculation, non-maximum suppression, thresholding. Smoothing reduces noise in the image using techniques like Gaussian smoothing. Noise can create false edges, so smoothing is often applied before edge detection. Gradients represent the change in intensity at a pixel. High gradients indicate a strong change in intensity, which often means the presence of an edge. The gradient magnitude is calculated,

often using techniques like the Sobel or Prewitt operators. After determining the gradient magnitude, the edges must be thinned by eliminating any pixels that are not thought to be edges. This step keeps only the local maxima of the gradient. To distinguish between strong edges and weak edges, a threshold is applied. Only the gradients above a certain value are retained, and others are suppressed. Double thresholding is used in techniques like Canny edge detection to classify edges into strong, weak, and non-edges (Muthukrishnan, 2011).

A basic mathematical procedure called convolution is required for many popular image processing operations, including edge detection. A third array of numbers with the same dimensionality can be created by multiplying two arrays of numbers—typically of different sizes—together using convolution. This can be applied to image processing operations that result in simple linear combinations of certain input pixel values as output values (Jain, 1989). Convolution is accomplished by moving the kernel through all of the locations where it completely fits within the image's bounds by sliding it across the image, usually beginning at the upper left corner. Every single output pixel associated with a kernel position is determined by multiplying the kernel values by the underlying picture pixel value for every single cell in the kernel, and then summing these values collectively. For the image with M rows and N columns, and the kernel has m rows and n columns, then the size of the output image will have $M - m + 1$ rows, and $N - n + 1$ columns.

$$O(i, j) = \sum_{k=1}^m \sum_{l=1}^n I(i+k-1, j+l-1)K(k, l),$$

where $i = 1, \dots, M - m + 1$ and $j = 1, \dots, N - n + 1$.

A 2-D convolution operator called the Gaussian smoothing operation is used to blur images and eliminate noise and detail. One kind of picture-blurring filter is the Gaussian blur, which determines the modification to be applied to each pixel in the image using a Gaussian function.

$$G(x, y) = \frac{1}{2\sigma^2} e^{-\frac{x^2+y^2}{2\sigma^2}}$$

Here,

- σ is the standard deviation of the Gaussian distribution,
- x is the horizontal axis distance from the origin,
- y is the vertical axis distance (where $y = 0$ for one dimension).

This formula, when used in two dimensions, yields a surface with concentric circles as contours and a

Gaussian distribution from the center point. A convolution matrix is constructed using values from this distribution and applied to the original image.

An image processing method called edge detection is used to identify the borders of objects in pictures. It operates by looking for brightness discontinuities. In fields including image processing, computer vision, and machine vision, edge detection is utilized for data extraction and image segmentation. There are numerous approaches to edge detection. The majority, however, can be divided into two groups: gradient and Laplacian. By locating the maximum and lowest in the image's first derivative, the gradient approach finds the edges. To locate edges, the Laplacian approach looks for zero crossings in the image's second derivative.

The input image is convolved in first order derivative by means of an adaptive mask, producing a gradient image where edges are identified using thresholding. The majority of first-order derivative operators are the classical operators, such as Sobel, Prewitt, and Robert. Gradient operators are another name for these operators. These gradient operators search for the highest and lowest intensity values in order to identify edges. These operators decide whether to classify a particular pixel as an edge by looking at the distribution of intensity values nearby. These operators cannot be employed in real-time applications due to their longer computation times.

The extraction of zero crossing points, which suggests the existence of maxima in the image, is the foundation for second order derivatives. Here, an adaptive filter is used to first smooth the image (Kumar Singh et al., 2014). Since noise greatly affects the second order derivative, the filtering function plays a crucial role. These operators are proposed by the authors in (Marr, 1980) and are derived from the Laplacian of a Gaussian (LoG). Here, a Gaussian filter is used to smooth the image. One major issue with LoG is that the localization of asymmetrically profiled edges by zero-crossing points generates a bias that gets worse as filtering has a smoothing impact (Akhtar et al., 2012).

Canny (Canny, 1986) offered an intriguing solution to this issue, stating that an ideal operator for step edge detection should meet three requirements: good detection, good localization, and only one reaction to a single edge. When recognizing edge types other than those for which they are optimal, these operators have some limitations regarding localization, although they nevertheless perform well against noisy images (Joshi, 2012).

A gradient-based edge detector for the spatial domain is the Sobel edge detector. Two gradient masks, each measuring 3×3 , make up the Sobel operator: one along the horizontal direction and another along the vertical direction. The two masks move across the

picture in an attempt to compute the gradient at every pixel in the two-dimensional grayscale image (Jain, 1989; Joshi, 2012).

The Prewitt operator removes an image's edges exclusively in the vertical and horizontal directions, just like the Sobel operator does. The procedures in the detecting process are the same as those used by the Sobel operator. There are two masks in this operator. The image's absolute gradient is created by convolving the masks with the image. The square of the absolute gradients' magnitudes (along the x and y axes) at a given pixel indicates the edge strength there (Jain, 1989)(Joshi, 2012).


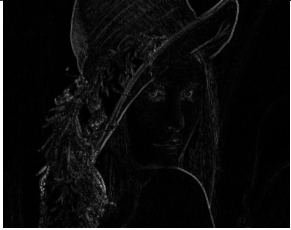

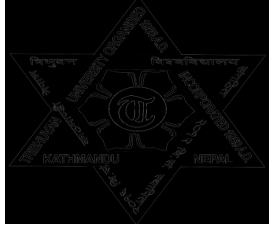




Among the most well-known and established edge detection operators is Robert's Cross Operator. Every pixel in the image under consideration has its spatial gradient determined by the operator (Jose, 2013). The output edge image is the absolute magnitude of the gradient at every single pixel in the input image. This operator is substantially faster and more straightforward than the Prewitt and Sobel operators.

2. Methods And Methodology:

The main exploration of this work focuses on determining the best edge detection on behalf of their performance. A sample image will be fed to both the edge detection algorithms. Output of the sample images from both the algorithms were analyzed in a quantitative approach. Finally, conclusion was drawn by comparing their performances on the basis of execution time.

The Table 1 shows the detail of the images used. The images used for the verification of this research consists of almost all the variations required to assure the performance analysis of these algorithms effectively. Sample images used for the testing purpose are Leena, TU logo, building, and TU cricket ground. The resulting image after edge detection (whether using Canny or LoG) is a grayscale image where the edges in the input image are highlighted. The output images are also in the right side of the Table 1. The output images depict huge variations with respect to their edges among one another. Such testing verifies the flexibility of the algorithm.

Table 1: Images used for verification of algorithms

Name	Pixel	Input Image	Output Image
Image 1	960×658		
Image 2	2362×2650		
Image 3	814×1080		
Image 4	1248×935		

LoG Edge Detector:

The Laplacian of Gaussian (LoG) Edge Detector is another popular method for detecting edges in images. It combines Gaussian smoothing and the Laplacian operator to detect edges, particularly where there is a rapid intensity change. LoG is especially useful for detecting edges in noisy images because the Gaussian smoothing step helps reduce noise before applying the Laplacian for edge detection (Shang, 2012).

First, a Gaussian filter is applied to smooth the image and reduce noise. The Gaussian function is represented as:

$$G(x, y) = \frac{1}{2\sigma^2} e^{-\frac{x^2+y^2}{2\sigma^2}}$$

Here, σ controls the level of smoothing. The larger σ , the more smoothing is applied.

After smoothing, the Laplacian operator is applied to the smoothed image to find regions of rapid intensity change. The Laplacian is a second-order derivative operator that highlights areas of the image where the intensity changes sharply (edges). In 2D, the Laplacian is defined as:

$$\nabla^2 I(x, y) = \frac{d^2 I}{dx^2} + \frac{d^2 I}{dy^2}$$

This operation is typically applied to the smoothed image, and it detects edges by finding zero-crossings in the Laplacian of the image. Zero-crossings occur where the intensity changes from positive to negative or vice versa, indicating the presence of an edge.

After applying the Laplacian, the algorithm looks for zero-crossings in the filtered image. These zero-crossings indicate the locations of edges. The idea is that an edge corresponds to where the second derivative of the intensity values goes from positive to negative (or vice versa). The LoG operator is the Laplacian applied to a Gaussian-smoothed image, often written as:

$$\text{log}(x, y) = \nabla^2 [G(x, y) * I(x, y)]$$

Where:

- $G(x, y)$ is the Gaussian filter,
- $I(x, y)$ is the input image,
- ∇^2 is the Laplacian operator,
- $*$ denotes the convolution operator.

Canny Edge Detection:

The Canny Edge Detector identifies edges by finding areas of the image where the intensity of pixels changes sharply.

It aims to detect only real edges and avoid detecting false edges (noise), making it both effective and efficient (Canny, 1986)(Ansari et al., 2017). The steps that must be followed are (Pirzada, 2013).

Before detecting edges, noise in the image is reduced by applying a Gaussian blur. This helps in smoothing the image and preventing false edge detection caused by noise.

$$G(x, y) = \frac{1}{2\sigma^2} e^{-\frac{x^2+y^2}{2\sigma^2}}$$

Here, σ is the standard deviation of the Gaussian distribution.

After smoothing the image, the algorithm calculates the gradient magnitude and direction at each pixel using edge detection operators like the Sobel operator. The gradient is found in both the horizontal (G_x) and vertical (G_y) directions.

$$G = \sqrt{G_x^2 + G_y^2}$$

The angle or direction of the gradient is

$$\theta = \tan^{-1} \left(\frac{G_y}{G_x} \right)$$

The gradient image is further processed to thin out the edges. Non-maximum suppression examines each pixel to determine if it is a local maximum in the gradient direction. This step sharpens the edges by suppressing all non-edge pixels.

The double threshold step is used to classify pixels as strong, weak, or non-edges based on their gradient magnitude.

Finally, weak edges that are connected to strong edges are kept, while the rest are discarded. This step connects edge segments and ensures that only continuous, meaningful edges are retained.

Experimental Setup:

Both algorithms were implemented using Java Programming Language (JDK 21), OpenCV 4.10.0 computer vision library, Apache NetBeans IDE 22, Microsoft Windows 10 Pro, Intel® Core™ i5-10210U CPU @ 1.60 GHz 2.11 GHz, and 8 GB RAM.

3. Results And Discussion:

Both algorithms were tested for all four sample images given in Table 1 above. For each sample image, five executions were performed in order to obtain the mean value. Both LoG edge detection and Canny edge detection algorithms performance were measured in nanoseconds.

For all four images, time taken by the Gaussian blur is calculated before applying both edge detection algorithms. Gaussian blur plays a crucial role in edge detection by reducing noise and smoothing the image before applying edge detection. The time taken by the Gaussian blur are 11968500, 11451700, 27887400, and 15336900 nanoseconds respectively for image 1, image 2, image 3, and image 4 respectively. The figure below shows Gaussian blur execution time for all four images.

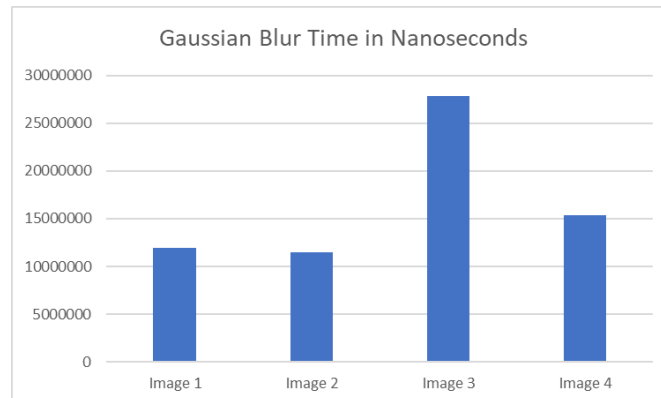


Figure 1: Gaussian blur time in nanoseconds for all images

Table 2: Execution time in nanoseconds for Image 1

No. of Observation	Canny Edge Detector	LoG Edge Detector
1	2515600	1058400
2	2460700	786600
3	1864400	806200
4	1831500	922400
5	1785700	646000
Average Time in ns	2091580	843920

The Figure 2 demonstrates that, in all five observations, the execution time required by the LoG Edge detection technique is less than that of the canny edge detection approach. The LoG Edge Detection algorithm takes 843920 nanoseconds, and the Canny Edge Detection algorithm takes 2091580 nanoseconds on average to process five observations for Image 1.

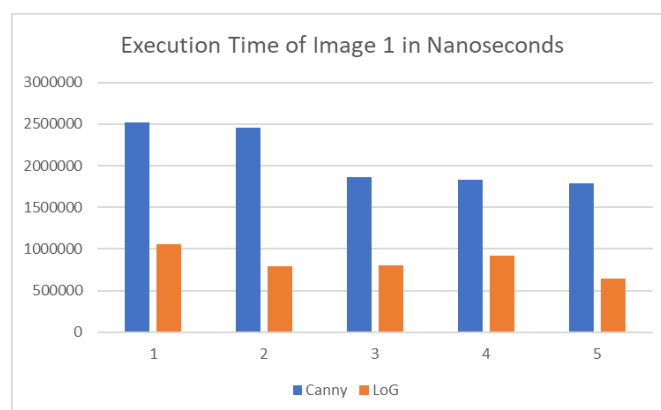


Figure 2: Execution time in nanosecond for Image 1

Table 3: Execution time in nanosecond for Image 2

No. of Observation	Canny Edge Detector	LoG Edge Detector
1	10802700	6706600
2	14656300	7882600
3	11717000	7721000
4	12071300	8507600
5	10990500	7922200
Average Time in ns	12047560	7748000

The Figure 3 demonstrates that, in all five observations, the computational time required by the LoG Edge detection technique is less than that of the canny edge detection approach. The LoG Edge Detection algorithm takes 7748000 nanoseconds, and the Canny Edge Detection algorithm takes 12047560 nanoseconds on average to process five observations for Image 2.

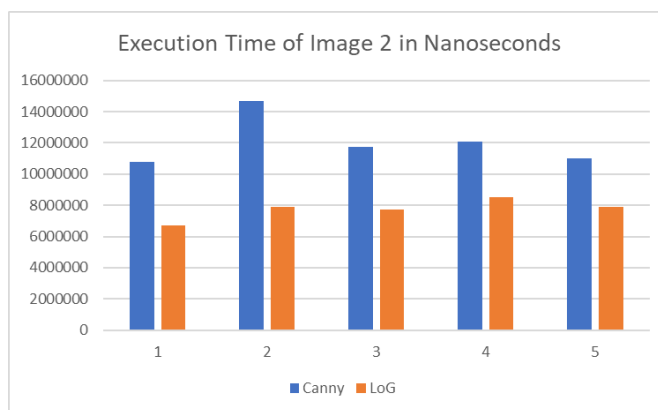


Figure 3: Execution time in nanosecond for Image 2

Table 4: Execution time in nanosecond for Image 3

No. of Observation	Canny Edge Detector	LoG Edge Detector
1	7033900	2892500
2	6744500	3127400
3	6739900	3229300
4	7033000	2245500
5	3502100	1651300
Average Time in ns	6210680	2629200

The Figure 4 demonstrates that, in all five observations, the computational time required by the LoG Edge detection technique is less than that of the canny edge detection. The LoG Edge Detection algorithm takes 2629200 nanoseconds, and the Canny Edge Detection algorithm takes 6210680 ns on average to process five observations for Image 3.

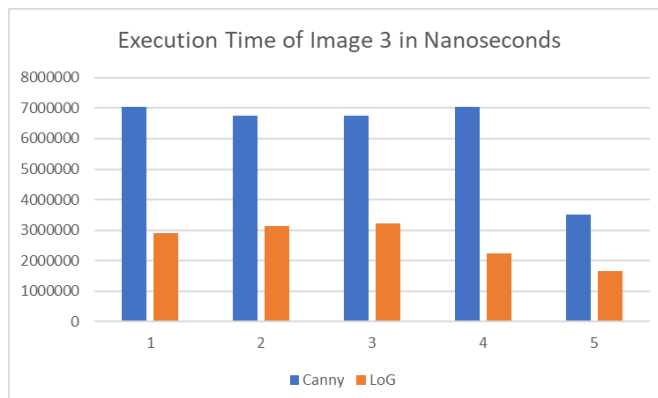


Figure 4: Execution time in nanosecond for Image 3

Table 5: Execution time in nanosecond for Image 4

No. of Observation	Canny Edge Detector	LoG Edge Detector
1	6352500	2443700
2	7381400	2688300
3	9985200	3144000
4	10516800	3054600
5	11564700	3315500
Average Time in ns	9160120	2929220

The Figure 5 demonstrates that, in all five observations, the computational time required by the LoG Edge detection technique is less than that of the Canny edge detection approach. The LoG Edge Detection algorithm takes 2929220 nanoseconds, and the Canny Edge Detection algorithm takes 9160120 nanoseconds on average to process five observations for Image 4.

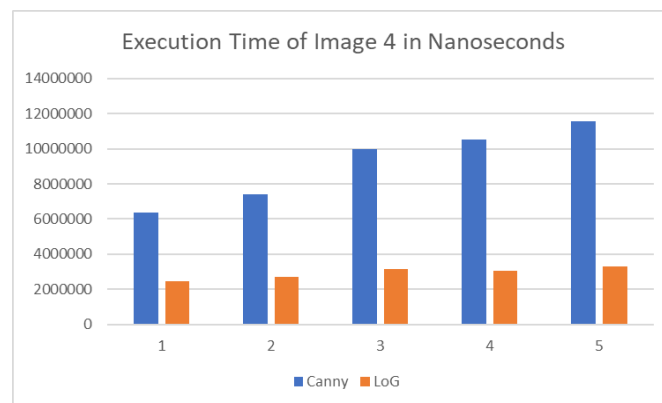


Figure 5: Execution time in nanosecond for Image 4

Table 6: Average execution time in nanosecond of both algorithms for all images

Input Image	Canny Edge Detector	LoG Edge Detector
Image 1	2091580	843920
Image 2	12047560	7748000
Image 3	6210680	2629200
Image 4	9160120	2929220

The Figure 6 shows average execution time of both Canny edge detection and LoG edge detection algorithms for all the four images. For all the images, the average execution time taken by the LoG edge detection algorithm is less than that of the Canny edge detection algorithm.

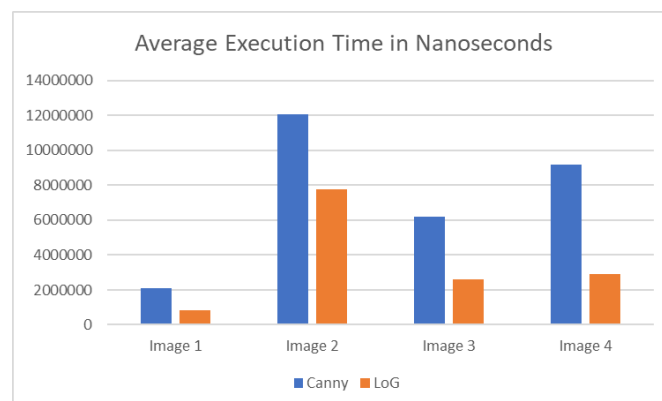


Figure 6: Average execution time in nanosecond of both algorithms for all four images

4. Conclusion:

Based on all the above observations, this study clearly shows that the performance of LoG edge detection algorithm is better than the performance of Canny edge detection algorithm. The execution time of LoG edge detection is less than that of Canny edge detection. Based on the execution time, the LoG edge detection algorithm outstands Canny edge detection algorithm. While the approach is rather efficient at returning results in the shortest amount of time, it might still be improved by concentrating on areas such as the Gaussian filter, gradient calculation techniques, picture noise reduction techniques, and so on.

Edge detection is a critical topic in image processing and computer vision, used to identify object boundaries within an image. Edge detection algorithm with higher speed can be used across various domains such as object detection and recognition, medical imaging, robotics and autonomous systems, image compression, satellite and aerial imaging, augmented reality and gaming, industrial quality control, security and surveillance.

This research can be explored further with deep learning integration to learn edge features and to improve robustness to noise, lighting changes and texture variations. Quantum computing can also be explored to achieve unprecedented processing speeds for edge detection in large datasets.

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6. Completing Interest:

The authors confirm that they have no competing interests to declare.

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