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A research journal is a periodical that contains articles, reports, and reviews of books written by experts and researchers in a particular field of study who report the results of research in that field. The articles are intended to be read by other experts and researchers to gain fact-based knowledge and they are typically much more sophisticated and advanced than the articles found in general magazines.

NCCS Peer-Reviewed Research Journal is a scholarly journal that incorporates articles based on research on management, administration, technology, and social issues. This research journal is published by the National College of Computer Studies (NCCS) Paknajol Marg, Kathmandu every year on an annual basis. From last year NCCS has been publishing “NCCS Peer-Reviewed Research Journal” regularly which includes articles on Computer technology, management, administration, and other social and economic issues.

This second issue 2023, covers different articles from various disciplines of science and society like economics, sociology, population, computer studies, management, etc. We hope this volume will contribute to generating new knowledge on management, technology, the economy, and the development processes of society as well as the country. We would like to thank all the reviewers like Prof. Dr. Achut Gyawali, Prof. Dr. Krishna Acharya, Dr. Laxman Singh Kunwar, Dr. Rudra Charmakar, Dr. Narayan Prasad Timilsena, Dr. Tika Ram Gautam, Dr. Keshab Bashyal, Mr. Bhoj Raj Joshi, and Mr. Dadhi Ghimire and the authors.

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Effects of Covid-19 Pandemic on Studying Habits of Students

- Ashok Bhandari¹

- Pratima Poudel²

Abstract

The research article investigates the impact of COVID-19 on the performance of students studying at the graduate and undergraduate levels in Kathmandu Valley. The aim of the study is to present how students have adapted to the shift from in-person to online learning environments during the pandemic. The text is based on representatives of 223 from varied groups allowing its relevance with authenticity. Indeed, COVID-19 has destructed and scattered the understanding and belief which is inherited throughout the generations. Its effect touched almost all fields and the education industry also became a victim of it. Students faced ample challenges along with the faculties members to cope with it. Students were found frustrated when they were deprived of physical education and at the same time, it is observed that they faced

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several inconveniences in the developed e-learning system. Observing students' psychology, using techniques to teach, the technology used to generate a learning environment, and so on found that e-learning is not as effective as physical learning.

Keywords: COVID-19, Pandemic, Education, Studying Habit

Introduction

Study habits refer to the behaviors, techniques, and strategies that students use to effectively learn and retain information. Developing good study habits is crucial for academic success. It is an action that students routinely and habitually carry out in order to complete the task of learning. Examples include reading, taking notes, and holding study sessions. Depending on how well they benefit the pupils, study habits can either be deemed effective or ineffective (Journal, 2023). Studying habits vary among students, but there are several common practices that successful students adopt to enhance their learning and academic performance. Here are some common study habits that successful students often employ:

Time management: Effective students create a study schedule that allocates specific times for studying different subjects or topics. They prioritize their tasks, set deadlines, and stick to a routine. **Active learning:** Rather than passively reading or listening, successful students actively engage with the material. They take notes, ask questions, participate in discussions, and seek clarification when needed. They also try to connect new information with their existing knowledge.

Setting goals: Students who excel academically set clear, realistic goals for themselves. They break down larger goals into smaller, manageable tasks and work towards achieving them step by step. This approach helps them stay motivated and focused.

Creating a conducive environment: Effective studying often requires a quiet and well-organized space. Successful students find a dedicated study area that minimizes distractions and allows them to concentrate better. They may also use tools like noise-canceling headphones or background music if it helps their concentration.

Taking regular breaks: While studying for long periods without breaks may seem productive, it can actually hinder retention. Successful students understand the importance of taking short breaks every 30-60 minutes to recharge their minds. They may engage in physical activity, stretch, or do something enjoyable during these breaks.

Utilizing different study techniques: Different subjects may require different study techniques. Successful students experiment with various methods such as summarizing, creating flashcards, visualizing concepts, teaching others, or using mnemonic devices. They adapt their approach based on the subject matter and their personal learning style.

Reviewing and revising: Regular review is crucial for long-term retention. Successful students review their notes, textbooks, and other study materials regularly to reinforce their understanding. They may dedicate specific study sessions for revision before exams or quizzes.

Seeking help and collaboration: Effective students are not afraid to ask for help or collaborate with classmates. They actively participate in study

groups, seek clarification from teachers or tutors, and discuss challenging concepts with peers. This helps them gain different perspectives and deepen their understanding.

Maintaining a healthy lifestyle: Physical and mental well-being significantly impact academic performance. Successful students prioritize their health by getting enough sleep, eating nutritious meals, and engaging in regular exercise. They also manage stress levels through techniques like mindfulness, meditation, or hobbies.

Staying organized: Good organizational skills are key to efficient studying. Successful students keep track of assignments, deadlines, and important dates using planners, calendars, or digital tools. They maintain tidy study materials, label folders, and use effective note-taking systems. Study habits can vary from person to person however, teaching techniques and methodology play crucial roles in understanding the subject matter. Students can develop some study habits that can drive them to academic success.

Effects of COVID Pandemic on Studying Habits of Students

The COVID-19 pandemic has had a profound impact on the studying habits. With the sudden shift to remote learning, students have had to adapt to unexpected circumstances and navigate a digital learning environment. The transition to online classes has required students to develop self-discipline and effective time-management skills. The boundaries between study and personal life have blurred, making it more challenging to establish a structured routine. The increased reliance on digital resources has led to longer screen time, which can negatively

affect focus and concentration. Additionally, the absence of face-to-face interaction with peers and instructors has hindered collaborative learning and immediate clarification of doubts. The limited access to physical resources like libraries and laboratories has necessitated a shift towards online materials and resources, requiring students to adjust their studying habits and techniques. Moreover, the mental health toll of the pandemic has added another layer of complexity, as students have had to cope with increased stress, anxiety, and uncertainty.

Despite these challenges, students have shown resilience and adaptability by embracing digital tools, seeking support through online platforms, and developing self-motivation to stay on track with their studies. As Eva Jereb states, “The pandemic has prompted a transformation in studying habits, encouraging students to become more self-reliant and adaptable to different learning environments.”

Objectives of the study

The primary objective of this article is to identify the changing studying habits of the students after COVID-19 as students were forced to limit themselves within their homes and limited in e-learning especially the students of Kathmandu Valley. Listed below are objectives to make the study more concrete.

1. To identify the changes in study habits of the students of graduate and undergraduate level
2. To identify the challenges that the student faced in remote learning
3. To find the effectiveness of the used teaching methods in teaching

4. To examine the teaching-learning resources used for an effective learning environment

Limitations

Limitations of one's study can be objective for another researcher, and none of the researchers can carry a total burden of content, similarly, this study also lacks its limit.

1. This study solely is dependent on the student perspective; every opinion is merely a representation of learners.
2. Age variation is also limited, as this study mainly focused on university students, students covering a mean age of 21.9 are only included.
3. The sample number is limited to 220, which may not provide an exact opinion of the students associated with universities.

Literature Review

Higher education has been severely influenced by the COVID-19 pandemic, which has increased the adoption of online learning methods. This section reviews shows research on how higher education students' study habits changed throughout the pandemic. As Rahiem (2020) emphasizes the ability to study from home has presented many difficulties for students in higher education. These limitations include a lack of institutional support, concerns with internet accessibility, trouble with online tests, and difficulties arising due to the dynamics of online education. Kapasia and others (2020) In addition mentioned that the students faced unsuitable study environments and distractions at home, Kapasia et al. (2020) further highlight the stress, despair, anxiety, and

poor network connectivity that students experience while learning online. These difficulties have had an impact on students' study habits.

Concerning e-learning different opinions can be found for instance, Huang and Chiu, (2015) state e-learning has been viewed as the ability to focus on the requirements of individual learners. For instance, focusing on the needs of individual learners can deliver knowledge in the digital age effectively as compared to educational institutions' needs or instructors. Most students all around the world are having problems with the instruction and evaluation of their last level of study. Likewise, Raspopovic et al., (2017) state that students must be able to assess the motivating factors to continue the momentum throughout the duration of the course. Students lack motivation and can easily lose sight of their original objective, rapidly become lost within the course, and consequently withdraw from the course. The final exam and graduation date have been postponed.

Because of this, many students' plans to study abroad have been permanently put on hold. Similarly, Gautam, S. S., and Tiwari, M. K. (2016) Some students have noted that faculty members' expertise and ability to teach online is unsatisfactory. Even when sharing PowerPoint material and presentations on the computer, assigning homework, and keeping track of students' progress, students require ongoing support. Due to the faculty members' lack of formal online teaching expertise, they expressed their unsatisfactory with their ability to lead classes online.

Different people prefer different types of learning, such as social, kinesthetic, visual, or auditory learning. Students may gain from working

in groups, asking for assistance, and mentoring younger students. Since most students find it awkward to express questions or voice concerns in front of the class, they typically have the opportunity to interact with teachers in private. Another benefit mentioned by students of the online learning method was the capacity to include presentations, movies, and audio practices that are normally uncommon in classroom settings at Nepali universities (Dhurba Kumar Gautam, 2021)

The COVID-19 pandemic has brought several significant changes in studying habits among higher education students. The research paper attempts to explore the changes and challenges that the students faced. Besides, there are several things left to identify from the teaching methodology to tutors' efforts to generate a learning environment.

Theoretical Review

A study habit is an action that students routinely and habitually carry out in order to complete the goal of learning, such as reading, taking notes, and holding study sessions. In order to properly study and learn, a person develops study habits, which are known as their regular behavior or routine practices. Students who practice good study habits find learning more pleasant and pleasurable and their courses easier to understand. In order to improve their academic learning and skills, students need to develop effective study habits. Some students may have bad studying habits that annoy them and make learning difficult for them.

Studying habits can vary depending on individual preferences, group dynamics, or the environment in which students choose to study. Here's an explanation of different studying habits:

i. Individual Study: Many students prefer to study individually as it allows them to focus on their specific needs and learning styles.

Individual study habits can include:

- **Personal Study Space:** Students create a dedicated study area that suits their preferences, whether it's a quiet corner in their room, a desk in a library, or a coffee shop.

- **Self-discipline:** Individual students often rely on self-discipline to manage their time effectively, set goals, and avoid distractions.

They may use techniques like the Pomodoro

Technique (working for specific intervals, followed by short breaks) to maintain focus.

- **Personalized Techniques:** Students develop study techniques that work best for them, such as making detailed outlines, using mnemonic devices, creating visual aids, or recording audio notes for review.

ii. Group Study: Studying in groups can be beneficial for collaboration, discussing concepts, and gaining different perspectives. Group study habits may include:

- **Study Groups:** Students form small study groups with classmates or friends to review material, discuss challenging topics, and share resources. They take turns explaining concepts to each other and engage in group discussions.

- **Division of Tasks:** Group members may divide the study material among themselves, allowing each individual to become an expert in a specific area. They can then share their knowledge with the group during study sessions.
 - **Peer Teaching:** Students take turns teaching concepts or solving problems to their peers within the group. Explaining ideas to others helps solidify their own understanding while providing an opportunity for group members to learn from each other
 - **Accountability:** Group study provides a sense of accountability as members can motivate each other, set study goals together, and track each other's progress.
- iii. Library Study:** Libraries offer a quiet and focused environment that is conducive to studying. Studying in libraries often involves:
- **Distraction-Free Environment:** Libraries are designed to minimize distractions, providing a peaceful atmosphere for studying. Students can concentrate on their work without interruptions.
 - **Resources Access:** Libraries offer access to various educational resources, including books, research materials, and online databases. Students can utilize these resources to enhance their understanding of the subjects they are studying.
 - **Silent Study or Group Study Rooms:** Libraries often have designated areas for silent study where individuals can work in solitude. They may also provide group study rooms where students can collaborate and discuss their studies in a shared space.

iv. Online Study: With the advancement of technology, online studying has become increasingly popular. Online study habits may involve:

- **Virtual Learning Platforms:** Students utilize online platforms, such as learning management systems, online courses, or educational websites, to access study materials, lectures, quizzes, and assignments.
- **Self-paced Learning:** Online studying allows students to set their own pace and study at a time that suits their schedule. They can review materials multiple times and revisit previous lessons as needed.
- **Online Discussion Forums:** Students participate in online discussion forums or chat groups to interact with peers and instructors. These platforms provide opportunities for asking questions, clarifying doubts, and engaging in academic discussions.
- **Digital Tools:** Students use various digital tools like note-taking apps, flashcard platforms, online collaboration tools, and video conferencing platforms to enhance their online study experience.

It was found that studying habits and environments played a crucial role in acquiring the subject matter. Some students preferred a combination of these habits depending on the subject, their personal learning style, and the resources available to them. Experimenting with different methods it is discovered that individual study, use of library to study, group study, and online study have their own role to maximize their productivity and learning outcomes.

Research Methodology

The research paper has been done using both quantitative and qualitative methods. It is based on the selection of research parameters, location, and samples. It has selected students studying in Kathmandu for this research, especially at the graduate and undergraduate level to understand their differences in habits of study caused by the COVID-19 consequence. The study analyzes the situation and data occurring during the period.

Sample

The study sample consists of 220 students from different colleges of Kathmandu. Out of 220, 51.6% were female 47.5 % male and 0.9% did not disclose their gender. Students from the age group of 17-26 have participated in this survey. Sampling shows no discrimination in gender division as well as represents appropriate mean age selection. 21.9

Nature of the data

The significance of the study is always correspondent to its sources of information. Even though secondary information is used to study this research, analysis is completely dependent on primary sources collected using Google form, allowing a respondent to participate only once.

Analysis

Just raw data never speaks for itself, after collection of information, it's reviewed and analyzed sincerely. Using primary data collected by questionnaire, descriptive analysis of data is done to distribute the desired result. Data is analyzed by tabulating information using pie charts, percentages, simple statistical tools, and bar diagrams. We can visually

represent the proportions of each study location, making it easier to understand and describe the data.

Interpretation of Data

The collected data is analyzed and interpreted using tabulated format data provides percentages and numerical value. Data is presented and analyzed without using any personal prejudice and understanding. The mean age of the participants is 21.9 years with almost male female participation.

Student effectiveness, efficiency, effort, and attitude toward study before and after COVID19

When considering the efficiency, effectiveness, effort, and attitude toward the study of students' studying habits, the given table provides a visual representation of their self-assessment. From a general perspective, it is evident that students have varying opinions about the efficiency of their studying habits.

Table No 1: Student's response toward their effectiveness, efficiency, effort, and attitude on the study before COVID-19

Row Labels	Effectiveness of studying habit	Row Labels	Effort toward study
Ineffective	0.90	Average effort	29.15
Neutral	31.84	Low effort	3.14
Not very effective	6.73	Minimal effort	0.90
Somewhat effective	43.50	Moderate effort	52.47
Very effective	17.04	Very high effort	14.35
Grand Total	100.00	Grand Total	100.00
Row Labels	Efficiency of studying habit	Row Labels	Attitude toward study
Neutral	35.91	Negative and unmotivated	0.45
Not very efficient	5.91	Neutral	22.87
Somewhat efficient	41.36	Positive and motivated	31.39
Very efficient	16.82	Somewhat negative	2.24
	0.00	Somewhat positive	43.05
Grand Total	100.00	Grand Total	100.00

Source: Field Study, 2023

This data reveals that students had varying perceptions of their own studying habits. A significant portion of students (43.2%) considered their habits to be somewhat effective, indicating a moderate level of satisfaction with their approach. The majority of students (40.6%) rated their studying habits as somewhat efficient, whereas the overall opinion derived from this data reveals that a significant majority of students (52.3%) demonstrated moderate effort, indicating a commendable level of commitment to their studies with a combined total of 73.6%, the "somewhat positive" and "positive and motivated" attitude their study. At the same time strong pole stands as neutral participants. The presented responses of the respondents can't be considered fully satisfied with the self-habit of the study.

Table No. 2: Students' response toward their effectiveness, efficiency, effort, and attitude on study after COVID-19

Row Labels	Effectiveness of studying habits	Row Labels	Effort toward study
Ineffective	2.69	Average effort	40.81
Neutral	45.74	Low effort	18.83
Not very effective	26.91	Minimal effort	2.69
Somewhat effective	20.63	Moderate effort	29.60
Very effective	4.04	Very high effort	8.07
Grand Total	100.00	Grand Total	100.00
Row Labels	Efficiency of your studying habit	Row Labels	Attitude toward study
Inefficient	3.59	Negative and unmotivated	3.14
Neutral	44.39	Neutral	42.60
Not very efficient	21.97	Positive and motivated	10.31
Somewhat efficient	25.11	Somewhat negative	15.70
Very efficient	4.93	Somewhat positive	28.25
Grand Total	100.00	Grand Total	100.00

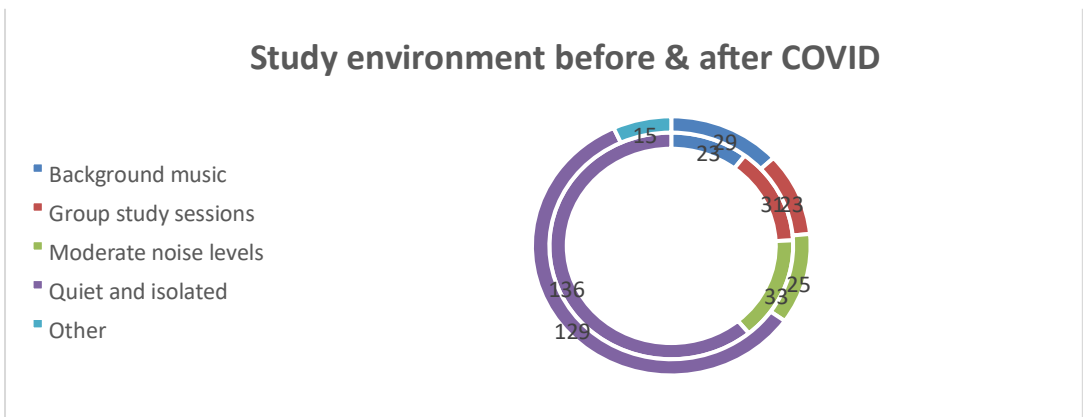
Source: Field Study, 2023

The table presented above shows continuous and regular increments in neutral and average responding students. Very few of the respondents are found against online and e-learning methodologies adopted after COVID-19. Neither had they responded that it adversely affected their study. Data collected noted that there in no significant changes in teaching effectiveness, efficiency, effort, and attitude.

Preference for studying habits before and after COVID-19

The pie chart presented below shows the changes in the studying environment of the students before and after COVID-19. The inner circle represents the response after COVID-19 whereas out circle stands for the respondents before COVID-19. As COVID-19 has made its own impact on the study of students, this pie chart shows negligible changes in the studying environment of the students. The majority of the respondents presented identical responses on studying environment. They still prefer the same kind of environment they used to enjoy before COVID-19.

Figure No. 1: Student's response toward changes in studying environment before and after COVID-19.



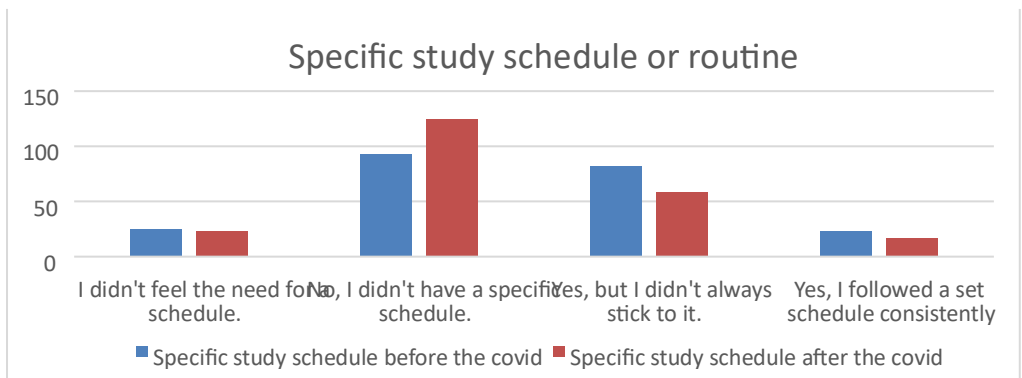
Students still prefer to use the quiet and isolated environment as they used to before COVID-19.

About 50% of the students preferred such an environment in contrast to remaining.

Specific Study Schedule

Routines or schedules are a major criterion expected to be followed by students, but the result was surprising understanding and countering our beliefs. Very few of the respondents have followed a strict routine. Less than 10% of the students are found following routines at the same time about the same percentage of the respondent's said schedules are not needed.

Figure No. 2: Student's response toward specific study schedule or routine before and after COVID-19

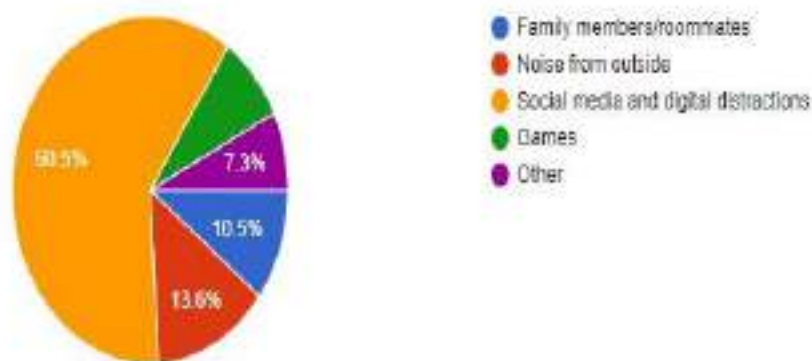


The rest of the students are found with no specific schedule. A slight change is found with the response of "not having a specific schedule and not always on schedule". The study can say that there is almost no impact of COVID-19 on students' schedules of studying.

Causes of distraction to study during e-learning

Based on the data presented in the pie chart, it is evident that students encountered various distractions while studying at home during the COVID-19 pandemic. The overall opinion derived from this data is that distractions from social media and digital platforms were the most common challenge, affecting a significant majority of students (60.5%). This indicates the pervasive nature of online distractions that can divert students' attention from their studies. Additionally, a notable percentage of students (13.6%) faced noise distractions from outside, which could include environmental noises or disruptions from neighboring surroundings.

Figure No. 3: Distractions faced by students while studying from home during COVID-19



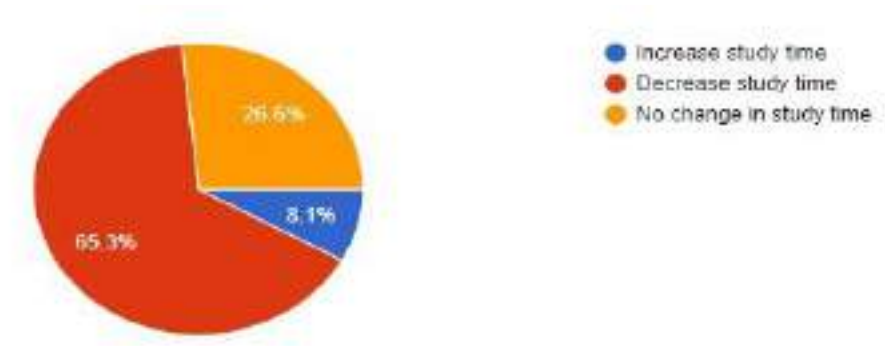
Furthermore, 10.5% of students found distractions from family members or roommates, highlighting the potential interruptions that can occur in shared living spaces. It is interesting to note that a smaller percentage of

students (7.3%) encountered other types of distractions, which could vary widely depending on individual circumstances. Moreover, 8.3% of students reported being distracted by games, suggesting the impact of recreational activities on their ability to focus on studying. These findings emphasize the importance of creating a conducive study environment and developing strategies to minimize distractions, allowing students to optimize their concentration and productivity while studying at home.

Effect on Study Habit

The impact of the pandemic on students' studying habits is reflected in the following data: 65.3% experienced a decrease in study time, 26.6% reported no change in their study routine, and 8.1% actually increased their study time. These statistics, depicted in the pie chart, illustrate the effect of study habits.

Figure No 4: Studying habits affected by COVID-19



The varying effects of the pandemic on students' dedication to their academic pursuits. The majority of students saw a reduction in study time, highlighting the challenges and disruptions caused by the

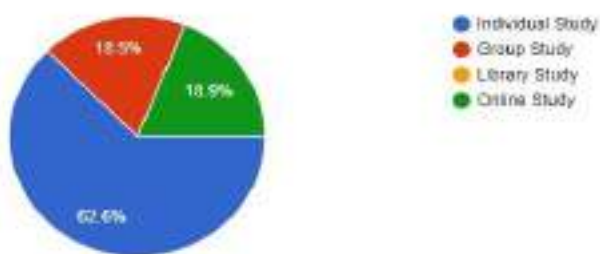
pandemic. It also showcases a smaller percentage of students who managed to adapt and increase their study time.

Preferred mode of study

The overall opinion derived from this data highlights the prevalence of individual study as the most favored choice among students, with 62.6% expressing a preference for this mode of learning.

This indicates a strong inclination towards independent learning and self-paced study.

Figure 5: Preferred mode of study after COVID-19



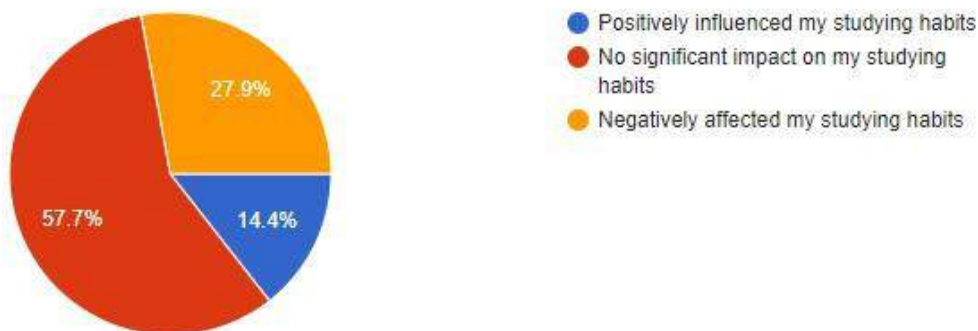
Additionally, 18.9% of students opted for online study, reflecting the growing popularity and convenience of virtual learning platforms. It is interesting to note that 18.5% of students showed an interest in group study, underscoring the value of collaborative learning and peer interaction. These findings emphasize the importance of recognizing and accommodating diverse learning preferences to create effective and inclusive learning environments. While individual study remains the preferred choice for the majority of students, the presence of online and

group study options highlights the need for flexibility and adaptable learning approaches to cater to the varying needs and preferences of students in the post-COVID-19 era.

Benefits of face-to-face interaction

The impact of reduced face-to-face interaction on students' studying habits during the pandemic varied: 57.7% experienced no significant change, 27.9% were negatively affected, and 14.4% saw a positive influence. This pie chart illustrates the diverse responses to the lack of interpersonal interaction, with most students adapting without major disruption.

Figure 6 No.: Impact on studying due to the lack of face-to-face interaction with instructors and peers during COVID-19

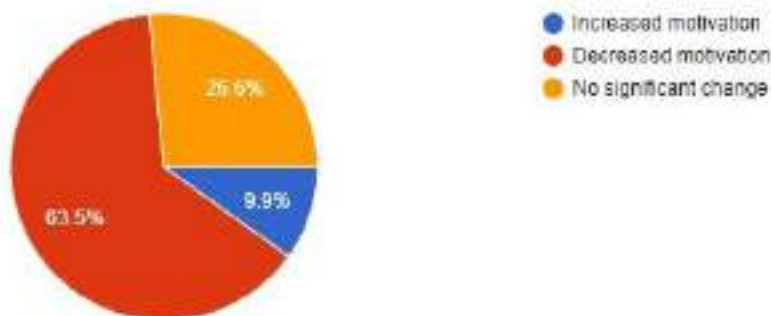


However, a considerable portion faced challenges, emphasizing the value of social connections in effective learning. A smaller group even found the change to have a positive impact, potentially due to increased focus or alternative forms of support.

Motivation

The overall opinion derived from this data reveals that the majority of students (63.5%) experienced a decrease in motivation. This indicates the challenges faced by students in maintaining their drive and enthusiasm for studying during this challenging time. However, it is worth noting that a significant portion of students (26.6%) reported no significant change in their motivation levels, suggesting that they were able to sustain their motivation despite the disruptions caused by the pandemic. Interestingly, a smaller percentage of students (9.9%) actually experienced an increase in their motivation to study.

Figure 7: Effects on students' motivation to study due to pandemic



This could be attributed to factors such as adapting to new learning environments, finding renewed purpose in their studies, or discovering effective strategies to stay motivated. These findings underscore the diverse range of experiences students had with their motivation to study during the pandemic and highlight the importance of finding ways to overcome challenges and maintain motivation for academic success.

Ease in online class compared to physical class

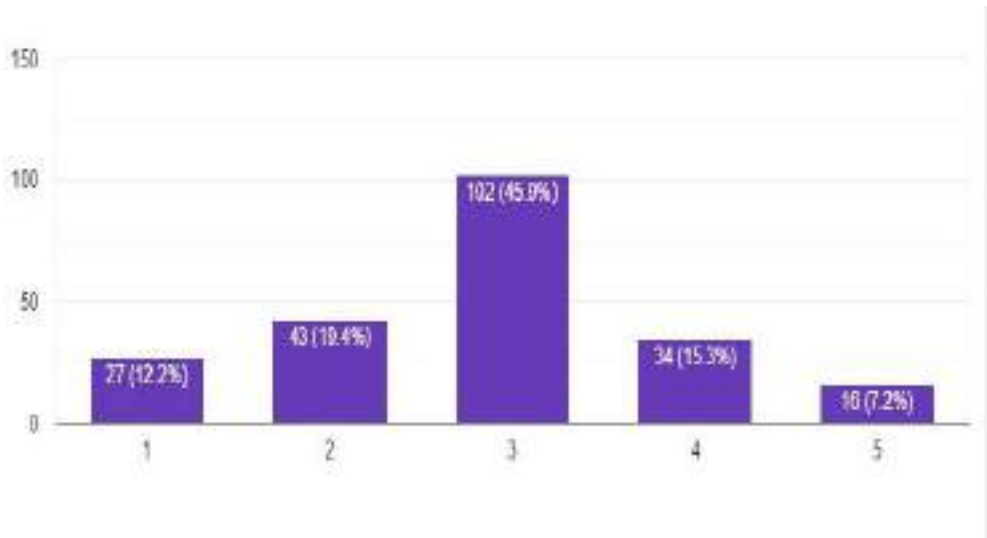
The ability of students to express their questions or concerns during online learning, compared to classroom settings, is reflected in the following data: 65.3% found it easier in the classroom, 17.6% reported no difference, and 17.1% found it easier online. This pie chart visually represents the preferences and experiences of students regarding communication in different learning environments. These findings underscore the importance of fostering effective communication strategies in both online and in-person learning environments to ensure students feel comfortable expressing their questions and concerns.

Table No 3: Ease of expressing questions or concerns for students during online learning compared to classroom settings

Response	The comfort of expressing questions in an online class
It's easier in a physical classroom	145
It's easier in online	39
No difference	39
Grand Total	223

Source: Field Study, 2023

Figure no 8: opinion on online assessments compared to physical tests



The bar diagram illustrates the ratings given by students on their experience with online tests and assessments compared to physical tests, using a scale of 1 to 5. The data reveals that 45.9% of students rated their experience as a 3, indicating a neutral or average satisfaction level.

Additionally, 19.4% gave a rating of 2, reflecting a somewhat lower satisfaction level. On the other hand, 15.3% provided a rating of 4, indicating a higher level of satisfaction. A smaller percentage of students rated their experience as a 1 (12.2%) or a 5 (7.2%), representing the lowest and highest levels of satisfaction, respectively. This bar diagram provides a clear visual representation of the varying ratings given by students, showcasing the range of experiences and opinions regarding online tests and assessments compared to traditional physical tests.

The collected data and information indicate that the COVID-19 period became a challenge to break the established physical-based education. Only in limited circumstances and situations, the unfavorable situation contributes to bringing changes in the education delivery system. However, the academic sector became a victim of it. Students did not enjoy remote or online learning in several ways. It became only one choice to deliver education. The situation generated fear, anxiety, and troubles physically and psychologically.

Overall, it has collected limited information that occurred during the COVID-19 period in the education delivery system. However, it has left several things to discover like psychological impact both on students and teachers. Learning outcomes and their effectiveness are another factor to study. It has not covered positive changes that are hidden yet and so on. It opens the door to study to others to do further research.

Conclusion

Overall, the COVID-19 pandemic generates an unexpected situation in the study environment and students are forced to study from home. A thought occurred in students' choice that either physical or remote learning is better in the education delivery system. In this regard, varied opinions of students appeared in study habits. It is found that customized approaches enhance overall studying efficiency and academic performance. It is also found that students exhibited predominantly positive attitudes toward their studying habits after COVID-19 which reflects a prevailing sense of optimism and motivation in their academic pursuits.

The collected data advocates that a significant shift towards online studying as the most popular choice for students after the COVID-19 pandemic. However, limited numbers like physical learning as more beneficial. Likewise, it is found that the pandemic also brought changes in study habits. The majority experienced reduced study time and a smaller percentage managed to adapt and increase their dedication to academic pursuits. The dynamic environment, individualized approaches, and ongoing improvement are crucial for maximizing learning outcomes. It shows a diverse range of strategies employed by students to stay motivated while studying, such as physical exercise, positive reinforcement, and goal-setting.

Additionally, the teaching-learning system faced various challenges for students, including technological issues, lack of motivation, and distractions at home. During the pandemic, students diversified their study materials, with online resources being the preferred choice, followed by lecture notes and textbooks. Not only this, COVID-19 significantly impacted students' academic progress, leading to delays in career plans, uncertainty about future academic goals, increased stress and anxiety, and other challenges. Support and understanding are vital in helping students cope with these disruptions. Students' psychological well-being is evident, with stress, anxiety, and feelings of despair being common challenges.

The reduced face-to-face interaction during the pandemic had varied effects on students' studying habits, a few numbers adapted to text well

while others faced challenges to accept as a positive influence on them. It generated diverse effects on students' studying habits to create a regular study habit. However, some students generally found remote learning easier to express their questions or concerns in the classroom setting compared to online learning and improved communication strategies in the virtual environment. However, COVID-19 taught a lesson that technology contributed massively to the education delivery system and opened a new dimension in learning as well as brought ample changes in students' study habits.

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Determinants of Lending Interest Rate of Nepalese Commercial Banks

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Abstract

This research analyzes the determinants of lending interest rates of commercial banks in Nepal. The lending interest is the main source of income for any financial institution. Secondary data has been collected from the annual reports of seven commercial banks for the study. Using convenience sampling techniques only seven banks are taken as samples out of 21 commercial banks in Nepal. 35 observations of the study are analyzed and interpreted using correlation and simple regression analysis. The study is based on the dependent variable lending interest rate and independent variables: liquidity ratio, deposit interest rate, return on assets, default risk, gross domestic production, and inflation. This study found a statistically positive and significant effect of deposit interest rate, return on assets, and inflation on the lending interest rate of commercial banks in Nepal.

Key Words: Deposit Interest, Default Risk, GDP, Inflation, Lending Interest, and Return on Assets.

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Introduction

This study intends to investigate the factors that Nepalese commercial banks' lending interest rates depend on during the five years from 2018 to 2022. Few research has been conducted to analyze the determinants of lending interest rates of commercial banks in Nepal. The direction of the interest rate's movement is not constant. Bhole (1992), the federal budget, inflation, monetary policy, and the status of the economy all play a role in determining interest rates. The choice to lend money to commercial banks is significantly influenced by interest rates. The ability of commercial banks to choose their interest rates is limited. Interest is the expense of using loanable funds. Banks and other financial organizations use the lending interest rate to finance both the short and long-term needs of both the public and private sectors. The rate of interest on loans is influenced by the creditworthiness of borrowers.

Yüksel, Mukhtarov, Mammadov, and Özsarı, (2018) explained that the two main types of interest are simple interest and gross interest. When there are no other management concerns, dangers, or drawbacks, the reward for the use of capital is pure interest. Gross interest is the amount that the lender receives from the borrower. Payments for risk, inconvenience, management, and exclusive use of funds are included in this. By making more loans at low deposit rates, commercial banks increase their profit margins. For fear that interest income won't be enough to cover the cost of deposits, other operating costs, and the revenue lost from a portfolio of non-performing loans, banks avoid setting lending rates too low.

Alnaqtari (2019) explained the primary factors influencing money cost are consumption time preference and production opportunity. The cost of an investment or a loan depends on the return on productive assets in an economy. Borrowing costs and returns are also impacted by consumers' preference for immediate gratification over future savings. Because it costs more for investors to borrow money at high rates, high lending interest rates are a sign of inefficiencies in the banking sector, which impede not only the development of finance but also economic growth. (2017) Nanjunga et al. The amount of interest a commercial bank charges on loans is important since it affects their ability to make a profit (Bhattarai, 2015; Nanjunga et al., 2016).

In the classical conception, the rate of interest is controlled by the interaction of two different factors. First, there is the supply of savings, which comes primarily from the commercial sector (Obeng and Sakyi, 2017). Lending by financial organizations is a good idea. It is accurate to say that the entire economy is expanding rapidly. It is the most important strategy for promoting business expansion and economic growth around the world. There are two types of loans: secured loans and unsecured loans. Unlike secured loans, which are disbursed in return for a collection of valuable properties, unsecured loans are disbursed based only on the lender's financial status and absence of collateral. Loan interest rates are linked to both secure and unsecured loans. Because unsecured loans pose a significant risk to financial institutions, their interest rates are typically higher than those of secured loans. The loan interest rate followed the 5Ps

and 5Cs of product, place, price, protection, profit, character, capacity, capital, collateral, and condition.

The objective of this study is to examine the factors that affect commercial banks' lending interest rates. Lending interest rate has a significant role in the formation of the financial and economic systems. Commercial banks want to know how both external and internal factors affect loan interest rates. Profitability is directly impacted by lending interest. Due to this conceptual gap, it is unclear whether lending interest rate has an impact on commercial banks favorably or unfavorably utilizing both internal and external factors. Various studies have been done in this area, but none of them have taken into these types of variables such as liquidity ratio, deposit interest rate, return on assets, default rate, bank size, GDP, and inflation. Therefore, the purpose of this study is to close the gap left by other studies

Literature Review

Bhattarai (2015) studied the factors that commercial banks in Nepal use to set their lending interest rates. to investigate the elements influencing the lending interest rate. Convenience sampling was used to choose just six commercial banks. The study took place between 2010 and 2015. Panel data were utilized. total data gathered from sample banks' yearly reports. From 2011 to 2017, there were just five banks in the sample. Regression investigation of the effect of the independent variable on the dependent variable used panel data. Operating cost as a percentage of total assets, deposit interest rate, profitability, and default risk were independent variables. All independent variables had positive correlations with the

dependent variables when the random effect model was chosen, while fixed effect models were rejected for operating costs, total assets, and profitability. The finding of the study was that R^2 was better and is significant and no multicollinearity problems.

Mbowe, Mrema, and Shayo (2020) examined the Tanzanian banks' lending interest rate factors. The study used two ways to track the factors that affect the interest rate on bank loans. From 2001 to 2017, a sample of domestic and international small- to medium-sized banks was employed in the study. Panel data from secondary sources was used in the study. In the study, regression analysis was utilized to show how an independent variable affected a dependent variable. The independent variables included the statutory minimum requirement, return on assets, deposit rate, high deviation from the mean ratios of market concentration, liquid assets, non-performing loans, operating cost, provision for bad loans, bank size, inflation real GDP, and treasury bill interest. The dependent variable was the lending interest rate. The investigation used both a descriptive and a causal-comparative research design. The study's key finding was that operating costs, non-performing loans, cost of funds, and inflation all had statistically significant effects on bank lending interest rates. Similar to how bank size and liquidity have an adverse effect, SMR has an adverse but statistically significant effect. SMR should be reduced cautiously in order to increase bank lending capacity.

Al-Qudah (2021) studied to examine the lending interest rates for commercial banks listed in Jordan. For the study's regression analysis, panel data were employed. Only eight years, from 2011 to 2018,

comprised the study period. Only thirteen commercial banks were included in the study's sample. The impact of the lending interest rate was examined using a descriptive and causal-comparative research methodology. Liquidity, bank size, return on assets, operational costs to deposit interest rate, and lending interest rate were independent variables, whereas lending interest rate was a dependent variable. The major finding of the study was LIQ and OPCOST had positive and insignificant and all other variables had significant effects. Similarly, LTQ, ROA, and size had negative and significant impacts on dependent variables but other variables had positive and significant impacts on dependent variables. F statistics was significant and r square was high.

Shrestha (2022) investigated the factors that influence Nepalese commercial banks' lending interest rates. Secondary data from the annual report of a commercial bank and an economic survey were used for the analysis. Twenty-five commercial banks made up the sample, which spanned only eight years from 2013/14 to 2020/21. There were 200 observations in all. Both a descriptive and a comparative-causal study design were used. The following factors were independent: GDP, management effectiveness, operational effectiveness, asset quality, credit risk, and lending interest rate. Regression was used to examine the effects of the independent variables on the dependent variable, whereas correlation was used to demonstrate the relationship between independent variables and the dependent variable. The study's key finding was that operational effectiveness and capital adequacy ratio were negatively correlated, while returns on assets, managerial efficiency, asset quality,

credit risk, inflation, and GDP were positively correlated. Similar to return on assets, the impact of lending interest rate was favorable but not very large. The other factors, such as asset quality, management effectiveness, and capital adequacy ratio, had positive and significant effects on credit risk, inflation, GDP, and operations efficiency.

Rathnayaka, Bai, Louembe, and Liqi (2022) investigated the performance of Chinese commercial banks and the liberalization of interest rates. There were just 10 commercial banks in the sample. From 1999 to 2019, twenty-one years were covered by the study. Both a descriptive and a causal-comparative research design were utilized in the study. The link between the independent and dependent variables was examined using correlation. To demonstrate how the independent variable affected the dependent variable, a regression analysis was performed. The dependent variable was the lending interest rate, while the independent variables were the profit margin, net interest margin, bank size, cash reserve ratio, loan deposit rate, capital adequacy ratio, non-performing loan, GDP, and M2. The major finding of the study was strongly dependent on their size, quality suggested the prompt adoption of an innovative risk management system to develop the bank's efficiency

Lawal (2022) found that Nigerian food security is determined by the overall amount of loans and the total interest rates from government-owned development financial institutions. in order to ascertain the impact of loans from government-owned development financial institutions on the achievement of food security in Nigeria and to look into the impact of interest rates on loans from these institutions on this outcome. Directly

relevant to agricultural loans and their interest rate was the study. The study's time frame was 2000–2018. Food security was the dependent variable, whereas total loans from state-owned development finance institutions and total interest on agricultural loans were independent variables. The hypothesis was tested using multiple regression and descriptive statistics. The study's main conclusion was that there was no discernible impact on Nigeria's food security. If the government increases loans from publicly owned projects, it had a favorable and significant impact on Nigeria's food security. Ghimire and Bhandari (2023) examined the elements that determine lending interest rates by looking at the factors that influence of lending interest rates of commercial banks in Nepal. For the analysis from 2016 to 2021, panel data were used. For analysis, both a descriptive and a causal-comparative study design were used. For the sample, only fifteen financial institutions were chosen. The operating cost to total assets, deposit interest rate, profitability, and default risk were independent variables, and the loan interest rate was the dependent variable. Only the deposit interest rate had a favorable and considerable impact on the lending interest rate, according to the study's findings. All other individual variables had a favorable but minimal effect on the loan interest rate. R_2 and all other correlation values were low.

Research Methodology

A casual comparative research design has been used in this study. The dependent variable is the lending interest rate (LIR), whereas the independent variables are the liquidity ratio (LR), deposit interest rate (DIR), return on assets (ROA), default risk (DR), gross domestic product

(GDP), and inflation (INF). The secondary data used as the basis for this study was only collected from commercial banks between 2018 and 2022. To choose the samples, a convenience sampling technique is employed. All data were taken from publicly accessible annual reports of representative banks. Out of the twenty-one commercial banks, seven have been chosen as sample banks as convenience samples. These data are investigated and interpreted through the use of inferential statistics including correlation, and multiple regressions. Microsoft Excel 10 and SPSS version 25 are both used in this analysis.

Research Model

The study's econometric model is expressed:

$$Y = \alpha + \beta x + \varepsilon$$

Where:

Y denotes for dependent variable, α is constant, β is the explanatory variables coefficient, "x" denotes for independent variables and ε used for the error term.

On the basis of the econometric model following research model can be applied.

$$LIR_{it} = \beta_0 + \beta_1 LR_{it} + \beta_2 DIR_{it} + \beta_3 ROA_{it} + \beta_4 DR_{it} + \beta_5 GDP_{it} + \beta_6 INF_{it} + e_{it}$$

Where:

LR_{it} = Lending interest rate for the bank during the t period.

DIR_{it} = Deposit interest rate for the bank during the t period.

ROA_{it} = Return on assets for the bank during the t period

DR_{it} = Default risk for the bank during the t period

GDP_{it} = Gross domestic product INF_{it} = Inflation rate

e_{it} = Error terms β_0 = Intercept $\beta_1 - \beta_6$ = Coefficient of parameters.

Research Framework

On the basis of the literature review and research gap, the following research framework has been developed:

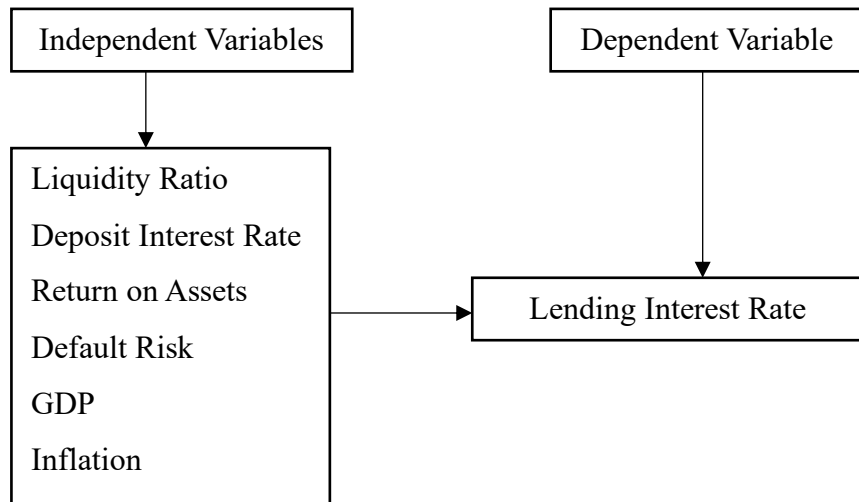


Figure 1. Research Framework. (Al-Qudah 2021)

Variables Definition

Lending Interest Rate

The average yearly rate at which a borrower is required to repay borrowed money is referred to as the interest rate. the opportunity cost of making a financial commitment. The definition of interest is "a payment from borrowers (deficit units) to lenders (surplus units) that compensates savers to lenders for parting with their savings for a predetermined period, typically stated in days, months, or years, and at some risk."

Liquidity Ratio

Abdul et al. (2011) demonstrated how the low rate of return on highly liquid assets is the reason for this association. The danger that a bank won't

be able to successfully and promptly meet its short-term debt obligations or its short-term financial needs is known as liquidity risk.

Deposit Interest Rate

Uhde and Heimeshoff (2009) analyzed how Short-term increases in deposit interest rates raise the cost of capital for banks, which causes interest rates on loans to climb. It is frequently expressed as a proportion of the total interest paid on interest-bearing deposits.

Return on Assets

Mbao et al. (2014) discovered that interest rates on loans had a negative correlation with profits. They said that rising bank expenses are often reflected in higher interest rates for borrowers, whereas things that boost bank profits typically have the opposite effect and reduce rates for borrowers.

Default Risk

High default rates are a result of high borrowing risk, which is brought on by the borrower's lack of collateral and credit references. As a result, banks have increased lending rates by making provisions for high default rates and charging their customers more as a result. (Bawumia et al. 2005)

Results and Discussion

Correlation Coefficient

The relationship between the independent and dependent variables is shown by the correlation matrix. Table 2 displays the correlation coefficients for the following variables: lending interest rate, liquidity ratio, return on assets, default risk, deposit interest rate, GDP, and inflation.

Table 1 *Correlation Coefficient Between Independent and Dependent Variables.*

Variables	LIR	LR	DIR	ROA	DR	GDP	INF
LIR	1						
LR	.404*	1					
DIR	.642**	0.082	1				
ROA	.530**	.398*	-0.035	1			
DR	.387*	.421*	0.102	.375*	1		
GDP	-.348*	-0.144	-.604**	-0.098	0.078	1	
INF	-0.228	-0.214	-.477**	-0.162	0.02	.918**	1

Note: Annual report.

Table 1 shows the correlation coefficient between the variables. There is a high positive correlation between the lending interest rate and deposit interest rate i.e., 0.642. The correlation between the ROA and LIR has a positive but moderate relation. Liquidity interest rates have a low positive correlation between the liquid ratio and default risk (0.404 & 0.387 respectively). The LIR with the gross domestic product and inflation have a negative correlation (-0.348 & -0.228).

Regression Coefficient

Table 2: *Regression Coefficient of Independent Variables on Dependent Variables.*

Variance	B	S.E.	t	Sig.	VIF
LIR	0.52	1.25	0.42	0.68	-
LR	0.03	0.02	1.90	0.07	1.39
DIR	0.66	0.11	6.00	0.00	1.83
ROA	1.69	0.31	5.38	0.00	1.33
DR	0.10	0.13	0.74	0.47	1.44
GDP	-0.12	0.07	-1.79	0.08	8.79
INF	0.47	0.17	2.76	0.01	7.22
R² = 0.81	Adj. R² = 0.77		F. Stat. = 20.07		Sig. = 0.00

Dependent variable: lending interest rate (LIR).

The regression coefficients of the independent and dependent variables are displayed in Table 2. The Table explains that the regression model for the study of determinants of lending interest rate of commercial banks in Nepal is fit for the study. Calculated F. value is greater than the tabulated value and p - the value of the model is 0.000 which is significant at a 1% level of significance this result is consistent with the result of Shrestha (2022). The independent variables of this study explain the lending interest rate by 77% as adjusted R^2 is 0.77. variance inflation factors of all the variables are less than 10 so there is no multicollinearity between the independent variables. The regression coefficient of the independent variables shows that there is a positive and significant effect of deposit interest rate, return on assets, and inflation on the lending interest rate at a 1% level of significance with p- p-values = 0.000, 0.000, & 0.01 respectively and the result is consistent with Mbowe, Mrema, and Shayo (2020) and contradict with the result of Al-Qudah (2021). It means increases in deposit interest rate, return on assets, and inflation support to increase the lending interest rate of the commercial banks in Nepal. Other variables of this study have a nominal impact on the lending interest rate.

Conclusion

The research has examined the determinants of lending interest of commercial banks in Nepal. An independent variable lending interest rate and Six independent variables: liquidity ratio, deposit interest rate, return on assets, default risk, gross domestic production, and inflation were used in the study. The panel data of seven commercial banks from 2018 to 2022

has been collected from the annual report. Correlation and the ordinary least square method have been applied to analyze the data.

Deposit interest rate, ROA, and inflation have a positive and significant effect on lending interest rates. However, GDP has an insignificant negative effect, and LR and DR have an insignificant positive effect on lending interest rates. Therefore, the conclusion of this study is, that the main independent variables like deposit interest rate, return on assets and inflation have positive and significant effects on the lending interest rate of Nepalese banks.

Implication for Future Research

The lending interest rate of commercial banks is also affected by the operating cost, total assets, and other variables. This study does not consider the aforementioned variables in this study. If the macroeconomic variables are supportive, the bank can positively manage the lending interest rate. Therefore, both the macroeconomic and bank-specific variables should take into account lending decisions for the enhancement of the performance of commercial banks. Banks can not consider a few factors to provide better performance, so future research must consider integrated research to understand the determinants of lending interest rates of commercial banks in Nepal.

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Performance Evaluation of Different Images Using Edge Detection Algorithms

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Abstract

To determine which edge detection method performs best and worst on different image types, numerous edge detection algorithms are examined. For the performance analysis, some sample photos from the web and some from Java are used as sources. The entropy and signal noise ratio are used to gauge how well the edged image performs. In image processing, conducting a thorough investigation of various edge detection techniques is highly worthwhile two widely used edge detection algorithms Log, and Canny—are taken into consideration in this analysis. Here in this paper, the analysis is focused on the performance of different edge detector algorithms. All candidate algorithms of edge detection are implemented in JAVA. The result of empirical performance shows that two variants namely canny perform better results for the edge detection algorithm. The result shows that when considering only the performance aspect. Cycle/byte is calculated for comparing different variants. Cycle/byte is decreased when the canny edge detector is examined. The canny edge

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detection algorithm shows a better performance than LoG. LoG has more than 3 times higher cycle/byte than Canny Edge detection.

Keywords: Canny Edge detection, Log Edge detection, cycle/byte, image processing, empirical performance

1. Introduction

Edge detection is a method of image processing that locates the edges of objects in pictures. It operates by looking for changes in brightness. In fields including image processing, computer vision, and machine vision, edge detection is utilized for image segmentation and data extraction.

There are numerous approaches to edge detection. The majority, however, can be divided into two categories: Laplacian and gradient. By looking for the greatest and minimum in the first derivative of the image, the gradient approach finds the edges. The Laplacian approach uses the second derivative of the image to find edges by looking for zero crossings. To create a gradient image in which edges are recognized by thresholding, the input image in the first-order derivative is convolved with a customized mask. The initial stage in many computer vision applications is edge detection. Edge detection drastically minimizes the data and offers the important information in a picture by filtering out irrelevant or undesired data. In image processing, these details are utilized to identify objects. Edge detection is a basic procedure used in computer vision and image processing software. In digital images, it is crucial to identify the features of the images. Just like humans, algorithms should pay attention to these features in order to perceive images. Edge detection application is a visual

processing technique used at this point. Edge detection's primary objective is to find and recognize distinct discontinuities in an image. These breaks are brought on by sharp variations in pixel intensity that define the borders of objects in a scene. Edges define the boundaries between the image's various areas. For the purposes of segmentation and matching, these boundaries are employed to identify objects (Bhardwaj & Mittal, 2012). Many of these processes start with these object boundaries. Edge detection is an important and basic operation to be completed for any image processing activities, image analysis, and pattern recognition on various images such as satellite images, medical images, etc.

2. Literature review

Edge detection is an image processing technique for finding the boundaries of objects within images. It works by detecting discontinuities in brightness. Edge detection is used for image segmentation and data extraction in areas such as image processing, computer vision, and machine vision. There are many ways to perform edge detection. However, most may be grouped into two categories, gradient and Laplacian. The gradient method detects the edges by looking for the maximum and minimum in the first derivative of the image. The Laplacian method searches for zero crossings in the second derivative of the image to find edges. (Bhardwaj & Mittal, 2012) The first-order derivative creates a gradient image in which edges are recognized by thresholding by convolving the input image with a modified mask. The majority of traditional operators, including Sobel, Prewitt, and Robert, are first-order derivative operators.

Also known as gradient operators, these operators. By looking for the greatest and minimum intensity values, these gradient operators find edges. These operators decide whether a given pixel should be labeled as an edge by looking at the distribution of intensity values in its immediate vicinity. Since they need additional computing time, these operators cannot be applied in real time.

These are based on the extraction of zero crossing points in second-order derivatives, which show the presence of maxima in the image. First, an adaptive filter is used to smooth the image (J.F, 1986). Since the filtering function is crucial since the second-order derivative is highly sensitive to noise. These operators, developed by Marr and Hildreth, are derivations of the Laplacian of a Gaussian (LOG), in which a Gaussian filter is used to smooth the image. We must fix a few parameters for this operator, such as the Gaussian filter's variance and thresholds. Although there are some ways for their automatic calculating (Meghana & G.K, 2012), their values must often be set by the user. The localization of edges with an asymmetric profile by zero-crossing points generates a bias, which worsens with the smoothing effect of filtering, which is a significant issue with LoG. Canny offered an intriguing solution to this issue, stating that the ideal operator for step-edge detection meets the following three criteria: good detection, good localization, and only one reaction to a single edge. Other operators have since been suggested. These operators have strong noise immunity, but they have certain localization limitations when detecting edge types other than their preferred ones. Finally, we draw the conclusion that, as a

result of the blurring, none of the actual edge detectors based on the first or second derivative of a picture satisfy our criterion. (Joshi & Koju, 2012)

2.1 Sobel Operator

The Sobel edge detector is a spatial domain gradient-based edge detector. The Sobel operator consists of two gradient masks of size 3×3 one along the horizontal direction and another along the vertical direction. The pair of masks slides over the image and aims to calculate the gradient at every single pixel of the 2D grayscale image. The Sobel operator is a simple edge detector and allows fast computation. The detection process performs a small amount of mathematical calculation and hence makes the detection process computationally cheap. However, the Sobel operator has a limited capability to detect the edges in an arbitrarily oriented direction. Due to this limited directional capability, it only extracts the edge direction only along the horizontal and vertical direction. Besides, this edge detector is also not robust to noise. Hence it has limited application where the image is noisy and rich in edges along different directions.

2.2 Prewitt's Operator

Like the Sobel operator, the Prewitt operator also extracts the edges of an image only along vertical and horizontal directions. The detection process follows the same steps as followed by the Sobel operator. This operator consists of a pair of masks. The masks are convolved with the image to produce the absolute gradient of the image. The edge strength at a particular pixel is given by the square of the magnitude of the absolute gradients (along the x and y axis) at the same point. Like the Sobel

operator, the Prewitt edge detector also adopts only limited directions and hence it has a limited application.

2.3 Robert's Cross Operator

It is one of the oldest and most popular edge detection operators. The operator calculates the spatial gradient at each and every pixel of the image under consideration. The absolute magnitude of the gradient at each single pixel of the input image is the resultant edge image. Unlike Prewitt and Sobel operator this operator is quite simple and much faster. Due to its fast computation and easy inclusion, it has a frequent application in hardware implementation.

2.4 LoG edge detector

The LoG (Laplacian of Gaussian) edge detector exploits the second-order derivatives of pixel intensity to locate edges. The Laplacian $L(x, y)$ of an input image $I(x, y)$ is given by

$$L(x, y) = \frac{d^2 I}{dx^2} + \frac{d^2 I}{dy^2} \dots\dots\dots(3.1)$$

and, can be computed by convolving the image with any of the convolution mask. This operator is sensitive to noise and is often applied to the image after it has been smoothed with Gaussian smoothing filter. The Gaussian smoothing filter G_1 is defined by

$$LoG \quad (x, \quad y) \quad = \quad -\frac{1}{\pi\sigma^4} \left[1 - \frac{x^2+y^2}{2\sigma^2} \right] e^{-\frac{x^2+y^2}{2\sigma^2}} \dots\dots\dots(3.2)$$

Convolving the image with any one of the smoothing kernels having a different value will result in the Gaussian smoothing.

This operator locates the edges in the second-derivative maps by fusing the zero-crossing points and the image-gradient magnitude. To locate the edge's subpixel location, linear interpolation is used. The standard deviation of the Gaussian smoothing filter employed in the LoG filter has a significant role in the behavior of the LoG edge detector. The Gaussian filter is wider and the smoothing is greater the higher the value. An excessive amount of smoothing could make edge identification challenging. Edges can be viewed as gradient points with a high intensity. (Bhardwaj & Mittal, 2012)

2.5 Canny edge detector

The list of requirements to enhance edge detection came next. The low error rate comes first, which means that true edges shouldn't be overlooked. The second is the localization of the edge point. The smallest distance between the edge pixels identified by the detector and the real edge pixels is that. The third is to just have one response to one edge. Canny edge detector implementation requires a sequence of stages.

Step 1: Prior to detecting the edge, the image's noise was first filtered out. This challenge makes use of the Gaussian filter. Convolution can be used to accomplish Gaussian smoothing. A smaller-sized mask should be able to be moved over a picture and be adjusted one square of pixels at a time. Mask width must be carefully chosen because it directly relates to localization mistakes.

Step 2: Edge strength is find out by taking the gradient of the image. A Robert mask or a Sobel mask can be used for this purpose. The magnitude of gradient is approximated using the formula,

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

.....(3.3)

$$|G| = |G_x| + |G_y|$$

.....(3.4)

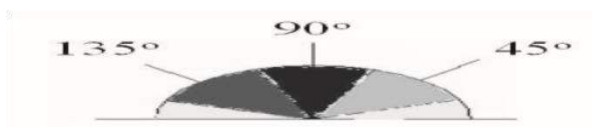
where G_x and G_y are the gradient in X and Y direction respectively.

Step 3: Find the edge direction by using the gradient in x and y directions.

Formula used is $\alpha = \arctan\left(\frac{|G_x|}{|G_y|}\right)$

.....(3.5)

Step 4: After knowing the edge direction relate it to the specific degree. Resolve the edge direction in horizontal, positive, vertical, negative diagonal (Chandra Sekhar & Abin, 2013)



Step 5: Use non-maxima suppression to suppress any pixel value that isn't regarded as an edge by tracing along the edge direction. It provides a fine edge line.

Step 6: Use double / hysteresis thresholding to eliminate streaking. (Bhardwaj & Mittal, 2012)

3. Measuring Cost

There is some extra cost that may be added to the absolute cost for creating edges using different edge detector algorithms but this is equally affected by all candidate's algorithms on the execution. The system time in nanoseconds is taken just before the execution of the code segment for generating edges in each algorithm and the completion of the execution. The time spent for creating the edge is calculated by subtracting the start time taken before execution from the completion time taken after completing the execution of a specific code segment that is used to produce the edge. The time required for each algorithm is calculated as follows:

```
long    startTime = System.nanoTime();  
// canny.cannyedge();  
//and logedge.logedge();  
long    timeRequired = System.nanoTime() - startTime;
```

Various processes may be run in the background of the system so absolute measurement may not be measured due to this reason, the time needed for creating an edge in all algorithms may not be observed in every run of program. Therefore at least 5 times, the program implemented in java is run in architecture describes as section below and finally average required time observed in every run is calculated as:



$$\text{Average required Time} = \sum_{i=1}^5 \frac{T_i}{5} \quad \text{where } T_i \text{ represent time obtained in } i^{\text{th}} \text{ run of execution.}$$



This average calculated time is used to calculate cycle per byte.

4. Measuring Performance

4.1 Data Collection

All the secondary data (image) are extracted from the internet. Table below shows the detail of the image used.

S.N	Name	Pixel	Figure
1.	Sample Image 1	512×512	
2.	Sample image 2	1000×1000	

3.	Sample image 3	250×250	
4.	Sample image 4	512×512	

4.1.1 Testing Data:

After the implementation of the algorithms and selection of proper data set, the modules will be tested using two algorithms Canny Edge Detector and LoG Edge Detector algorithm to get the best result.

4.2 Experiment & Result

4.2.1 Experimental Setup

The aim is to experimentally determine the best algorithm among Canny Edge Detection and LoG Edge Detection.

The algorithms used for various flavors were implemented in JAVA. The candidate's algorithms were executed on J2SETM (Java™ Platform, Standard Edition 17 Development Kit) environment with Windows10, 64 bits' machine having 8GB RAM, with Intel CORE™ i7 processor.

The sample image mentioned in Figure 5.1 were tested for both the algorithms (Canny and LoG). Each sample was executed 5 times to give the output as a mean value. The performance of Canny Edge detection and LoG Edge Detection were calculated in terms of time complexity (nanosecond). The result of the experiment is shown as follows:

4.2.2 Evaluation

4.2.2. (a) Sample Image1



Results:

No. of observation	Canny Edge (Execution time in ns)	LoG Edge (Execution time in ns)
1	925571902	3577939702
2	797692462	3032482393
3	830369636	3097272533
4	717162871	2696814838
5	839265043	3209588811
Average Time in NS	822012382.8	3122819655

Table 4.2.2.(a): Computational Time for the given Sample Image 1

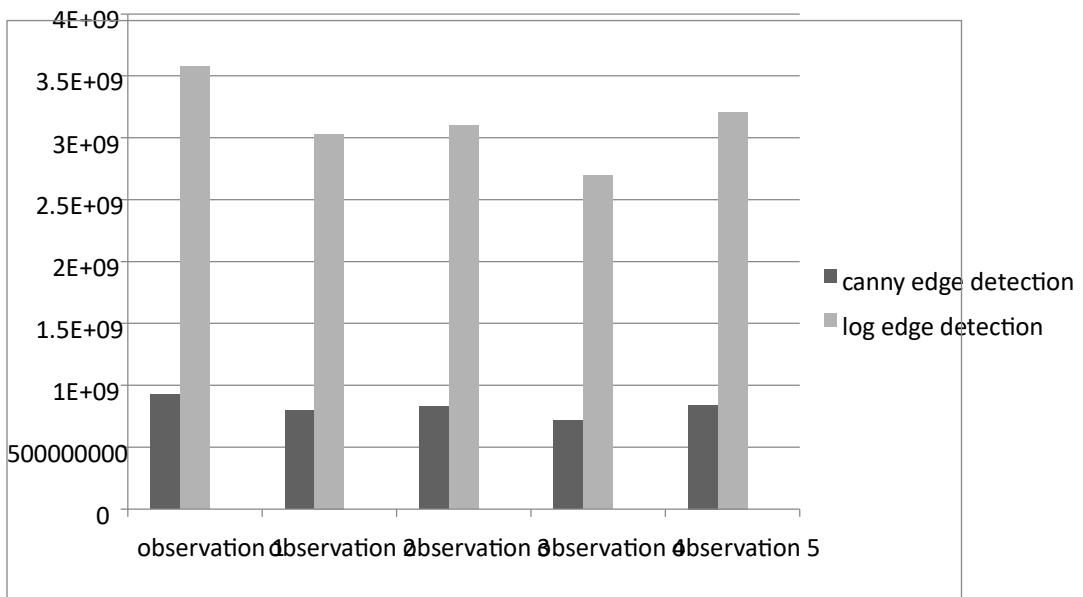
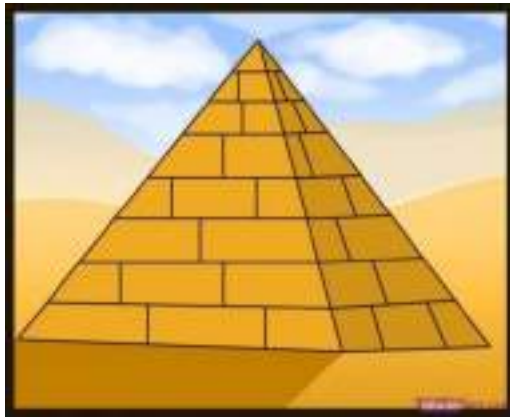


Figure 4.2.2.(a): Computational Time for the given Sample Image 1

The above graph shows that the computational time taken by canny edge detection is lesser in all five observations than that of LoG Edge detection

algorithm. The average computational time for five observations required for sample image 1 by Canny Edge Detection algorithm is 822012382.8 ns and LoG Edge Detection algorithm is 3122819655 ns.

4.2.2.(b) Sample Image2



Result

No. of observation	Canny Edge (Execution time in ns)	LoG Edge(Execution time in ns)
1	1536459171	7686080108
2	1566676516	8177579810
3	1548296837	7627500357
4	1469454116	7556601738
5	1514410708	7626201817
Average Time in ns	1527059470	7734792766

Table 4.2.2.(b): Computational Time for the given Sample Image 2

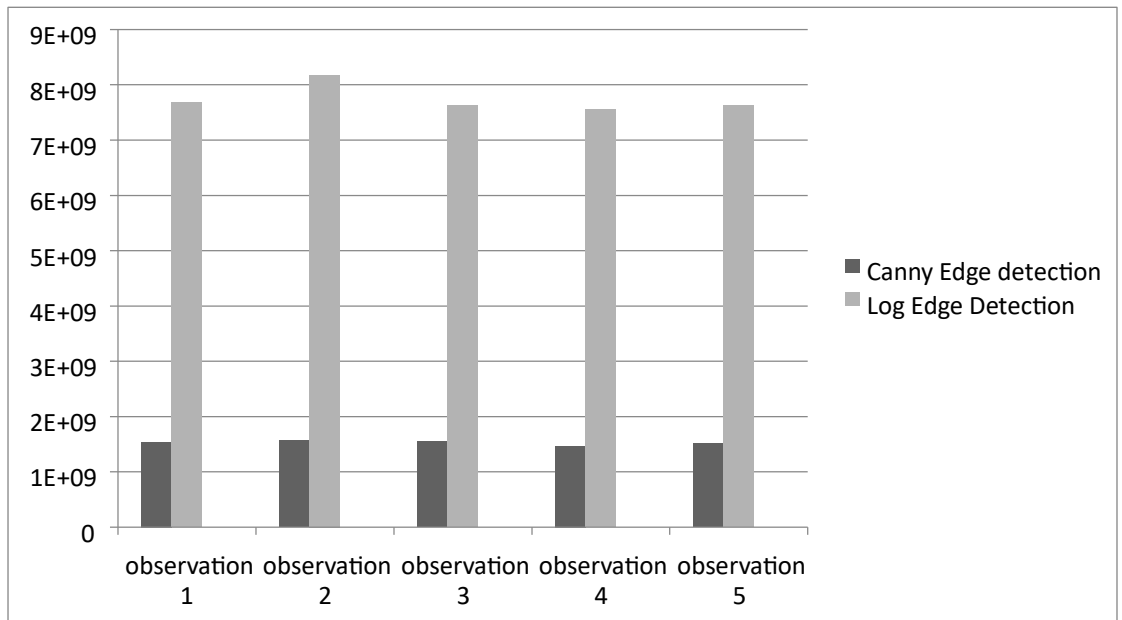


Figure 4.2.2.(b): Computational Time for the given Sample Image 2

The above graph shows that the computational time taken by canny edge detection is lesser in all five observations than that of LoG Edge detection algorithm. The average computational time for five observations required for sample image 1 by Canny Edge Detection algorithm is 1527059470 ns and LoG Edge Detection algorithm is 7734792766 ns.

4.2.2. (c): Sample Image3



Result

No. of observation	Canny Edge (Execution time in ns)	LoG Edge (Execution time in ns)
1	691395901	2802071746
2	830203210	2744704348
3	788477762	2960011556
4	812946604	2811954207
5	720794674	2822784685
Average Time in ns	768763630.2	2828305308

Table 4.2.2.(c): Computational Time for the given Sample Image 3

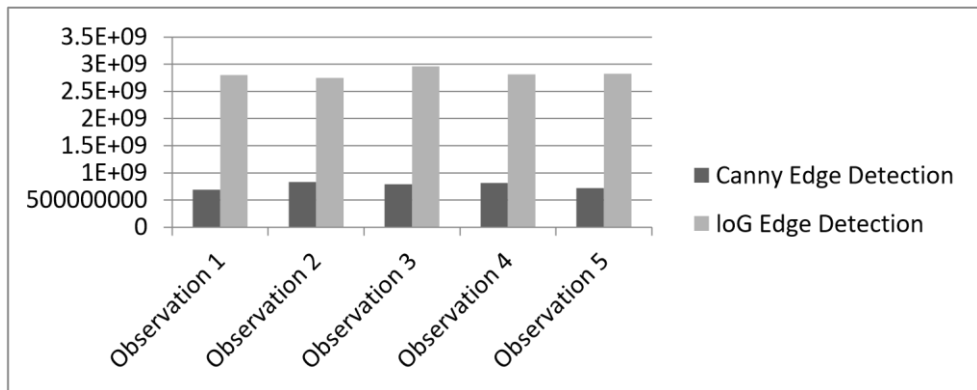


Figure 4.2.2.(c): Computational Time for the given Sample Image 3

The above graph shows that the computational time taken by canny edge detection is lesser in all five observations than that of LoG Edge detection algorithm. The average computational time for five observations required for sample image 1 by Canny Edge Detection algorithm is 768763630.2 ns and LoG Edge Detection algorithm is 2828305308 ns.

4.2.2,(d) Sample Image4



Result

No. of observation	Canny Edge (Execution time in ns)	LoG Edge (Execution time in ns)
1	817099876	2886975689
2	887798371	2838352367
3	735308730	2716432238
4	817987485	2844300993
5	798767044	2843363662
Average Time in ns	811392301.2	2825884990

Table 4.2.2.(d): Computational Time for the given Sample Image 4

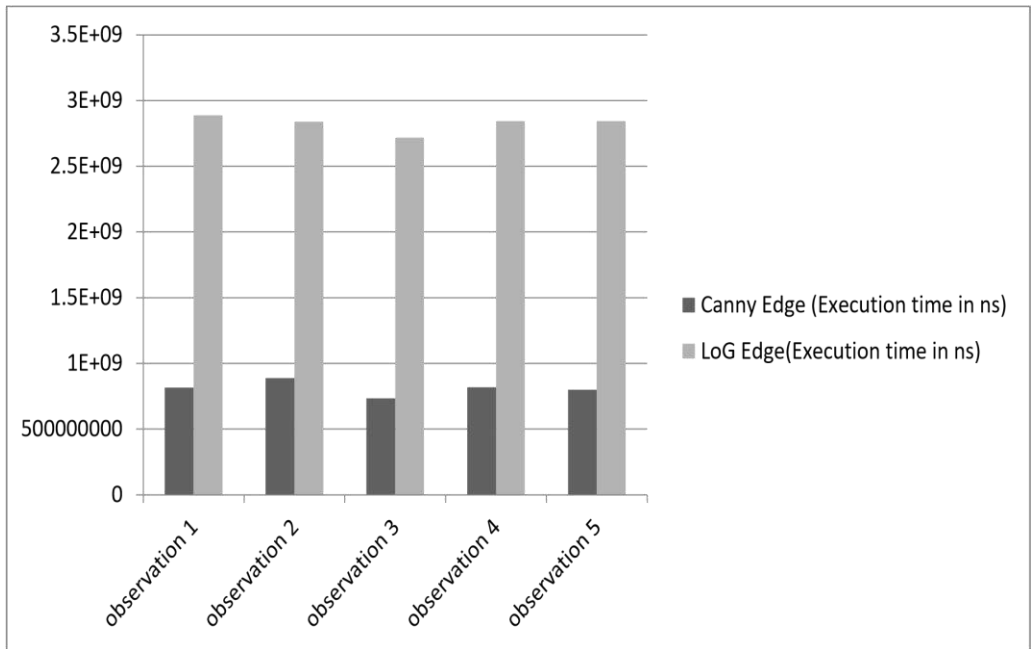


Figure 4.2.2.(d): Computational Time for the given Sample Image 4

The above graph shows that the computational time taken by canny edge detection is lesser in all five observations than that of LoG Edge detection algorithm. The average computational time for five observations required for sample image 1 by the Canny Edge Detection algorithm is 811392301.2 ns and LoG Edge Detection algorithm is 2825884990 ns.

5. Result

For every candidate image canny edge detection algorithm seems to be the better edge detector variant whatever the size of the image is taken to generate the edge. However, the nature of time required to detect edge remain unchanged according to input size of image and types of image. Canny seems to be best model in edge detection algorithm by this way. It is observed that Canny yields 19%-28% better performance (cycle/byte)

than LoG edge detector when various kinds of image were tested. For comparing two edge detection algorithms, Canny and LoG, it seems Canny algorithm is best to use for every types of image. LoG has more than 3 times higher cycle/byte than Canny.

6. Conclusion

From the analysis, it is identified that the Canny edge detection algorithm is performing better among the two algorithms. Out of the four image information, Canny algorithm on Dither binary image information yields the high entropy and Signal-to-Noise Ratio values. However, the LoG algorithm with indexed image information generates very low entropy with low SNR values. Though the algorithm is fair in giving results in optimal time further improvements can be made in the algorithm focusing on areas like the Gaussian filter, methods to calculate the gradients etc. Other areas include the noise suppression techniques in the image as the canny edge detection algorithm is highly affected by noise by making the image inappropriate for detection of the weak edges as they are also filtered while filtering the noise. Hence by making the advancements in the above given areas, this algorithm can be effectively used in areas like Computer Vision, Asphalt Concrete applications, Machine learning, etc.

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Performance Analysis of Sketching Methods

- Dinesh Maharjan¹

Abstract

One of the problems in data mining or machine learning is the high-dimensional dataset. MinHash can generate sketches of sparse datasets efficiently reducing the dimension to a few thousand. These sketches, then, can be used for different machine learning applications. It takes $O(kd)$ computations to generate k hash values for a data point with d non-zeros. The Sketch of a data point is the vector of k hash values. Weighted Minwise Hashing is another method to generate a sketch of size k in $O(kp/d)$ computations. Here, p is the size of the universal set. Optimal Densification is the most efficient and accurate method as it can generate k hash values in mere $O(d + k)$ computations. In this paper, we investigate the performance of Optimal Densification, Weighted Minwise Hashing, and Vanilla MinHash by performing two experiments. Firstly, we investigate Jaccard similarity estimation accuracy on six different synthetic datasets. Then, we perform one nearest neighbor classification (1NN) of four real datasets. Optimal Densification outperforms both Weighted Minwise Hashing and Vanilla MinHash in terms of accuracy and time taken to generate the sketches.

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Keywords: MinHash, Sketch, Jaccard Similarity, Densification

Introduction

Similarity computation is the basic operation that needs to be performed in machine learning, data mining, image recognition, and speech analysis for the comparison of data points. One of the comparison metrics is Jaccard similarity. For the universal set

$U = \{0, 1, 2, \dots, p - 1\}$, the Jaccard similarity between two sets S and T is defined in

Eq. 1.

$$J = (S \cap T) / (S \cup T) \dots\dots\dots 1$$

It is the fraction of similar items between two sets. So Jaccard similarity can be used in many applications. However, computing Jaccard similarity for datasets with large p is very expensive. In the worst case, it takes $O(p)$ time. So Broder introduced MinHash (Broder, Charikar, Frieze, & Mitzenmacher, 2000) which reduces the dimension from p to k by generating high-quality sketches. Here $p \gg k$. Sketches of two sets S and T can be used to estimate Jaccard similarity. The most important applications of sketches generated by MinHash are indexing streams (Mahadevan, 2000), classifying text (Chi, Li, & Zhu, 2014), clustering images (C. Li, Chang, Garcia-Molina, & Wiederhold, 2002), and Locality Sensitive Hashing (Andoni & Indyk, 2006; Andoni, Indyk, Laarhoven, Razenshteyn, & Schmidt, 2015; Har-Peled, Indyk, & Motwani, 2012). So in recent years, many semantic works have been published related to MinHash. Originally MinHash (Broder, 1997; Broder et al., 2000) is designed to quickly detect the near-identical text documents on the basis

of Jaccard similarity. However, it can be used for estimating cosine similarity (Shrivastava and Li, 2014c) also. Thus, MinHash is very popular in large-scale data mining techniques (Chum et al., 2010; Tamersoy, Roundy, & Chau, 2014). Although MinHash achieves computational improvement over the naive approach, it is not sufficient for highdimensional datasets. This is because, given a universal set U of size p , it needs to generate the permutation of size p to obtain each hash value. Moreover, it requires $O(kd)$ computations to generate a sketch of size k , where d is the number of non-zeros in S . Thus, generating a hash value becomes the major bottleneck for large k and d . One Permutation Hashing (OPH) (P. Li, Owen, & Zhang, 2012) is able to generate the same number of hash values with a single permutation and gains remarkable improvement in execution time. It needs only $O(k + d)$ computations. However, it is unable to generate hash values for empty bins that do not contain any non-zero elements. This issue is addressed in papers (Shrivastava & Li, 2014a, 2014b) with the method of densification. Their method lacks enough randomness, and as a result, the estimated Jaccard Similarity has high variance. Optimal densification (Shrivastava, 2017) successfully solves the empty bin problem with sufficient randomness by using a 2-universal hashing function.

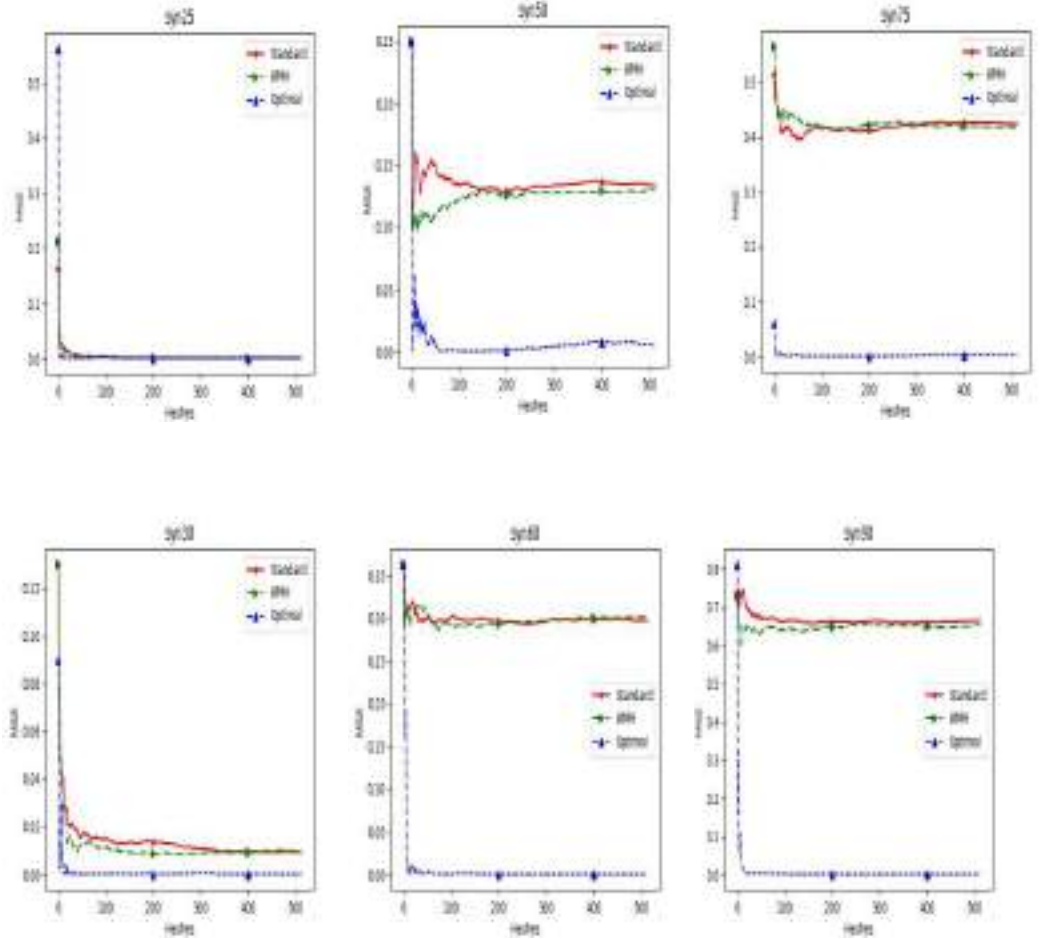


Figure 1: MSE with the size of sketch, k . The MSE values are averaged over 10 executions.

We compare the performance of MinHash, Weighted Minwise Hashing, and Optimal Densification by performing two tasks on synthetic as well as real datasets. The real datasets are downloaded from (Hsu et al., 2003) and most of these datasets are never used in the literature.

Objectives of the Study

The main purpose of this study is to investigate the performance of different state-of art methods for reducing dimension. The special objective of the study follows below:

1. To examine the performance of MinHash, Weighted Min-wise Hashing, and Optimal Densification on time series data.
2. To use the sketches generated by hash-based methods as the features for the classification of time series data.

Review of Sketching Methods

We review Standard MinHash, Weighted MinHash, and Optimal Densification.

MinHash paved the foundation for hash-based dimensionality reducing methods.

Weighted Minwise Hasing and Optimal Densification are efficient and effective versions of MinHash,

Standard MinHash

Standard MinHash (Broder, 1997; Broder et al., 2000) is an LSH (Locality Sensitive Hashing) randomized hashing method that is widely used for big data analysis. It improves the naive method of computing Jaccard similarity by generating small-sized sketches of high-dimensional sets. For the universal set $U = \{0, 1, \dots, p - 1\}$, it generates a random permutation, π , of size p and applies it to a set S . Then, the minimum among the permutation values of the elements in S is returned as a hash value. That is, $h_{\pi\text{standard}}(S) = \min(\pi(S))$

A new independent permutation is generated to obtain each hash value. MinHash, as a consistent hashing scheme, uses the same permutation to generate the j^{th} hash value of all the sets. The probability of collision is equal to the Jaccard similarity itself i.e. $P(h_{\pi\text{standard}}(S)=h_{\pi\text{standard}}(T)) = J(S, T)$, where $h_{\pi\text{standard}}(S)$ and $h_{\pi\text{standard}}(T)$ are hash values generated by executing MinHash for sets S and T respectively. MinHash must perform $O(kd)$ computations to generate sketches of size k . The value of k and d can explode up to thousands and millions respectively. In such cases, MinHash performs very slowly.

Optimal Densification of OPH

Shrivastava and Li introduced the method of densification (Shrivastava & Li, 2014b) to improve Standard MinHash by randomly sampling the direction of densification.

The direction may be circularly right or circularly left depending upon the discrete random number generated in $[0, 1]$. Such densification lacks sufficient randomness, and thus, has high variance on highly sparse datasets. For fast and accurate sketching,

Optimal densification (Shrivastava, 2017) generates a random number, z_i for each $i \in S$ using a 2-universal hash function (Dietzfelbinger, Hagerup, Katajainen, & Penttonen, 1997) as shown in Eq. 2.

$$z_i = (a_i + b) \gg l - w \dots\dots\dots 2$$

where a and b are random odd integers generated from a uniform distribution, and l and w are bit sizes of i and z_i respectively. It is worth noting that Eq. 2 helps to gain sufficient randomness by randomly

converting a l -bit i into a w -bit z_i . z_i works as the permutation value for the corresponding i . Optimal densification, then, splits $[0, 2w)$ into k bins of equal size. After generating z_i for all i in a bin, it returns a minimum z_i as the hash value for the bin. Empty bins, j , are assigned with the hash value of nonempty bins using Eq. 3.

$$j = (a_j + b) \gg l - k \dots\dots\dots 3$$

where $a_j + b$ is of l -bits. Instead of sampling non-empty bins from a predetermined direction as done in (Shrivastava & Li, 2014b), Eq. 3 uniformly samples non-empty bins from a random direction. This provides sufficient randomness and makes optimal densification efficient and accurate. Since its time complexity to generate k hash values is $O(k + d)$, it will be slow for large d . Weighted Minwise Hashing Weighted Minwise Hashing (WMH) (Shrivastava, 2016) is a generalization of Standard MinHash and achieves computational improvements over MinHash on sets with $d \geq 0.5p$. It can generate sketches of binary sets as well as weighted sets. Given a universal set, $U = \{0, 1, \dots, p - 1\}$, WMH estimates Jaccard similarity between two sets S and T by generating a sketch of each set using Rejection Sampling (Casella, Robert, Wells, et al., 2004). In order to generate hash values consistently, WMH assigns a unit weight to each non-zero element of S . It means upper bounds, b_i , for each element i in the universal set U is 1. Then, cumulative upper bounds, $r_i \in \{0, 1, 2, \dots, p\}$. Notice that, the corresponding non-zero elements of each set fall into the same interval $[r_i, r_{i+1})$. If $i \in S$, then $[r_i, r_{i+1})$ is considered as the white map otherwise black map. WMH attempts to

sample the white map by generating Continuous Uniform Random variable x in $[0, p)$. If x lies in the white map, the number of attempts, c , made to sample the white map is returned as a hash value. If x lies in the black map, then it resamples by generating another Uniform random number. This process goes on until the white map is sampled. WMH also satisfies the LSH property i.e. $p(h^{wmh}(S) = h^{wmh}(T)) = J(S, T)$. Note that $h^{wmh}(S)$ is the sketch generated by executing the WMH algorithm for S .

WMH is summarized in Algorithm 1.

Algorithm 1 Weighted Minwise Hashing

Input: set, S , size of sketch, k , random seeds, s , size of universal set, p

Output: a sketch of S , h

```

1: for  $j = 0, 1, \dots, k - 1$  do
2:  $c=0$ 
3: set seed  $s_j$  to the uniform generator
4: while true do
5:  $x \sim \text{Continuous Uniform}(0, 1)$ 
6:  $i = \lfloor x * p \rfloor$ 
7: if  $i \in S$  then
8: break
9: end if
10:  $c=c+1$ 
11: end while
12:  $h_j = c$ 
13: end for
14: return  $h$ 

```

Rejection sampling keeps on trying to sample a white map until it achieves the first success. Thus, the hash value, $h^{wmh}(S)$ has geometric distribution with probability of success d/p . The expected value of $h^{wmh}(S)$ is p/d . Thus, the time complexity of WMH to generate k hash values is $O(pk/d)$.

Table 1: Basic Statistics of Datasets

Dataset	Train Set Size	Test Set Size	P	Sparsity
Syn30	1	1	1024	0.6
Syn60	1	1	1024	0.6
Syn90	1	1	1024	0.6
Syn25	1	1	1024	0.8
Syn50	1	1	1024	0.8
Syn75	1	1	1024	0.8
StarLightCurves	8236	1000	1024	0.54
HandOutlines	1000	370	2709	0.41
Gisette	6000	1000	5000	0.87
Forde	3601	1320	500	0.5

For a sparse dataset, the value of d will be very small compared to p which leads to a large expected value of $h^{wmh}(S)$. Thus, WMH becomes very slow on highly sparse datasets. However, if $d \geq 0.5p$ and $d \leq k$, then $O(pk/d) < O(k + d)$. In such cases,

WMH will execute faster than Optimal densification.

Locality Sensitive Hashing (LSH):

Locality Sensitive Hashing (LSH) (Andoni and Indyk, 2006) is one of the applications of mapping sets into sketches. It hashes similar sets to the same bucket with high probability which reduces search space to a great extent. It means sets with the same elements or high similarity will be hashed with the same code with high probability. We then compute the similarity only among the sets which got hashed into the same bucket. As we have already mentioned sketch is the vector of hash codes extracted for a given set using different hash functions, MinHash (Broder, 1997; Broder et al., 2000) was proposed as the LSH method of Jaccard similarity for the quick detection of similar text documents. A. Shrivastava claims that MinHash can be used to estimate the Cosine similarity also (Charikar, 2002).

Weighted Set:

The major drawback of MinHash is that it can deal with binary sets only not with the weighted sets. A weighted set is very common in real-life problems as it can represent the importance of an element in the set. A weighted set S contains weights s_i for the elements i . Given a universal set, $\Omega = \{0, 1, \dots, p-1\}$, Generalized Jaccard Similarity (GJS) between two weighted sets $S = \{s_0, s_1, s_2, \dots, s_{p-1}\}$ and $T = \{t_0, t_1, t_2, \dots, t_{p-1}\}$ introduced in (HAVELIWALA, 2000) and was efficiently estimated by introducing the method of unweighted minwise hashing. Their method (HAVELIWALA, 2000) converts weighted set into unweighted by expanding the s_i with additional distinct elements $\{s_{i1}, s_{i2}, \dots, s_{is_i}\}$ in proportion to its weight s_i . Then Standard MinHash (Broder et al., 2000)

is applied. This approach cannot deal with real weights and is inefficient. Other unweighted minwise hashing methods (Gollapudi and Panigrahy, 2006; Haeupler et al., 2014) can deal with the real weights but they still have to generate additional elements. A significant improvement was seen in the paper (Manasse et al., 2010) that uses pairs of active indices (w_i, z_i) to generate each hash value. Their method is referred to as Consistent Weighted Sampling (CWS). However, this approach still needs to sample many active indices per weight to obtain each hash value.

Research Methods

We use theoretical and empirical research methods. We first theoretical correctness of Vanilla MinHash, Weighted Min-wise Hashing, and Optimal Densification in estimating Jaccard similarity. Then, we perform experiments to prove the unbiasedness of all the methods. The experiments use six synthetic datasets and three time series datasets. The experimental results prove that all of the methods are unbiased estimators of Jaccard similarity. Moreover, sketches can be used for machine learning purposes.

Experimental Results

In order to perform a comparative study between Bitwise MinHash and other state-of-the-art methods, Standard MinHash (Broder et al., 2000), Optimal Densification (Shrivastava, 2017), and WMH (Shrivastava, 2016), we perform two different tasks on synthetic and real datasets. We first inspect consistency in estimating Jaccard similarity using six pairs of synthetic data points. The pairs are of different similarity and sparsity.

Then, we investigate the efficiency and effectiveness of compared methods with 1-NN classification. The Basic statistics on the datasets used for our experiments is provided in Table 1.

MSE in estimating Jaccard Similarity

Consistency is one of the important qualities of an estimator. Thus, we investigate the consistency of compared methods on six synthetic datasets. We record the Mean Squared Error (MSE) of compared methods for each hash value. MSE measures the difference between actual Jaccard similarity and estimated Jaccard similarity. Moreover, we compare the efficiency of each method on the basis of hash generation time. Results are shown in Fig. 1.

Synthetic datasets, Syn30, Syn60, Syn90, Syn25, Syn50, and Syn75 are pairs of data points created by sampling elements from a uniform distribution at intervals $[0, 1024)$. The Jaccard similarity between the pair of data points in Syn30 is 0.30 and the same applies to other synthetic datasets.

Discussion on the Results: MSE of all methods in Fig. 1 decreases with an increase in sketch size, k . This ensures the consistency of all the estimators. This also proves that bias is negligible. Optimal Densification beats all other methods in terms of MSE.

The time taken for generating sketches is shown in Fig. 2. Results show that Optimal Densification is almost 20 times faster than Standard MinHash.

1-NN Classification

We conduct 1-NN classification on four real datasets, StarLightCurves, Han Outlines, Gisette, and FordA to further assess the quality of signatures. All datasets are downloaded from (Chen et al., 2015). We compare the effectiveness of all the methods on the basis of classification accuracy. Accuracy is the proportion of correctly classified test sets. The plots for the classification accuracy are shown in Fig. 2.

Discussion on the Results: We can see that Optimal Densification beats both WMH and Standard MinHash. WMH and Standard MinHash stand at similar classification accuracy in three datasets. However, WMH has better accuracy than Standard MinHash in case of StarLightCurves.

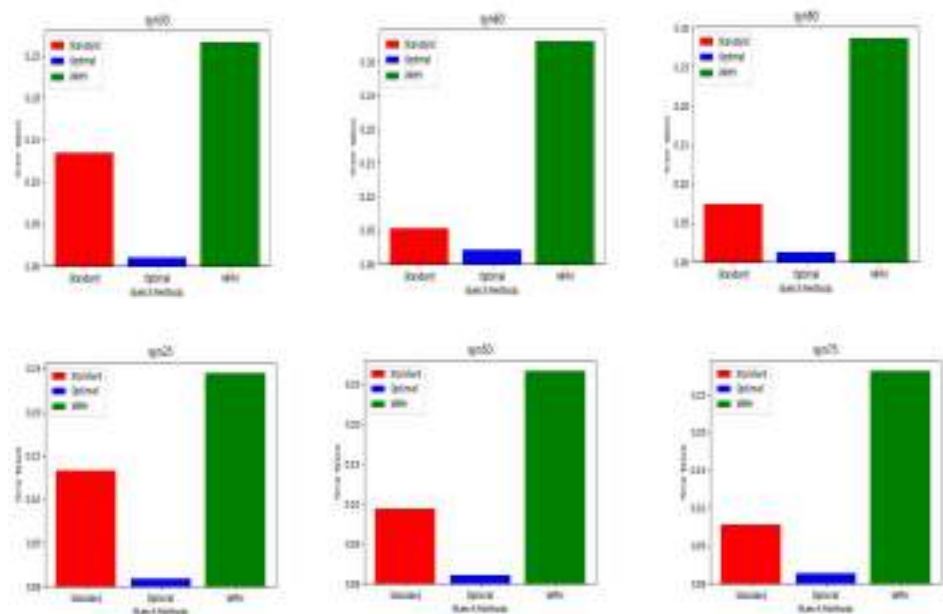


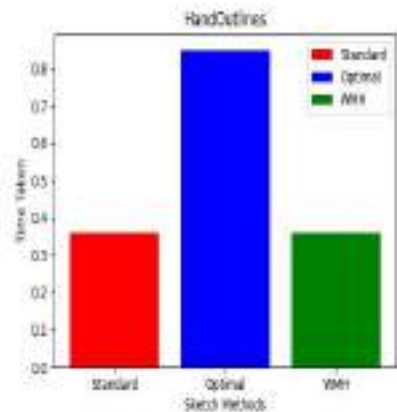
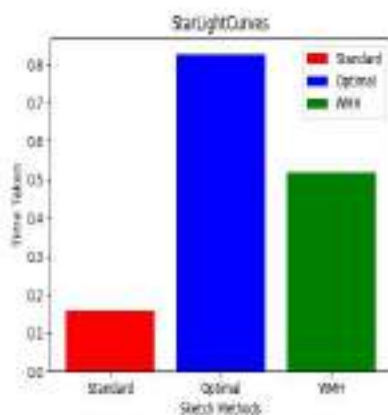
Figure 2. Time taken to generate hash with the size of a sketch, k . The Time taken is averaged over 10 executions.

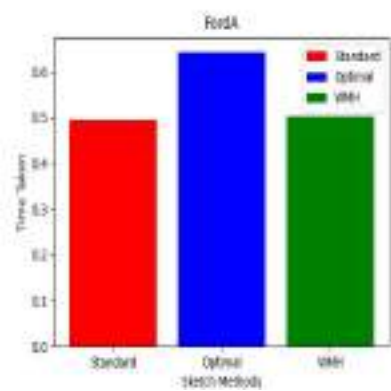
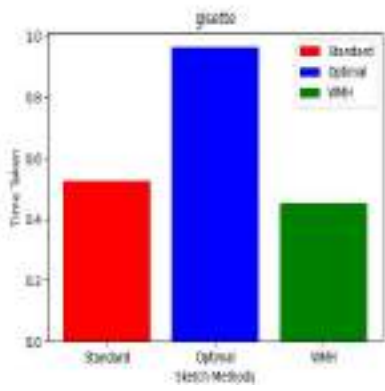
Conclusion

In this paper, we compare the quality of sketches generated by Standard MinHash, Optimal Densification, and WMH. We calculate estimated Jaccard similarity using the sketches and compare the Mean Squared Errors. Results show that Optimal Densification outperforms both Standard MinHash and WMH. Moreover, Optimal Densification is the fastest among the three in generating sketches.

The best application of sketch is to classify the data point. We perform the One Nearest Neighbor (1NN) classification of four real datasets by computing the Jaccard similarity of each test point with the training set. The test data point is classified with the class of the train data point having maximum similarity. As expected, Optimal Densification has better classification accuracy. Thus, we conclude that Optimal

Densification is one of the most accurate and efficient similarity search methods.





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Nepal's Policies and Practices for Gender Equality

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Abstract

The development policy of the government of Nepal based the article on gender equality, inclusion, and its relationship with development in the context of the current federal structure. This article focused on two objectives: to examine the institutional contributions to gender equality and inclusion and to learn how to participate and benefit from the development activities and services on an equal basis. Gender inclusion in the development sector is defined as the participation, decision-making roles, responsibilities, attributes, and power relations in all development government sectors. Using secondary sources, this article gathered and reviewed related literature from books, articles, election commission reports, related acts, policies, and constitutions, as well as collected profiles. 31.1 percent of people who find this article are elected, 58.9 percent of them are men, and 41.1 percent of them are women. In province No. 5, there are 22.28 percent of elected officials, of whom 58.78 percent

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are men and 41.22 percent are women. In Province No. 6, a total of 29.73 percent of candidates are elected and 26.73 percent of the province's 7 candidates are elected, with 59 percent being men and 41 percent being women. Gender equity and its relationship to government among elected candidates is quite high compared to what the Nepal Constitution of 2072 and various political parties' election manifestos of 2074 allotted, as the Nepal Constitution of 2072 stated that every political party must include at least 33 percent women in all of its political activities, including elections. Considering gender when making decisions and giving women leadership roles. Lack of participation in local development activities, allocation of gender-sensitive funds, and policy- and program-making.

Keywords: Development, equality for women and men, policies, and local government.

Introduction

Gender disparity has existed in Nepal since the beginning, but only recently have discussions and problems related to gender entered the public eye. In Nepalese society, men and women have vastly different access to rights and power. Women in rural areas are less fortunate than women in urban areas. In comparison to men, women have less access to productive opportunities, services, and resources like land, livestock, financial services, and education. Despite government policies supporting them and giving them an identity, the third gender seems to be in some way marginalized in society. The gender development side is one of the most important aspects of community development. "Gender" relates to qualities or characteristics that society associates with each sex rather than

to male and female, or masculine and feminine, respectively. Women and men can be learned; people are either born female or male. "Gender" relates to the socially constructed roles, obligations, and qualities, in a given society or community, as well as the power dynamics that apply to men and women. These constructs are highly variable over time and are influenced by context, socioeconomic status, geography, and culture. Gender perceptions are deeply ingrained, vastly different across cultures, and evolve over time. But in every culture, gender determines who has access to resources and what level of power (Sijapati & Subedi, 2020).

In order to achieve gender balance, both men and women must actively participate in all decision-making processes and have equal access to and control over resources and services. Feminists who were concerned about the way in which women's issues were seen in terms of their sex, or their biological differences from men, rather than in terms of their gender, or considering how men and women interact socially, culturally, and economically, a relationship in which women have historically been systematically oppressed, developed the gender focus rather than women as the primary focus (Sijapati, 2011).

According to the Centre Bureau of Statistics (CBS) 2011, the female population is approximately 51 percent, and the preliminary report from the Census 2021 shows that 43.4 percent of people are truly poor and 67.5 percent are illiterate. Agricultural work and small cottage industries are the main economic occupations of 62 percent of the country's large female population (86%) who live in rural areas and depend on them for food, income, and employment. A small, unable, and impoverished female

population is depicted in this demographic picture. Men and women should have equal access to opportunities, resources, and options in order for them to be able to make decisions that will affect their own lives and the welfare of the nation (USAID, 2010).

According to the Nepalese development paradigm, this is a critical state of gender exclusivity. In this context, this study examined the knowledge and practices of gender inclusion in local governments. Local governments in particular can combat female gender inequality by encouraging gender inclusion. Females are included in every effective decision-making process at the local level and in good governance, regardless of whether households experience socioeconomic effects of gender inclusivity and female empowerment.

Women and development are a concept that combines theory and practice to advance development. After its founding, which can be connected to the First World Conference on Women sponsored by the United Nations in Mexico City in 1975, In the latter half of the 1970s, it was first brought up in the scholarship of gender studies. Compared to the previously prevalent theory, WID, also known as Women in Development, is frequently misunderstood. but It has a variety of distinctive traits (Razavi & Miller, 1995).

Women and Development (WAD) was created in response to concerns about the limitations of modernization theory as an explanation and a shift in perception of women's role in development. While earlier theories held that development was a means of advancing women, new theories proposed that women's participation was essential to the development and

that, Women ought to take an active role in development programs rather than just receiving aid as passive recipients. Furthering this line of reasoning, WAD argued that women have always played a essential part in development and did not suddenly appear as a result of exogenous development efforts in the 1970s (Rathgeber, 1990).

In order to liberate women from the patriarchal hegemony that would otherwise exist if women participated in development alongside men in patriarchal cultures, the WAD approach proposes women-only development initiatives. However, this idea has been hotly contested by theorists in the field. In this sense, WAD is distinct from WID due to the theoretical basis on which it was developed. WAD concentrates on the connection between capitalism and patriarchy rather than specifically on how women relate to development. While much of theorizing about WAD is still undocumented as a result of the ongoing and urgent development work that many WAD theorists engage in, With the aid of dependency theory and neo-Marxism, this theory aims to comprehend women's issues (Barriteau et al., 2000).

Women in Development are strategy for developing, implementing, and assessing programs that are exclusively geared toward empowering women. WID does not contest the existence of gender inequality and thus focuses on treating the signs instead of the underlying problems. It is acknowledged by the Gender and Development (GAD) approach that social structures that disadvantage marginalized groups have a negative impact. By empowering these groups to ensure that they receive an equal

share of the benefits from the development process, the approach aims to create sustainable development that is fair to both men and women.

The Women and development paradigm places a strong emphasis on the connections between women and the work that they do in their societies as economic agents in both the public and private spheres. Additionally, it highlights the unique roles that women play in the upkeep and advancement of their societies. with the awareness that including women in development efforts solely would serve to amplify the existing structures of inequality present in societies where patriarchal interests are dominant. Generally speaking, it is believed that WAD provides a more critical conceptualization of women's position than WID (Rathgeber, 1990). The Women and development strategy highlights the distinctiveness of women's knowledge, work, aspirations, and obligations while also advocating for the acknowledgment of that distinctiveness. Given this reality and the well-known propensity of development organizations to be dominated by patriarchal interests, WAD subscribers introduced women-only initiatives (Barriteau et al., 2000).

Dependency theorists, on the other hand, contended that liberal development models, such as the attempt to include women in the current global capitalism, were merely the "development of underdevelopment " (Frank, 1969). " According to this point of view, the only way to achieve balanced human development is to break free from the structural oppression of global capitalism. A narrative of advancement and an endeavor, the development paradigm that was doable came under sustained scrutiny in the 1980s, according to critics of post-structuralizing

Visvanathan (2011). Men and women should develop equally, according to dependency theory. The importance of gender equality from an existing perspective has been emphasized.

The Nepali Congress (NC), Communist Party of Nepal-Unified Marxist Leninist (CPN-UML), and Nepal Communist Party (Maoist Center), even if their views on federalism differ, several other small political parties have pledged support for the federal democratic-republican government and an inclusive, participatory, and representative democracy, at least in their election manifestos. First-Past-the-Post (FPTP) candidates for the election for the constitution assembly have been nominated by the Nepali Congress in proportions of 21percent for indigenous peoples, 13 percent for Madhesi, 1 percent for Dalits, and 13 percent for Muslims, according to the 2018 report of the Nepalese Election Commission. 50 percent of all proportional candidates for CA are women. These top three political parties have not nominated 33 percent of women, despite the government's political pledge and the constitution's need for 33 percent female participation in state institutions.

In contrast to the Madhesi and indigenous peoples, Using the FPTP electoral system, just 30 (12%) women were elected to the CA. Women, on the other hand, have roughly half of the CA's proportional seats (2074 B.S.). According to the election results, women hold 197 (32.77%) seats in the Constituent Assembly out of the total 601 seats that were officially proclaimed. These voters demanded a truly proportional electoral system; therefore, they were dissatisfied with the election process. However, they are happy with the election's outcome because it was the first time in

Nepal's political history that there was such a strong ideological representation. The outcome of the CA election largely confirms the success of the struggle for an inclusive political and administrative system in Nepal, which was led by indigenous peoples and other marginalized populations. It is countered that elected officials are more answerable to their political parties than to the communities in which they live. However, it represents a significant turning point in Nepal's political history (Gurung, 2009). The Policy's goal is to promote inclusion and gender equality. Examining how the institutional environment affects gender equality and inclusion is one of the policy's goals. to learn how to fully and equally benefit from and participate in local activities and services.

Methods

The article used the "Development Theory," which came into existence after 1970 as an alternative to "Modernization and Dependency Theory," to promote the overall development of the country, community, and people (Subedi, 2011). Justice, sustainability, and inclusive development are key tenets of this theory. This paper is grounded in pragmatism and anti-positivism/interpretative philosophy and draws on gender inclusion to examine how local government development is related to these issues. The pragmatist school of thought recommends specific techniques for understanding how gender development relations relate to local government at all levels of government in Nepal. This article used secondary sources that the researcher gathered and reviewed by looking through books, articles, reports from the election commission, related acts, policies, and constitutions, as well as collected profiles. The major source

of this article is the Local Election, (2074). Local Election Result Book as well as Provincial election results books of Nepal.

Results and Conclusion

Gender Inclusion Development Sectors' Current Laws and Policies

A perspective and process known as "gender mainstreaming" examines how any planned action, such as legislation, policies, or programs, in all situations and at all levels, will impact both men and women. It is a way to guarantee that the issues and encounters of both men and women are taken into account when designing, implementing, overseeing, and assessing policies and initiatives in all areas of politics, business, and society. This way, both men and women can benefit equally and inequality won't persist. The realization of gender equality is the ultimate goal. Gender mainstreaming is described in another way, the institutionalization of gender issues across the entire organization, in terms of accounting for gender equality in business and financial matters, in particular. In terms of attitudes, "culture," goals, and procedures, staffing, along with other organizational practices, contributes to a long-term transformation of the organization; gender empowerment: Women's involvement in decision making, as well as their capacity to speak up for themselves and bring issues to the forefront (Moser & Moser, 2005). a part of the gender inclusion policy; a dual approach that combines mainstreaming gender with specific actions for gender equality; analysis of gender; joint approach to responsibility, where gender experts support all decisions but where everything is jointly responsible, Women's empowerment and decision-making through gender-specific training and support, as well as

monitoring and evaluation of gender inclusion. A smaller number of institutions share three additional elements: budgets, working with other organizations, and knowledge resources. The operational and programming implementation of gender mainstreaming, in contrast, has received very little attention from assessment. Resulting from both In terms of gender equality, the implementation's effects are still largely unknown. Thus, a dual strategy is required for the coming decade: the implementation of gender mainstreaming (with much greater documentation transparency) and the development of more trustworthy methods for evaluating output and results. Although there has been progress, the next ten years will be the true test of gender mainstreaming in practice (Moser & Moser, 2005).

The 1995 Fourth United Nations World Conference on Women in Beijing produced the Beijing Platform for Action, as a significant international strategy for the advancement of gender equality, gender mainstreaming has been established. The United Nations Economic and Social Council established a few fundamental tenets for gender mainstreaming (UNESCO, 2017). Additional specific instructions were provided in a letter the Secretary-General sent on October 13 to the heads of all United Nations entities. The General Assembly's twenty-third special session was held to track how the Beijing Platform for Action was being used (Angela & King, 2002). In the past, local and regional governments have worked to advance gender equality on a global level with a focus on increasing the representation of women in local elected office and encouraging the involvement of all women in development decision-making (Anne, 2015).

The Global Declaration on Women in Local Government, which serves as a blueprint for international commitments and principles governing local and regional governments' actions in support of women's rights, was adopted by the International Union of Local Authorities (IULA) in 2000 (UNCHS, 2000).

The relationship between gender inclusion and local development defines how a society views the rights, obligations, and gender identities in relation to one another. It is crucial to alter men's attitudes toward women when there is a connection between gender and local development. Women will always be dominated in society in some way, unless and until people's attitudes toward them change. It is crucial that there is gender equity in society when it comes to questions of gender and local development. Treating men and women equally in terms of rights, benefits, obligations, and opportunities is referred to as gender equity. Local development is very challenging when it comes to gender equity. Gender balance must be carefully considered during local development to ensure sustainable growth. These statistics, which were broken down by the board age of an elected parliament member, show that the highest percentage (24.24%) of people are between the ages of 46 and 50 overall, as well as in both males (23.9%) and females (33.33%). Males in the age group 56–60 and females in 51–55 make up the second highest percentages. The age group 41–45 has the third highest percentage (11.52% overall, 11.32% male and 16.67% female), with 11.52 percent. The majority of members are, however, over 40 and under 60 years old. Members who are over 70 make up just 0.61 percent.

Additionally, the minority includes those under 40.

Table 1: Broad Age Group of Elected Members of Parliament by Sexes, 2074 Election

Age Group	Male		Female		Total	
	Number	Percent	Number	Percent	Number	Percent
30-35	4	2.52	1	16.67	5	3.03
36-40	7	4.4	-	-	7	4.24
41-45	18	11.32	1	16.67	19	11.52
46-50	38	23.9	2	33.33	40	24.24
51-55	31	19.5	2	33.33	33	20.0
56-60	33	20.75	-	-	33	20.0
61-65	19	11.95	-	-	19	11.52
66-70	8	5.03	-	-	8	4.85
71 and above	1	0.63	-	-	1	0.61
Total	159	100.0	6	100	165	100.0

Source: Election Commission, Nepal, 2074.

Table 2: Number of Local Elected Officials by Provinces in 2074.

S.N	Numbers	No of Candidates members			Total Elected Members		
		Male	Female	Total	Male	Female	Total
1	Koshi	15,254	9,813	25,067	3,554	2,489	6,043
2	Madhes	22,861	14,387	27,248	3,895	2,723	6,618
3	Bagmati	14,726	8,887	23,613	3,433	2,359	5,792
4	Gandaki	7,598	5,057	12,655	2,317	1,617	3,934
5	Lumbini	14,024	9,010	23,036	3,017	2,116	5,133
6	Karnali	7,554	4,848	12,402	2,211	1,476	3,687
7	Sudhupashim	8,502	5,841	14,343	2,262	1,572	3,834
Total		90,519	57,843	14,8364	20,689	14,352	35,041

Source: Election Commission, Nepal, 2074.

Note: Only two new candidates are in province five who have a third gender.

There are only two new candidates in Lumbini Province 5 who identify as third gender. In a province-by-province analysis of the number of candidates and representatives who are elected to local government, in a final, out of a total of 1,48,364 people ran for office in all 7 provinces, but only 35,041 (23.62%) of those people were chosen. 20 689 (22.86%) of the 90 519 male candidates are elected, making up the gender. 14,352 (24.81%) female candidates out of 57,843 total candidates are elected. According to an analysis done the by province, 25,067 candidates were present in Koshi Pradesh. Out of them, 6043 (24.11%) are elected; 58.81 % of them are men, and 41.19 % are women. There were 27,248 candidates overall in Mahades Pradesh. Of them, 24.29 percent are elected; 58.85 percent of them are men, and 41.15 percent of them are women. There were 23,613 candidates overall in Province 3. There are

5,792 (24.53%) of them who are elected, with 59.27 percent men and 40.73 percent women. There were 12,655 candidates overall in Gandaki Pradesh.

Table 3: Expressed as a Percentage, Local Elected Members by Province in Local Elections in 2074

S.N	Province	No of Candidates members			Total Elected Members		
		Male %	Female %	Total %	Male%	Female %	Total
1	Koshi	16.85	16.96	16.89	7.26	17.34	17.25
2	Madhes	25.26	24.87	18.37	18.92	18.97	18.89
3	Bagmati	16.27	15.36	15.92	16.67	16.44	16.53
4	Gandaki	8.39	8.74	8.53	11.25	11.27	11.23
5	Lumbani	15.49	15.58	15.53	14.65	14.74	14.65
6	Karnali	8.35	8.38	8.36	10.74	10.28	10.52
7	Sudharpashim	9.39	10.10	9.67	10.99	10.95	10.94
Total		100.0	100.0	100.0	100.0	100.0	100.0
Local Elected Members (in Total Number and Percentage) by Province in Local Elections in 2074							
1	Koshi	60.85	39.15	25,067	58.81	41.19	6,043
2	Madhes	83.9	16.1	27,248	41.15	27.23	6,618
3	Bagmati	62.36	37.64	23,613	59.27	40.73	5,792
4	Gandaki	60.04	39.96	12,655	58.9	41.10	3,934
5	Lumbani	60.88	39.11	23,036	58.78	41.22	5,133
6	Karnali	60.91	39.09	12,402	59.97	40.03	3,687
7	Sudharpashim	59.28	40.72	14,343	59.0	41.0	3,834
Total		61.01	38.98	14,8364	59.04	40.96	35,041

Source: Election Commission, Nepal, 2074.

There are 3,934 (31.1%) of them who are elected, with 58.9% men and 41.10% women. There were 23,036 candidates overall in Lumbini province. Out of them, 5,133 (22.28%) are elected, and 58.78% of men and 41.22 % of women. There were 12,403 candidates overall in Karnali Province 3687 of them (29.73%) are elected, 59.97% of them are men and 40.03% are women. There were 14,343 candidates in total across Sudhuraschim province. A total of 3834 (26.73%) of them were elected, with a male-to-female ratio of 59 to 41.

As stated in the election manifestos of the various political parties and the Nepal Constitution of 2072, each and every political party must include women who make up at least 33% of all political activity in the country, including voting. However, among the elected candidates, women's inclusion in local government is quite high.

Table 4: Local Elected Government Broad Age Group by Sex, 2074 Election

Age Group	Mayor	Deputy Mayor	Chairman	Vice. Chairman	Ward President	Male Members	Female Members	Total
21-40	52	111	112	237	2,036	4,542	6,610	13,700
41-60	205	172	293	215	4,057	7,542	6,096	18,584
61 and above	36	10	53	8	649	1399	603	2,757
Total	293	293	460	460	4,267	13,484	13,309	35,041
Age Groups Represented in Local Elected Government in 2074, Broken Down by Sex, in Percent								
21-40	17.75	37.88	24.35	51.52	30.2	33.68	49.67	39.1
41-60	69.97	58.70	63.7	46.74	60.8	55.94	45.80	53.0
61 and above	12.29	3.41	11.52	1.74	9.0	10.38	4.53	7.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Election Commission, Nepal, 2074.

As a representative cross-section of the local government personality, the male and female members, as well as the mayor, deputy mayor, chairman, vice chairman, and ward president, are all elected. Among all age groups, those between the ages of 41 and 60 make up the majority (53%) while those between the ages of 21 and 40 make up 39.1% and those 61 and older make up just 7.9%. The majority (69.97%) of mayors are between the ages of 41 and 60 When examined as a post, ward presidents make up 60.8%, chairmen 63.7%, and deputy mayors 58.70%. However, the age range of the Vice Chairman's majority (51.52%) is between 21 and 40. Similarly, 58.70% of Deputy Mayors are 41-60 or older.

Table 5: Districts in Each Province, the Amount of Elected Local Government Members by Sexes, and the Level of Local Government

Province No.	No. of Dist.	Metropolitan city		Sub - Metropolitan city		Municipality		Rural Municipality	
		M	F	M	F	M	F	M	F
1	14	56	41	118	86	1513	1035	1922	1290
2	8	95	66	229	157	2451	1711	1116	789
3	13	178	264	156	41	1417	984	1709	1156
4	11	98	69	-	-	967	675	1262	886
5	12	-	-	241	167	1139	805	1652	1162
6	10	-	-	-	-	926	631	1285	855
7	9	-	-	57	39	1069	746	1126	787
Total	77	427	440	801	490	9482	6587	10072	6925

Source: Election Commission, Nepal, 2074.

Table 6: Jhapa District Has (in Number) Elected Members for Local Government of Study

S.N	Name of R.M/Municipality/	Mayor/Chairman		Depu.Mayor		Ward president		Members	
Jhapa		M	F	M	F	M	F	M	F
1	Gauradaha Municipality	1	0	0	1	9	0	20	20
2	Gaurejung Rural Municipality	1	0	1	0	6	0	13	17
3	Siva Sataksthi Municipality								
Lalitpur									
1	Lalitpur Metropolitan city	1	0	0	1	29	0	67	54
2	Godawari Municipality	1	0	0	1	14	0	31	33
3	Konjosom Rural Municipality	1	0	0	1	5	0	12	14
Total		5	0	1	4	63	0	143	139

Source: Election Commission, Nepal, 2074.

Note: - There are two municipalities, two rural municipalities, and one major city.

Conclusions

A burning issue in the modern world is gender equity, development, and local government viewpoint. Women's status is gradually being promoted and included in local development sectors that make decisions. Women are becoming more powerful and active in a variety of industries, including household economy, environmental conservation, infrastructure development, and social sectors. the exclusion of women from decision-making and positions of leadership. the lack of participation of the chairman of local development activities and other ward chairmen and other members of the 41% elected in local government in the creation of local development programs and policies, the allocation of a gender-friendly budget. In accordance with Nepal's 2072 Constitution, as well as national and local policy, after being elected to the local government, the staff members created a number of gender relation policy program activities, such as a women-friendly budget and other necessary policy programs. Although there is no plan or action, there is a demand for the budget. Even the legal system stipulates that all judgments must favor men.

The constitution and policies of Nepal address equal participation and decision-making in local social development sectors. One of the main goals of the national government for a "new Nepal" that emphasizes gender equality is to reform the Nepali state in the spirit of inclusive democracy. In spite of the fact that all levels of government, the 2015 Constitution includes provisions for women and other marginalized

groups, these measures by themselves are probably not going to be enough to improve the level of representation and meaningful participation for these groups. It's crucial to comprehend whether local government is adequately addressing the inclusion of women and minorities, as required by the Constitution. Support from constituents for and evaluation of inclusion practices, including the capacity of women and people of color to take part in local government policy-making, are among the indicators to gauge progress toward greater inclusion.

The financial capacity of local governments is one of the most crucial elements in determining their ability to function effectively. Despite the fact that subnational expenditure has encountered significant difficulties, the main concern is still whether local governments have sufficient financial resources and fiscal autonomy to meet their budgetary needs and aspirations.

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Performance Analysis of Trading Company Through Cost Volume Profit (A Case Study of Salt Trading Corporation Limited)

- Mausam Shah ‘Nepali’¹

Abstract

The objective of the research is to analyze the performance of a Trading Company through cost-volume-profit with reference to Salt Trading Corporation Limited. The major goal of this paper is to scrutinize the financial performance from 2069-70, as well as its influence on the economic growth of Nepal. According to the findings, Salt Trading Corporation has a low contribution margin, low P/V ratio, high breakeven point, and low margin of safety. It further indicates that cost and breakeven point have a positive correlation as sales price and breakeven point have a negative correlation. The company's condition is very poor and requires effective improvement in the given situation.

Keywords: Cost-volume-profit analysis, Salt Trading Corporation Limited, Break-even point.

Introduction

Salt Trading Corporation (STC) Limited is one of the largest business organizations in Nepal which was established as the pioneer Public Private Partnership (PPP) of the Government of Nepal.

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It was established over five decades back (13th September 196 and 3), the corporation was launched with the objective to avoid iodized common salt, as salt is not produced in Nepal and depends on import from India, for all citizens of the country.

In its long run of dedicated service to the nation, STC has contributed to ensuring proper supply and distribution of essential daily consumable goods, eroding black-marketing by regulating market and artificial scarcity and industrial development in Nepal. With an equity share ratio comprising 79:21 of investment from private: to public, STC is managed by the joint effort of state (Government) and private (shareholders). Cost–Volume–Profit (CVP) analysis is a study of the relationship between sales, volume, expenses, revenue, and profit. It is the systematic exploration of the relationship between company cost, volume (Sales revenue), and profit. It explores the idea about how small changes in one variable impact on rest of the variables (Chapagain, S. (2014). Cost-volume-profit analysis is a simple but flexible tool for exploring potential profit based on cost strategies and pricing decisions. While it may not provide detailed analysis, it can prevent "do-nothing" management paralysis by providing insight on an overview basis (Tulvinschi & Khirita, 2009).

Statement of the Problem

Salt Trading Corporation Limited is one of the leading service undertakings in the Nepali economy. It serves as one of the largest public sector taxpayers to the Government. Further, it offers a huge number of employments that substantially help the government to

downsize the unemployment rate. There is no practice of clear segregation of fixed, variable, and unit variable costs for different products in the company. Also, there is no practice of using Cost volume profit analysis tools for major decision-making (Dhakal, N. (2014). Specifically, when we talk about CVP and PPC, no study to date has been conducted in the public sector trading industry. Therefore, this study was conducted to smack the gap. This study stated the following research questions. What is the profit volume ratio of STCL? and What is the relationship between cost, volume, and profit of the company?

Objective of the Study

The overall objectives of this study are to analyze the cost volume profit of Salt Trading Corporation Limited (STCL). The specific objectives of this study are highlighted as follows:

1. To examine the profit volume ratio of the STCL.
2. To ascertain the break-even profit for STCL
3. To study the relationship among the cost, volume, and profit of the company

Literature Review

The performance evaluation of trading companies is a critical aspect of financial management, aiming to assess their profitability, operational efficiency, and sustainability. Cost-volume-profit (CVP) analysis plays a vital role in this evaluation process by providing insights into how changes in costs, volumes, and prices affect a company's profitability. This literature review explores the application of CVP analysis to assess the performance of trading companies, with a specific focus on Salt Trading Corporation Limited. CVP analysis, also known as break-even

analysis, is a financial management tool that examines the relationships between costs, volumes of sales or production, and profits. It allows organizations to determine their break-even point and understand the impact of changes in key variables on their bottom line. CVP analysis consists of fixed costs, variable costs, contribution margin, and break-even point. Trading companies like Salt Trading Corporation Limited engage in the buying and selling of goods without undergoing a transformation process. For such entities, CVP analysis holds unique relevance. It helps in assessing the impact of changes in the volume of goods traded and pricing strategies on profitability. CVP analysis can be used to determine the minimum sales volume required to cover fixed costs, indicating the level of activity necessary for sustainability.

Methodology

This entire research design followed the quantitative data to analyze the data. The secondary data have been extensively used for this study. These secondary data were gathered from published and unpublished documents and annual reports of Salt Trading Corporation Limited (STCL), scholars' research articles and journals, books, and published theses from different campus libraries.

Population and Sample

There are 37 public enterprises operating in Nepal and they are considered as the population of the study. Out of these companies, Salt Trading Corporation Limited (STCL) has been selected as a sample using judgment sampling. Among them, only 23 PEs have been privatized.

Data Analysis Tools

The collected data is arranged systematically and identified. The available information is grouped as per the need of research work in order to meet the research objective. The collected data are presented in the appropriate form of tables and charts.

Accounting / Financial Tools

(i) Contribution-Margin Approach

$$\text{Break-even Sales (in Units)} = \frac{\text{Fixed Expenses}}{\text{Contribution Margin per unit}}$$

$$\text{Break-even Sales (in RS)} = \frac{\text{Fixed Cost}}{\text{Contribution Margin Ratio}}$$

Or,

$$\text{Contribution Margin} = \text{Sales Revenue} - \text{Variable cost}$$

(ii) Profit-Volume Ratio (P/V Ratio):

$$\text{P/V Ratio} = 1 - \frac{\text{Variable Cost}}{\text{Sales}}$$

$$\text{P/V Ratio} = \frac{\text{Contribution Margin}}{\text{Sales}}$$

Or,

$$\text{P/V Ratio} = \frac{\text{Fixed Cost} + \text{Profit}}{\text{Sales}}$$

$$\text{Profit} = (\text{Sales} \times \text{P/V Ratio}) - \text{Fixed Cost}$$

$$\text{Profit} = (\text{Actual Sales} - \text{Break-even Sales}) \times \text{P/V Ratio}$$

$$\text{Profit} = (\text{Actual Sales} - \text{Break-even Sales Unit}) \times \text{Unit Contribution Margin}$$

(iii) Margin of Safety = (Actual Sales- Break-even Sales)

$$\text{Margin of Safety in Units} = \frac{\text{Profit}}{\text{Contribution Margin Per Unit}}$$

$$\text{Margin of Safety (in Rs.)} = \frac{\text{Profit}}{P/V \text{ Ratio}}$$

$$\text{Margin of Safety Ratio} = \frac{\text{Margin of Safety}}{\text{Actual Sales}}$$

(iv) Profitability Ratio

$$\text{Net Profit Margin} = \frac{\text{Net Profit}}{\text{Sales}}$$

Statistical Tools

In this research following regression model is extracted in order to interpret the result.

$$\text{Profit} = \beta_0 + \beta_1 \text{SR} + \beta_2 \text{VC} + \beta_3 \text{FC} + e_i \dots \dots \dots \text{(i)}$$

Where,

Profit = Net profit/loss of Salt Trading Corporation Limited

SR = Sales Revenue

VC = Variable cost

FC = Fixed Cost

TC = Total Cost = Variable Cost + fixed Cost e_i = Error terms

Likewise, β_0 is the Y-intercept, and β_1 , β_2 , and β_3 are partial slope coefficients of sales revenue, variable cost and fixed cost of Salt Trading Corporation Limited.

Variables

In this research, one dependent and three independent variables have been shown in the following manner. **Dependent Variable**

Net Profit: Profit is the excess amount of total cost over total revenue. Hence it is the function of several factors such as changes in sales volume, cost, and prices.

Independent Variables

Sales Revenue: Sales revenue is the major source of income for any company. The company generates profit and operates the organization by selling its goods or services to consumers.

Variable Cost: A variable cost is a cost that changes in direct proportion to changes in the cost driver activity. Thus, the variable cost, which varies according to the level of production or output, is called variable cost (Diktta, B.D. (2015).

Fixed Cost: The cost, that remains unchanged to an entire range of production or output, is called fixed cost. Such types of fixed costs include like rent, insurance premiums, salaries, depreciation, and property taxes.

Total Cost: Total cost includes both total variable cost and total fixed cost.

Empirical analysis

The research paper analyzes the profit-volume ratio and the relationship between cost volume and profit of the company. Various tools have been used to analyze the inter-related relationship between these variables. Analyzing the performance of a trading company, through cost-volume-profit (CVP) analysis can provide valuable insights into its financial

health and operational efficiency. CVP analysis helps in understanding how changes in sales volume, costs, and selling prices impact the company's profitability. The analysis of the relationship between profit and volume is known as profit-volume analysis. The two factors profit and volume are interconnected and dependent on each other. Profit depends on sales; selling price to a greater extent will depend upon the volume of production. Hence, there is an inter-relationship between cost, volume, and profit. Profit is the function of a variety of factors; it is affected by changes in sales volume, cost, and prices. Profit may be affected by the changes (increases or decreases) in the price, volume, variable cost, fixed cost, and other combination factors.

An increase in variable cost will lower the P/V ratio, push up the BEP and reduce profit. On the other hand, if the variable cost declines, the P/V ratio will increase, BEP will be lowered and profit will rise (Akmese, K, Buyuksalvarci, & Akmese, H. 2016). The P/V ratio establishes the relationship between contribution and sales value. It is expressed in the following formula.

$$\begin{aligned}
 \text{Profit Volume Ratio (Contribution Margin Ratio)} &= \frac{\text{Contribution Margin}}{\text{Sales}} \\
 &= \frac{\text{Sales} - \text{Variable Cost}}{\text{Sales}} \\
 &= \frac{\text{Contribution Margin Per Unit (CMPU)}}{\text{Selling Price Per Unit (SPPU)}} \\
 &= 1 - \frac{\text{Variable Cost Per Unit (VCPU)}}{\text{Selling Price Per Unit (SPPU)}}
 \end{aligned}$$

This ratio is further evaluated by comparing the changes in contribution to changes in sales or changes in profit to changes in sales. Likewise, any increase in contribution margin would mean an increase in profit only because fixed cost is assumed to be constant at all levels of production. It is depicted in the following formula.

Profit Volume Ratio (Contribution Margin Ratio)

$$\begin{aligned} &= \frac{\text{Change in Contribution Margin}}{\text{Change in Sales}} \\ &= \frac{\text{Change in Profit}}{\text{Change in Sales}} \end{aligned}$$

This ratio is useful for the determination of the desired level of output or profit and for the calculation of variable costs for any value sales.

The variable costs can be expressed as under:

$VC = \text{Sales} (1 - P/V \text{ ratio}).$

Various types of analysis have been carried out to understand the overall performance of the company.

Sales Trend Analysis

Last five years data have been used to analyze the overall sales of the company.

Overall, Sales

STCL is the trading corporation. The sales are given below:

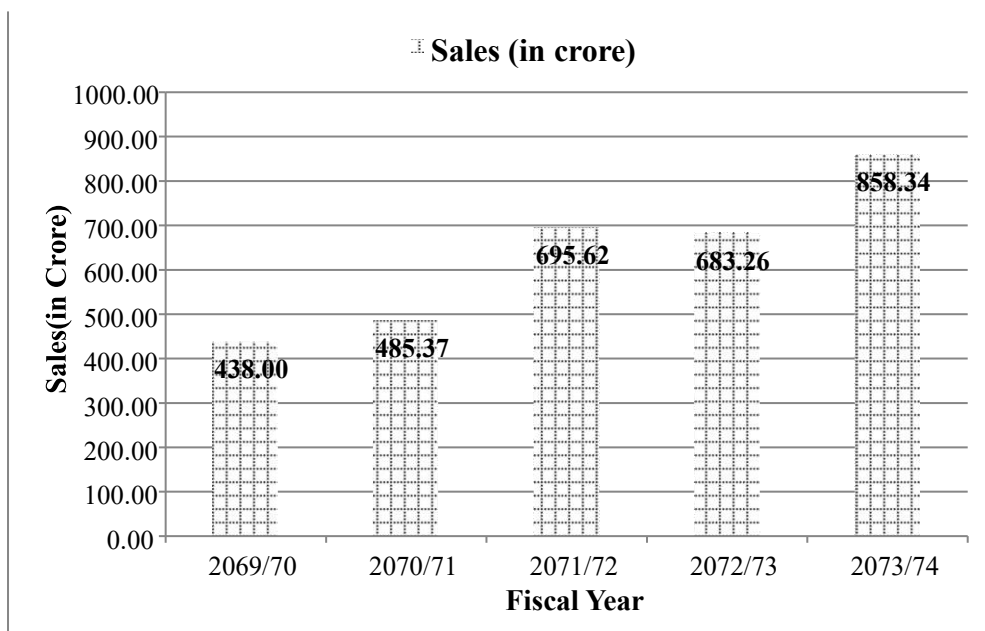
Table: Overall, Sales

Details \ Year	2069/70	2070/71	2071/72	2072/73	2073/74
Total Sales	438.00	485.37	695.62	683.26	858.34
Changes in Sales	-	10.81%	43.31%	-1.77%	25.62%

Source: Annual Report of STCL 2073/74. (NRs in crore)

The overall sales of the company can be seen from the following graphical presentation.

Figure: STCL Last five years sales



Source: Annual Report of STCL 2073/74

The figure above shows that the different years' sales values with different in the bar diagram. The chart above clearly demonstrates that the sales trend of the SLTC is not constant.

Products Sales

STCL has six different products namely: 1. Consumable material 2. Agricultural material 3. Fuel, lubricant, and tyre tubes 4. Machine and equipment 5. Construction material and 6. Other material. The sales values of each product are presented in the following table.

Table: Product Wise Sales

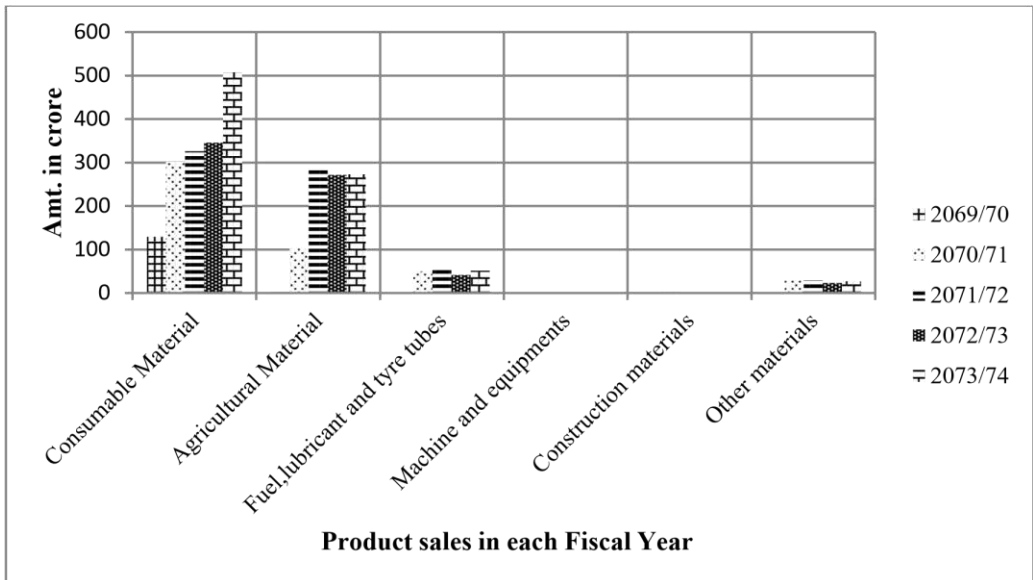
Year		2069/70	2070/71	2071/72	2072/73	2073/74
Products						
Consumable material	Amount (Rs.)	129.26	301.41	325.73	345.76	507.73
	Change (%)	-	133.18	8.06	6.14	46.84
Agricultural material	Amount (Rs.)	1.88	103.33	287.36	271.74	272.56
	Change (%)	-	93.93	178.09	-5.43	0.30
Fuel, lubricant and tyre tubes	Amount (Rs.)	1.00	50.15	52.27	41.40	51.08
	Change (%)	-	4,915	4.22	-20.79	23.38
Machine and equipment's	Amount (Rs.)-	0.04	.0071	0.03	0.0036	-
	Change (%)	-	-82.25	322.53	-88	-
Construction materials	Amount (Rs.)	-	2.49	1.56	1.50	0.88
	Change (%)	-	-	-37.34	-3.84	-41.33
Other materials	Amount (Rs.)	0.27	27.97	28.65	22.83	27.08
	Change (%)	-	10,259	2.43	-20.31	18.61

Source: Annual Report of STCL, 2073/74.

(NRs in crore)

Above table shows that total sales of consumable products were on an increasing trend during the fiscal year 2069/70 to 2073/74. SLTC recorded a 4,915 percent sales record in selling fuel and tyre lubricants during the fiscal year 2070/71.

Figure: Product-wise sales



Variable Cost Analysis

Variable cost varies in direct proportion to change in output or activities level, but per unit is constant within one financial year (Giri, 2011). According to the company's annual reports, variable cost is costs covering cost of sales were as follows:

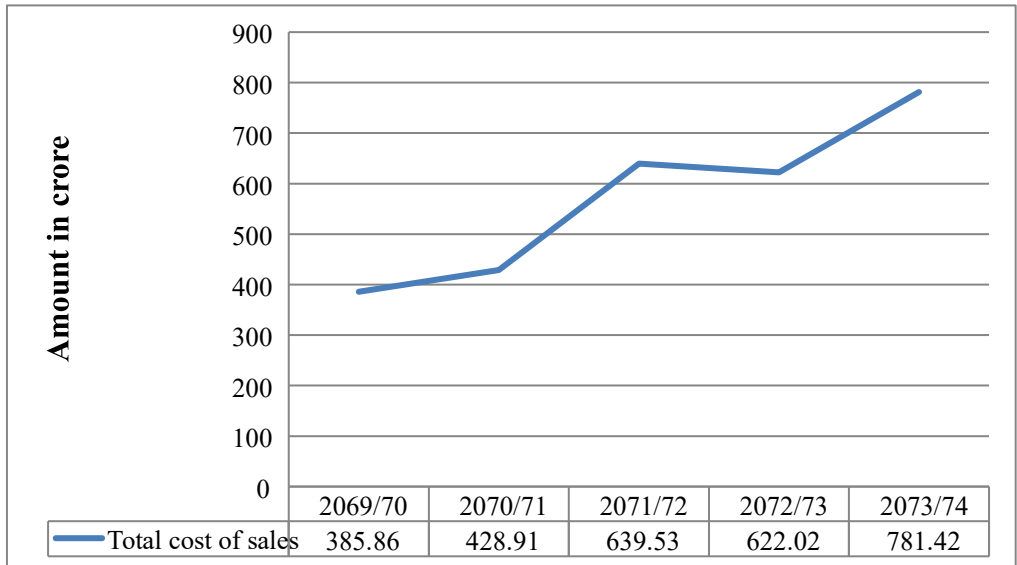
Table: Variable Cost Details

Details \ Year	2069/70	2070/71	2071/72	2072/73	2073/74
Purchases	286.61	479.91	474.95	533.12	739.88
Add: Opening inventory	154.51	143.43	312.37	257.55	280.49
Less: Closing inventory	143.43	312.37	257.55	280.49	362.03
Add: Business expenses	88.16	117.94	109.76	111.82	123.07
Total cost of sales	385.86	428.91	639.53	622.02	781.42
Sales value	438.00	485.37	695.62	683.26	858.34

Source: Annual Report of STCL, 2073/74. (NRs. in crore)

Table shows the fluctuating trend in the variable cost sheet. Variation in variable cost of sales, opening inventory, purchases and business expenses for different year is due to internal and external factors. The position of variable of the company can be clearly seen from the following graphic presentation.

Figure : Trend of Variable Cost



Fixed Cost Analysis

Fixed cost remains constant in total amount despite the changes in the level of activity within a fiscal year. According to STCL's annual report, fixed cost was classified into following patterns.

Table: STCL Fixed Cost Details

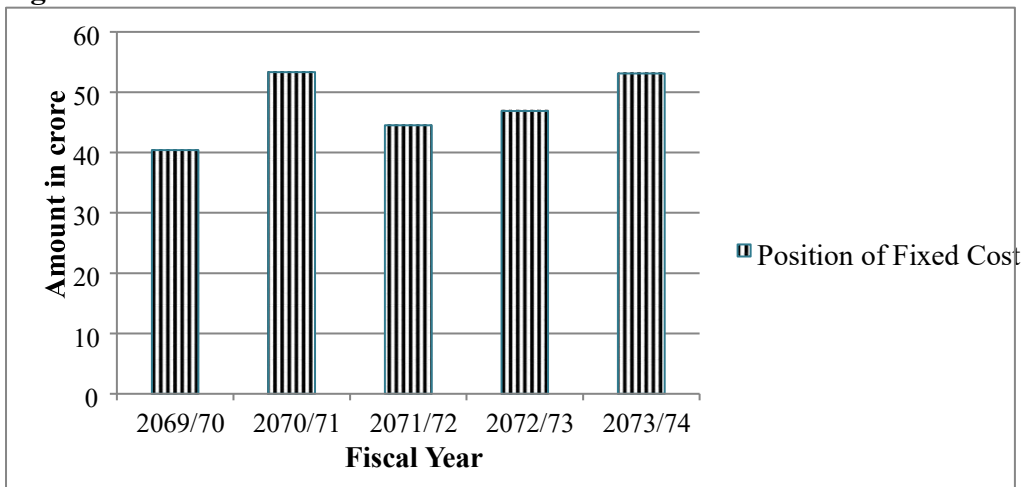
Year Details	Administrative Cost		Interest Expenses		Depreciation Expenses		Total Cost	
	Cost	% Change	Cost	% Change	Cost	% Change	Cost	% Change
2069/70	9.07	-	30.65	-	0.67	-	40.39	-
2070/71	11.87.	30.87	40.79	33.08	0.66	-1.49	53.32	32.01
2071/72	9.72	-18.11	33.70	-17.38	1.11	68.18	44.53	-16.48
2072/73	10.21	5.04	35.48	5.28	1.18	6.30	46.87	5.25
2073/74	10.76	5.38	41.02	15.61	1.32	11.86	53.10	13.29

Source: Annual Report of STCL, 2073/74.

(NRs. in crore)

Above table shows that administrative expenses, interest and depreciation expenses for different fiscal years.

Figure: Position of Fixed Cost



Income Statement Analysis

Income is computed by deducting all expenditure from turnover. It is a surplus of sales over expenditure. High income indicates good performance whereas low income indicates poor showing of the company.

Table: STCL Income Statement Details

Details \ Year	2069/70	2070/71	2071/72	2072/73	2073/74
1.Sales	438.00	485.37	695.62	683.26	858.34
2.Variable cost	385.86	428.91	639.53	622.02	781.42
3.Contribution margin (1-2)	52.14	56.46	56.09	61.24	76.92
4.Fixed cost	40.39	53.32	44.53	46.87	53.10
5.Net income (3-4)	11.75	3.14	11.56	14.37	23.82
6.Net profit margin (1÷5)	37.27	154.57	60.17	47.54	36.03
7.PV ratio (3 ÷1)	0.11	0.11	0.08	0.08	0.08
8.% of FC on sales (4÷1)	0.09	0.10	0.06	0.06	0.06
9. % of VC on total cost (2÷2+4)	0.90	0.88	0.93	0.92	0.93
10. % of FC on total cost (4÷2+4)	0.09	0.11	0.06	0.07	0.06
11. Operating leverage (3÷5)	4.43	17.98	4.85	4.26	3.22

Source: Annual Report of STCL, 2073/74.

(NRs. in crore)

Net income represents operating income only. Non-operating income and non-operating expenses were not incorporated in this analysis. The net profit margin of the company was 37.27 percent, 154.57 percent, 60.17 percent, 47.54 per cent and 36.03 per cent in the fiscal year 2069/70, 2070/71, 2071/72, 2072/73 and 2073/74 respectively. It indicates that net profit of the company was in fluctuating and the profit decreased in the last two fiscal years. Sales, variable costs, fixed cost and operating profit of the company can be clearly seen in the following graphical presentation.

Figure: Sales, Variable Cost, Fixed cost and Profit

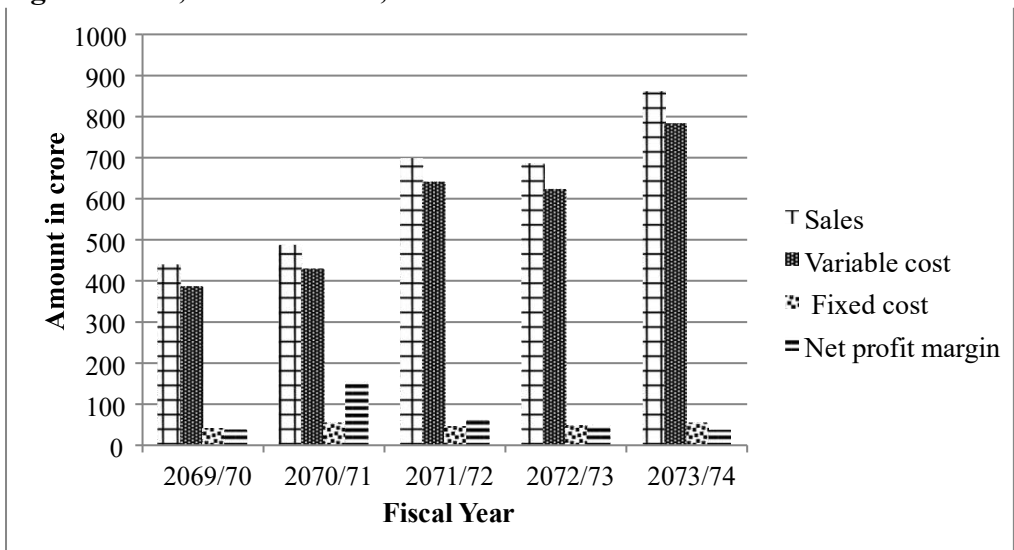


Figure shows sales, variable cost, fixed cost, and net profit margin.

Analysis of Correlation between Sales and Net Profit

The degree of correlation is measured by correlation coefficient. Here, Karl Pearson's coefficient of correlation, a most popular method, is used to determine the coefficient of correlation between sales and net profit.

Table: Analysis of Correlation between Sales and Net Profit

FY	Sales (x)	Profit (y)	xy	x ²	y ²
2069/70	438.00	11.75	5146.5	191844	138.06
2070/71	485.37	3.14	1524.06	235584	9.85
2071/72	695.37	11.56	8038.47	483539	133.63
2072/73	683.26	14.37	9818.44	466844	206.49
2073/74	858.34	23.82	20445.65	736747	567.39
Total	Σx = 3160.34	Σy = 64.64	Σxy = 44973.12	Σx ² = 2114558	Σy ² = 1055.4

Source: Annual report of STCL, 2073/74.

(NRs. in crore)

Correlation Coefficient (r)

$$\begin{aligned}
 & \frac{N \sum xy - \sum x \cdot \sum y}{\sqrt{N \sum x^2 - (\sum x)^2} \sqrt{N \sum y^2 - (\sum y)^2}} \\
 &= \frac{5 \times 44973.12 - 3160.34 \times 64.64}{\sqrt{5 \times 2114558 - (3160.34)^2} \sqrt{5 \times 1055.4 - (64.64)^2}} \\
 &= \frac{224865.6 - 204284.38}{\sqrt{585041} \sqrt{1099}} \\
 &= \frac{20581.22}{764.88 \times 33.15} \\
 &= 0.81
 \end{aligned}$$

$$\begin{aligned}
 \text{Probable Error (P.E.)} &= 0.6745 \times \frac{1-r^2}{\sqrt{n}} \\
 &= 0.6745 \times \frac{1-0.81^2}{\sqrt{5}} \\
 &= 0.6745 \times \frac{0.3439}{2.2361} \\
 &= 0.6745 \times 0.1537 \\
 &= 0.1036
 \end{aligned}$$

The value of correlation coefficient is 0.81. This indicates that there is positive correlation between sales and net profit. The value of correlation coefficient suggests that if sales increase, net profit also increases but not in same manner.

Break-Even Analysis

BEP analysis is most widely known form the CVP analysis. BEP is that point of sales at which neither there will be neither profit nor loss. The BEP of the company in Rs. is presented in the following table.

Table Break Even Point Details

Year Details	2069/70	2070/71	2071/72	2072/73	2073/74
BEP (Rs.)	367.18	484.72	556.62	585.87	663.75
Change (%)	-	32.01	14.83	5.25	13.29
BEP (Ratio)	0.84	0.99	0.80	0.86	0.77

Source: Annual Report of STCL, 2073/74.

(NRs. in crore)

Where,

$$(a) \text{ BEP (Rs.)} = \frac{\text{Fixed Cost}}{P/V \text{ Ratio}}$$

$$(b) \text{ BEP (Ratio)} = \frac{\text{BEP Sales(Rs.)}}{\text{Actual Sales(Rs.)}}$$

Table shows that the BEP (Rs.) were in fluctuating trend. The main reasons of fluctuating BEP were the change in fixed cost and change in variable cost. The change in contribution margin or profit volume ratio was also the root of cause of reduction and deduction in BEP.

Margin of Safety Analysis

Margin of safety is the excess of actual sales over the breakeven sales volume. Thus, it provides a certain amount of cushion to the company to avoid loss (Pradhan, S. (2013)). The margin of safety can be expressed as a percentage by dividing the margin of safety by actual sales margin of safety and safety margin ratio of the company are presented in the following table.

Table Margin of Safety Details

Year	2069/70	2070/71	2071/72	2072/73	2073/74
Details					
Margin of safety (Rs.)	70.82	0.65	139	97.39	194.59
MOS Ratio (%)	0.16	0.001	0.19	0.14	0.22

Source: Annual report of STCL, 2073/74.

(NRs. in crore)

Margin of Safety (MoS) = Actual Sales – BEP Sales

$$\text{Margin of Safety Ratio} = \frac{\text{Margin of Safety}}{\text{Actual Sales}}$$

In the above table it can be clearly seen the actual position of the margin of safety of the company. The margin of safety of company was in fluctuating trend. The margins of safety of company were 70.82, 0.65, 139, 97.39 and 194.59 in the fiscal year 2069/70 to 2073/74 respectively.

Sales Mix and Break-Even Analysis

Here, Salt Trading Corporation Limited has six different products. So the company is defined as multi-product organization. Through it is very difficult to calculate product wise BEP for the company due to the different sales price and cost price of the product the following procedure is used to calculate product wise BEP.

a) $\text{Sales mix (Rs.)} = \frac{\text{Individual Sales (Rs.)}}{\text{Total Sales (Rs.)}}$

b) $\text{Weighted P/V ratio} = \text{Sales mix (Rs.)} \times \text{P/V ratio of each product}$

Or,

c) $\text{Weighted contribution margin} = \text{Sales mix (Unit)} \times \text{Contribution margin of each product}$

d) $\text{Overall BEP (Rs.)} = \frac{\text{Total Fixed Cost}}{\text{Weighted P/V Ratio}}$

e) $\text{Product wise BEP (Rs.)} = \text{Overall BEP (Rs.)} \times \text{Sales mix (Rs.) of each product.}$

The product wise BEP in Rs. of the company are presented in the following table.

Table: Product wise BEP (Rs.)

Details		Consumable material	Agricu-ltural material	Fuel, lube, tyres,	Machine and equipment's	Constructi on materials	Other materials
Fiscal year							
2069/70	BEP (Rs)	367.18	336.58	367.18	310.69	336.58	367.18
	BEP (%) Ratio	1.01	0.93	1.01	0.86	0.93	1.01
2070/71	BEP (Rs)	458.46	458.46	458.07	422.49	458.46	459.48
	BEP (%) Ratio	0.94	0.94	0.94	0.87	0.94	0.94
2071/72	BEP (Rs)	558.02	558.02	557.32	133.60	534.57	557.32
	BEP (%) Ratio	0.80	0.80	0.80	0.19	0.76	.80
2072/73	BEP (Rs)	523.10	500.78	420.35	500.21	476.80	522.51
	BEP (%) Ratio	0.76	0.73	0.61	0.73	0.69	0.76
2073/74	BEP (Rs)	592.63	592.63	592.63	-	584.15	591.97
	BEP (%) Ratio	0.69	0.69	0.69	-	0.68	0.68

Source: Annual Report of STCL, 2073/74. (NRs. in crore)

BEP (Rs) = Fixed Cost/PV Ration

PV Ratio= CM/Sales of individual product

The above table shows that BEP of the company for each product largely decreased and increased within the period of five years.

Sensitivity of CVP Analysis

The analysis of cost behavior facilitates the use of CVP technique to know the degree of impact on financial result which is known as “sensitivity analysis” (Wagle, Y. (2013). The following table provides the insights into the “sensitivity analysis.”

Table: Different Factors Affecting CVP Analysis

Factors	Effects in P/V ratio	Effects in BEP	Effective in profit
Sales revenue:			
Increase	No effect	No effect	Increase
Decrease	No effect	No effect	Decrease
Variable cost:			
Increase	Decrease	Increase	Decrease
Decrease	Increase	Decrease	Increase
Fixed cost:			
Increase	No effects	Increase	Decrease
Decrease	No effects	Decrease	Increase

Source: Annual Report of STCL, 2073/74.

Effects of Changes in Sales Value

Any increase or decrease in the sales value will have effect in profit. There will be changes in profitability as the changes occur in operating leverage.

Table: Income Statement with Change of Sales Value of the Fy 2073/74

Details	Original	Change in Sales Value	
		10% Increase	10% Decrease
Sales revenue	858.34	944.17	772.50
Les: Variable cost	781.42	781.42	781.42
Contribution margin	76.92	162.75	(8.92)
Fixed cost	53.10	53.10	53.10
Profit	23.82	109.65	(44.18)
CM ratio	0.08	0.17	0.0115
BEP	663.75	312.35	4617.39

Source: Annual Report of STCL, 2073/74. (NRs. in crore)

Table shows that with the increase in sales value by 10 percent the profit of the company will be increase by 109.65 percent. Similarly, with the decrease in sales value by 10 percent the profit of the company will decrease by 44.18 percent. The sales value is changed by the same percentage when changes are made in sales by 10 percent.

Effect of Change in Variable Cost

The impact of change in variable cost on profit is straight forward if it does not cause any change in sales revenue and fixed cost. An increase in variable cost will lower P/V ratio, push up the BEP and reduce profit. On the other hand, if the variable cost decline, P/V ratio will increase. BEP will be low and profit will rise.

Table: Statement with Change of Variable Cost for the Fiscal Year 2073/74

Details	Original	Change in variable cost	
		10% Increase	10% Decrease
Sales revenue	858.34	858.34	858.34
Les: Variable cost	781.42	859.56	703.28
Contribution margin	76.92	(1.22)	155.06
Fixed cost	53.10	53.10	53.10
Profit	23.80	(54.32)	101.96
CM ratio	0.08	(0.0014)	0.18
BEP	663.75	37928.57	295.00

Source: Annual report of STCL, 2073/74. (NRs. in crore)

Above table shows that with 10 percent increase in variable cost, break-even point increase by 663.75 percent which indicates that variable cost and break-even point have positive and proportionate relationship.

Effect of Changes in Fixed Cost

A change in fixed cost does not influence P/V ratio. An increase in fixed cost will push up BEP but reduce profit. It increased and decreased of fixed cost by 10 percent with other factors assumed to remain same, it gets following result for the fiscal year 2073/74.

Table: Income Statement with Change of Fixed Cost for the FY 2073/74

Details	Original	Change in fixed cost	
		10% Increase	10% Decrease
Sales revenue	858.34	858.34	858.34
Les: Variable cost	781.42	781.42	781.42
Contribution margin	76.92	76.92	76.92
Fixed cost	53.10	58.41	47.79
Profit	23.82	18.51	29.13
CM ratio	0.08	0.08	0.08
BEP	663.75	730.12	597.37

Source: Annual report of STCL, 2073/74. (NRs in crore)

Above table shows that 10 percent of fixed cost increase break even amount is increased by same percentage. From this situation, it can be concluded the break-even point and fixed cost has get direct proportionate relationship.

Major findings of the study

On the basis of the analysis, observation and information discussion, the following major findings have been drawn:

- Total sales of the corporation were unstable.
- Expenses of Salt Trading Corporation Limited were fluctuated.
Variable cost as well as fixed cost increased or decreased during the period.
- The corporation has no details of systematic expenses planning which are essential for profit planning and control.

- Contribution margin of the corporation were Rs. 52.14, Rs. 56.46, Rs. 56.09, Rs. 61.24 and Rs. 76.92 percent in the fiscal year 2069/70 to 2073/74 respectively. It shows that the low contribution were in the fiscal year 2069/70 and 2073/74. Low contribution margin may problem to the corporation.
- From the study it is found that BEP sales analysis is the major component of the CVP analysis in the corporation.

Conclusion

Salt Trading Corporation has low contribution margin, low P/V ratio, high breakeven point and low margin of safety. The sensitivity test of CVP analysis proves that if variable and fixed cost increases, the breakeven point will also increases and if they were decreased then, the breakeven point also decreases.

It indicates that cost and breakeven point has positively correlation where as sales price and breakeven point has negatively correlation. The company's condition is very poor and requires effective improvement in situation.

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APPENDIX-I: ACTUAL SALES

Year / Products		2069/70	2070/71	2070/71	2072/73	2073/74
Consumable material	Amount (Rs.)	129.26	301.41	325.73	345.76	507.73
Agricultural material	Amount (Rs.) 1	1.88	103.33	287.36	271.74	272.56
Fuel, lubricant and tyre tubes	Amount (Rs.)	1.00	50.15	52.27	41.40	51.08
Machine and equipments	Amount (Rs.)	0.04	.0071	0.03	0.0036	-
Construction materials	Amount (Rs.)	-	2.49	1.56	1.50	0.88
Other materials	Amount (Rs.)	0.27	27.97	28.65	22.83	27.08
Total		132.45	485.35	695.6	699.23	859.33

Source: Annual Report of STCL, 73/74

(NRs. in crore)

APPENDIX-II: COST OF GOODS SOLD

Year / Details	2069/70	2070/71	2070/71	2072/73	2073/74
Purchases	286.61	479.91	474.95	533.12	739.88
Opening inventory	154.51	143.43	312.37	257.55	280.49
Closing inventory	143.43	312.37	257.55	280.49	362.03
Business expenses	88.16	117.94	109.76	111.82	123.07
Total cost of sales	385.86	428.91	639.53	622.02	781.42

Source: Annual Report of STCL, 73/74

(NRs. in crore)

APPENDIX III: PROFIT AND LOSS A/C

Particulars	2069/70	2070/71	2071/72	2072/73	2073/74
Actual sales	438.00	485.37	695.62	683.26	858.34
Cost of goods sold	385.86	428.91	639.53	622.02	781.42
Gross profit	52.14	56.46	56.09	61.24	76.92
Other income	8.32	8.24	7.07	6.44	15.28
Total	60.46	64.7	63.16	67.68	92.2
Adm. expenses	9.07	11.87	9.72	10.21	10.76
Interest expenses	30.65	40.79	33.70	35.48	41.02
Depreciation expenses	0.67	0.66	1.11	1.18	1.32
Operating profit	11.75	3.14	11.56	14.37	23.82
Gain on sale of assets (loss)	0.19	0.88	0.52	-	0.83
Earning before bonus and taxes	4.81	(3.86)	2.35	3.13	9.01
Employee bonus	0.10	-	0.26	0.31	1.00
Earning after bonus (loss)	4.71	(3.86)	2.09	2.82	8.01
Tax amount	2.95	0.17	0.59	0.53	1.68
Earning after tax (loss)	1.76	(4.03)	1.5	2.29	6.33
Opening retained earning	143.42	140.65	132.89	128.50	126.94
Closing retained earning	141.13	133.53	128.50	126.94	129.55

Source: Annual Report of STCL, 73/74

(NRs. in crore)

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**Relationship Between Work-Related Stress and Accidents:
Moderating Role of Safety Factors**

- Pralhad Adhikari¹

Abstract

Work-related stress has been identified as a risk factor for accidents according to the inadaptability theory of accident causation. The same theory says that increasing adaptability can reduce accidents. So, safety culture can be expected to be a moderator in the relationship between work-related stress and errors or accidents (as a composite construct). A survey was conducted among 431 employees from various industries using the job stress index, safety culture scale, and workplace error-accident history scale with the aim of testing if safety culture mitigates the relationship between workplace stress and errors/accidents. Work-related stress and errors/accidents correlated significantly, $r=.18$, $p<.01$. However, safety culture was not found to moderate their relationship. The conclusion is that a safety culture may not reduce the accidents caused because of work-related stress, and alternatives need to be sought. However, other studies with more methodological rigor or more objective data are needed to verify this conclusion.

Keywords: safety climate, safety compliance, inadaptability theory, errors, accidents

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Introduction

Safety culture includes many things like management commitment, necessary infrastructure, and behavioral issues such as compliance with safety guidelines. It has three major components: employees' behaviors, their cognition, and environmental factors like safety mechanisms (Mathis et al., 2017, p. 564). A Nepalese study (Adhikari, 2021) indicated that a safety culture should be created with supportive management by improving working conditions. Supervisors should be careful to foster a climate of safety by establishing a good communication system. They should also encourage compliance with safety rules (Dessler, 2014, p. 416). A believer in safety culture emphasizes safety in their organizational culture and fosters safety practices at organizational, design, and individual levels (Mathis & Jackson, 2008, p. 469). Safety culture includes communication openness, welcoming response to errors, and management support among others. The safety culture can be made with the help of commitment to safety goals (Turner, 2000) and open discussion about safety hazards including minor ones. Accidents occur because of human and system errors (Adhikari, 2015). Safety training is essential to reduce accidents and is predictive of safety knowledge, motivation, compliance, and participation (Vinodkumar & Bhasi, 2010). In addition to commitment from management, continuous improvement should be the norm. The employees should get a chance to report the incidents and hazards without the fear of punishment because reporting is a valuable source of data based on which desirable interventions can be designed (Johnson, 2003). Culture is created by the collective habits of people regarding speech,

communication, dressing, eating, and other behaviors. Likewise, safety culture refers to individual, group, and organizational habits to think about, react to, and communicate about hazards and safety issues.

Safety culture is significantly correlated with stress (Asefzadeh et al., 2017) which is the bodily reaction when the unpredictable and uncontrollable environmental demands exceed the natural regulatory capacity (Koolhaas et al., 2011). The people who experienced more accidents comply less with safety culture (Milczarek & Najmiec, 2004). Safety climate, the shared value perceived and placed by an organization and its members on safety (Griffin & Curcuruto, 2016), affects the well-being of the construction workers (Chen et al., 2017). A higher number of safety climate problems are associated with more accidents (Ajslev et al., 2017). The commitment of management, workers' knowledge, and their participation are significantly related to the accidents (Vinodkumar & Bhasi, 2009). Safety behavior is the predictor of safety outcomes (Panuwatwanich et al., 2017). In short, errors or accidents are constantly shown to be associated with stress including work-related stress.

Stress is a person's response to threatening or challenging stimuli (Feldman, 2019). Job stress work-related stress or occupational stress mean the same thing and refer to the stress created because of various aspects of a job, work, or occupation. Job stress is theorized to be caused by environmental factors such as financial/political uncertainty, organizational factors such as role ambiguity, and personal factors such as family problems (Robbins & Judge, 2022, p.631). It is supposed to result in physiological strain such as headache, psychological strain such as

anxiety, and behavioral strain such as high absenteeism (p.631). Stress as a risk factor might trigger errors and accidents among employees. A study is needed to explore this relationship. The safety culture (say safety climate, motivation, compliance, and participation) is expected to moderate the relationship. Research is needed in that direction too. For this study, safety culture has been defined as made up of safety climate, safety motivation, and safety behaviors (Neal & Griffin, 2006).

The inadaptability theory of accident causation posits that inadaptability, which is contributed by individual factors like stress, sleep deprivation, and distraction, and system factors like degrading road conditions, and corroding machines are the causes of accidents (Adhikari, 2017). The factors created by the interaction of both humans and the system may also contribute to inadaptability or adaptability. The very theory posits that increasing adaptability can reduce errors-accidents. So, factors like safety culture, situational awareness, attention, alertness, and mindfulness are expected to be helpful in reducing errors and accidents and enhancing safety according to this theoretical framework. In this study, a hypothesis has been tested: the safety culture weakens the relationship between work-related stress and errors or accidents. Likewise, the other hypotheses are related to the three components of safety culture.

Method: Participants

There were 431 participants taken by convenient sampling. Most of the participants were young ($M_{age}=29.18$, $SD=7.40$) with an average experience of 3.67 years and average daily working hours of 8.51 hours.

More than half participants (57.9%) were male and 42.1% were female.

The following table represents the industry they belonged to:

Table 1: The industry related to participants

Industry	Frequency	Percentage
Automobile	29	6.73
Construction	65	15.08
E-commerce	30	6.96
Service	118	27.38
IT	65	15.08
Manufacturing	30	6.96
Medical	94	21.81
Total	431	100

Source: Survey, 2022

Measures

The job stress index (Bernas & Major, 2000) was used to measure work-related stress. It has 12 items on a Likert scale to be rated from “Strongly disagree” through “Strongly agree”. A higher score means more work-related stress. The safety culture scale used in a study to measure safety climate, motivation, and behaviors (Neal et al., 2000; Neal & Griffin, 2006) was used to measure safety culture. In other words, safety culture is assumed to be made up of safety climate, safety motivation, and safety behaviors. Safety behaviors had two components: safety compliance and safety participation. Each safety component had three items to be rated on a 5-point Likert scale (“Strongly Disagree” through “Strongly Agree”),

and more scores in each meant more value in each. A scale with 5 items was developed to measure workplace error and accident history (WEAH). This Likert scale had five response options ranging from “Never” to “Almost always”. Its items were related to errors and accidents that occurred in the workplace during the last 12 months. A higher score meant more errors and accidents at the workplace. The WEAH scale had the following items:

1. You have committed minor errors
2. You have committed serious errors
3. You have fallen into minor accidents
4. You have fallen into serious accidents
5. Your coworker has fallen into serious accidents

Cronbach’s alpha in this sample was .86 for the job stress index. It was .89 for the safety culture scale and .82 for WEAH. These are acceptable reliabilities.

Procedure

The survey was administered to the participants with the help of research assistants who were students in a graduate college of Industrial and Organizational Psychology program in Kathmandu. The participants were approached while they worked in their workplace. They were requested to fill out the survey. The white-collar workers were asked questions in English but the illiterate and blue-collar workers were approached with their Nepali translation.

Data Analysis

Data was organized in Excel and imported to SPSS. The moderated regression analyses were carried out. Six models were tested. In addition, some descriptive statistics were computed.

Results

The summary of work-related stress, safety climate, and errors-accidents are given in Table 1.

Table 2: Descriptive statistics of the three main variables

	M	SD	Q ₁	M _d	Q ₃
Work-related stress	31.72	8.524	26.00	31.00	36.00
Safety culture and (consisting of safety climate, motivation, behaviors)	44.10	7.567	39.00	45.00	49.00
Errors and Accidents	6.49	4.071	3.00	6.00	9.00

Source: Survey, 2022

The correlations between the variables of the study are given in Table 3. All safety factors are positively and significantly correlated. The safety culture did not correlate significantly with errors and accidents. However, work-related stress and errors-accidents have correlated significantly.

Table 3: Correlation matrix

		1	2	3	4	5	6	7	8	9	10
1	Age										
2	Work hours/day	-0.02									
3	Experience (years)	.54**	0.10								
4	Work-related Stress	-0.01	0.05	0.04							
5	Safety culture	-.17**	.15**	-0.02	0.03						
6	Errors & accidents	-0.06	0	.21**	.18**	0.06					
7	Safety climate	-0.06	-0.07	-.26**	-.13**	.13**	-0.06				
8	Safety Motivation	-0.04	-0.06	-.24**	-.11*	.16**	-0.06	.95**			
9	Safety compliance	-0.04	-0.07	-.23**	-.12*	.15**	-0.06	.95**	.95**		
10	Safety participation	-.12*	-0.04	-.25**	-.13**	.17**	-0.05	.94**	.94**	.94**	
11	Safety behavior	-0.08	-0.06	-.25**	-.12*	.16**	-0.05	.96**	.96**	.99**	.99**

Note. * Means significant at .05 and ** significant at .01 levels.

Source: Survey, 2022

The moderation model showed that a 3.6% variance in error accidents is explained by predictor variables: work-related stress and safety culture. However, they could not predict errors-accidents significantly. The interaction term was not significant as shown in the table below.

Similarly, no other safety factors moderated this relationship.

Model	Interaction term	b	LLCI	ULCI	% of variance explained by the predictors
1	Stress x Safety Culture	.001	-.005	.007	3.6
2	Stress x Safety Climate	.0002	-.007	.007	3.4
3	Stress x Safety Motivation	-.001	-.009	.006	3.5
4	Stress x Safety Compliance	-.0005	-.008	.007	3.5
5	Stress x Safety Participation	-.0003	-.008	.007	3.3
6	Stress x Safety Behavior	-.0002	-.004	.004	3.4

Despite the lack of statistical significance, a graph was created in three levels of safety culture and the following pattern (refer to Figure 1) was seen. Figure 1 shows that safety culture seems to have no effect on errors and accidents.

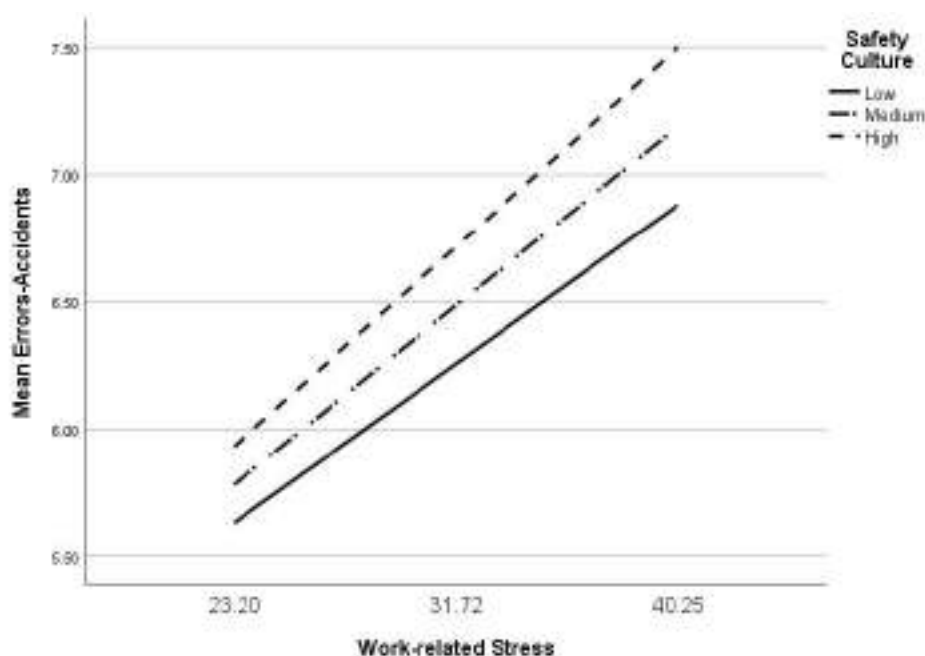


Figure 1. The figure shows that errors-accidents increase as stress increases at work, and safety culture appears to have no effect on the levels of accidents

Discussion

Stress, such as acute stress and that related to life events, increases accidents (Green, 1985). This study also showed a significant positive correlation between work-related stress and errors/accidents. This study did not support the idea that a safety culture is helpful in reducing errors and accidents. Confidence in the inadaptability theory of accident causation (Adhikari, 2017) was not provided. The findings in this study are consistent with Neal and Griffin's (2006) which showed no significant correlation between safety climate or behavior with accidents. The

moderation models were not found significant. So, a safety culture may not mitigate accidents caused because of work-related stress.

The possible cause of the failure of safety culture in placating the errors-accidents caused by stress is the overemphasis on behavioral aspects. There are only three items for climate and nine items for behaviors in the test to measure the safety culture used in this study. Situational factors may also be responsible for errors and accidents. The questionnaire used does not include situational factors like work pressure, safety systems, and job risk (Christian et al., 2009).

Implications

The inadaptability theory of accident causation did not gain support in this study. However, methodological flaws may be to blame and new studies should test this theory using objective data, rather than subjective or self-reported data. Organizations and factories should focus less on safety culture as a strategy to reduce errors and accidents. Stress is a risk factor but safety climate, motivation, compliance, and participation may not be the protective factors for errors and accidents at the workplace. This study has contributed a new and briefer version of error-accident history. The longer version (Adhikari, 2022) had six items. Regarding the validity of this briefer version, a significant correlation with stress establishes some extent of convergent validity because we can intuitively predict that stressful persons are prone to errors and accidents.

The alternative ways to lessen the accidents are to modify the behaviors of employees, improve the design of the workplace, and change the way employees interact with the system. There are options to alter the

environment, training, selection, equipment, task, or organization design (Lee et al., 2017, p.6). Employee/job features, tools, and physical/psychological environment make up the work system (p.518).

As in a previous study (Adhikari, 2022), the inadaptability theory could not garner confidence. However, the problem may be a methodological issue as pointed out in it. Self-reported data about accidents may not be accurate. Questionnaires face criticisms for methodological inadequacy (Strauch, 2015) in investigating safety culture and accidents. This research could have lacked methodological rigor such as quality control of the research assistants. The relationship can be replicated increasing the rigor. Stressors such as schedule pressure are known to contribute to errors or accidents (Pereira et al., 2020). In this study, the composite score of errors and accidents was used as a dependent variable. The disparate scores could have been used. Convenient sampling may have impaired the generalizability of the findings. Moreover, stress is not always negative but this study deals it as one. Distress is the harmful stress. Eustress is not harmful and can be considered challenging and hence performance-boosting.

This study was carried out among the various professionals. So, a focused study can be conducted in the future, taking the participants who work in error- and accident-prone occupations. Other risk factors like violations (de Winter & Dodou, 2010), and protective factors like awareness or training (Adhikari, 2015) can be tested in future studies. The objective data are desirable. The same research problem can be examined with objective data such as those maintained by organizations. Moreover, a future study

may be conducted to establish other psychometric characteristics of the WEAH scale.

Work-related stress may not directly lead to accidents. Stress occupies the mind and leads to distraction or lack of attention, situational awareness, and concentration. So, these constructs and mindfulness can be tested as mediators in the relationship between stress and errors/accidents. If these prove to be mediational, the interventions can be designed to enhance mindfulness, attention, concentration, and situational awareness and lessen distraction, ultimately reducing errors and accidents at the workplace. Stress should not be limited to work-related, to cause incidents (including both errors and accidents). Since the stress caused in personal life lingers, such stress may also lead to unwanted incidents. Hence, stress can be studied in broader delimitation.

Conclusion

The safety culture globally, and safety motivation, safety behaviors (and safety compliance, safety, and participation), and safety motivation separately could not moderate the relationship between stress and error-accidents. Stress and errors or accidents are significantly correlated. Rather than focusing on safety climate, behavior, and motivation, managers should seek alternative ways to reduce errors and accidents. However, these conclusions should be considered with caution because the self-reported incidents of errors or accidents may not be accurate. So, verification of this conclusion demands organizationally maintained objective data on incidents.

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Knowledge and Practice on Sanitation and Hygiene among Secondary-Level Students

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Abstract

Sanitation and hygiene are essential components among the students to create a behavioral impact for living a healthy lifestyle. In this context, the study intends to investigate the knowledge and practice of sanitation and hygiene among the students in Shree Adinath Madhyamik Vidayala in Kirtipur municipality ward number six of Kathmandu Valley, where most of the students are from a middle-class background. The study employed quantitative and qualitative research, with an emphasis on exploratory and descriptive research designs. A total of 35 students in grade 10 of the school was the universe of the study and all these students were included in this study and the census methods was applied. The study indicates that students possess knowledge of hygiene conditions.

Key Words: sanitation, hygiene, knowledge, practice, and students

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Introduction

It would be good to begin by introducing health and hygiene. Nepal welcomed the new constitution in 2015 and is underway the federal structure, which means the country will be divided on the basis of population, available resources, etc. for equal development all over the country. With the current structure, the Government of Nepal (GON) envisions scaling up the decentralization process and plans for the development of the country. From centralized to autonomous government, to empowering local people and ensuring the place of minorities backward and groups in the mainstream of development, federalism has brought high hopes for everyone.

Another fact is that building these autonomous states and distribution of power, on a budget part can be very expensive for a developing country like Nepal. 25% population are living below the poverty line with USD 50 cents per day, 5 million people are undernourished and Nepal is prone to natural disaster as per the Borgen Project. Regardless, Nepal's GDP per capita has reached USD 1003.6, (CEIC,2018). This means that the country is increasing the amount of production, the economy is ascending and citizens have high income and spending capacity. But if we look at the living standard of the rural population which is 81% of the total have not been much affected. Many areas are still less prioritized in terms of development (World Bank,2017).

It would be good to include disciplinary works of literature. It has been six decades since Nepal has been focusing on Water Sanitation and Hygiene, which is one of the many important areas for human development

(SDP,2017), but lacked a long-term development plan. this could be one reason behind Nepal as a country could not succeed in bringing together all the stakeholders from top to bottom level to achieve the target. It is the main basis for sustaining a healthy life. Good health may not be everything but without its other development is impossible. After the enforcement of the Sanitation and Hygiene Master Plan (SHMP) Water Sanitation and Hygiene have been prioritized by the whole nation. For that reason, the new constitution has envisaged and clearly mentioned that all citizens will have access to safe drinking water and sanitation (2nd Constituent Assembly, 2015).

The sanitation promotion and activities in Nepal date back to the 1980s with the establishment of the Development of Water Supply and Sewerage (DWSS) along with the United Nations (UN) declaration of the International Decade of Drinking Water Supply and Sanitation. However, major effort on sanitation is found to have started in the early 90s with programs like Janata ko Khane Pani ra Sarasafai Karyakram, (JAKPAS), MPPW/ World Bank (1993-1996), Nepal National Sanitation Policy and Guidelines for Planning and Implementation of Sanitation Program, Rural Water Supply and Sanitation Fund Development Board which among others (Ministry of Urban Development, 2011).

Many donors like WB, ADB, Government of Finland have provided support for 2-3 decades to end the gap in water sanitation and hygiene. As specified by the Sanitation and Hygiene Master Plan, the toilet coverage nationwide was 62% before 2011. In 2015, it reached around 81% according to the DWSS report. The master plan largely focused on the

open defecation-free idea with universal access to toilets in both the urban and rural context, through the total sanitation approach. CLTS and SLTS have been mentioned as major hygiene and sanitation approaches in SHMP. Even though focused on community, the idea of CLTS is closely connected to children and schools, which is one of the most highly targeted areas in sanitation (Sanitation Update, 2018)

As stated in Rural Water Supply and Sanitation National Strategy and Policy (Ministry of Urban Development, 2009) water supply and sanitation improvement in schools will be given special emphasis in high-risk areas. The focused components in the document are; Separate child-friendly toilets for boys and girls and urinals for boys. A regular toilet cleaning campaign involving both teachers and students. Incorporation of health, sanitation, and hygiene education in the curriculum of all children's classes. A school contribution of at least 20% of the cost of toilet construction (including 1% in cash) and involvement of out-of-school children through a child-to-child approach for the extension of health, hygiene, and sanitation education

This explains that there is a huge need for sanitation hygiene infrastructure and strategy as well as implementation in the schools. The government of Nepal has been producing the policy documents but, there is a weakness and a huge gap in providing those facilities, the execution part is quite lagging. Another document Urban Water Supply and Sanitation Policy focused on the urban areas however, does not mention school (public or Private) sanitation hygiene plans or programs, even though the situation

is alarming in the semi and urban areas (Ministry of Physical Planning and Works, 2009).

The DoE and the DWSS have historically led WASH in school efforts. Both the school sanitation and hygiene education (SSHE) and school-led total sanitation (SLTS) approaches introduced in Nepal in 2000 and 2005 respectively have institutionalized schools as the center of learning and motivation for sustained sanitation and hygiene behaviors. SLTS is a participatory and low-s subsidy approach. It drives toilet construction, use, and maintenance through the application of a long-term behavior change and awareness campaign led by schools throughout Nepal. Changing sanitation practices is about changing the mentality of people, and thus improving sanitary practices. It is easier to change the mentality of young children who have fewer preconceptions about sanitation (UN-HABITAT, 2010).

The National Framework for Child-Friendly Schools for Quality Education has emphasized that there must be the necessary provision of safe drinking water, clean toilets, and drainage since this is the most important and fundamental aspect of a child-friendly environment (Ministry of Education, 2010).

The Constitution of Nepal (2015) stipulates access to drinking water and sanitation as a fundamental right of the citizens. Nepal is still falling behind in the list of developed countries because of its HDI (UNDP,2018). One of the core areas to influence the living standard is the progress in the area of water sanitation and hygiene since it is directly linked with life expectancy which means an increase in the number of schooling-age

children. According to the Human Development Indices and Indicators (UNDP,2018) between 1990-2017 Nepal's life expectancy at birth increased by 16.3 years, which means years of schooling increased by 2.9 years and expected years of schooling increased by 4.7 years. Nepal's GNI per capita increased by about 111.6% during those years. Currently, Nepal's GNI per capita is USD 2730 (World Bank,2017)

In developing countries like Nepal, neither the government nor the general public have a proper understanding of the importance of sanitation and hygiene. Separate policies have not been formulated that concentrates on sanitation and hygiene situation solely and seriousness is not seen in implementing the ones that exists. As per the WASH experts, Nepal has good policies but is behind in implementation, it is also because of the frequently changing government and the absence of ownership in all areas, from the local to the central level.

Globally, about 1.7 million people die every year from diarrhea diseases, and 90% are children under 5 years old, mostly in developing countries. It also implies that 88% of cases of diarrheal diseases worldwide are attributable to unsafe water, inadequate sanitation, and poor hygiene (World Health Organization, 2017). The WHO data indicates that diseases associated with poor sanitation and unsafe water account for about 10% of the global burden of disease. 1/3 of child related death in Nepal are due to poor sanitation and dirty water (CEAD), 2019) Simply by hand washing practice morbidity can be reduced by 43% and child mortality by 33% (UNICEF, 2017)

According to UNICEF, a gram of human feces has 10 million viruses, 1 million bacteria, and 12,000 parasites (UNICEF,2010). So, in the case of hand washing after defecation, various diseases will easily enter the human body. Diseases associated with poor sanitation are basically diarrheal diseases, acute respiratory infections, undernutrition, and other tropical diseases. Besides diarrhea, open defecation also causes anemia and is a huge problem. diarrhea may not necessarily kill but it makes the children more susceptible to a host of illnesses impacting school attendance, and economic productivity and drains family income.

The state of sanitation remains a powerful indicator of the state of human development in any community. Each year, more than 800,000 children under five die needlessly from diarrhea, more than one child a minute (United Nations, 2013). Poor sanitation and hygiene are the primary causes. The government of Nepal had set the target to attain full coverage by 2017 but it did not materialize 100% Household toilet construction was the main target from the beginning thus institutional and especially school toilets have been under shadow.

This study is an attempt to verify the importance of sanitation and hygiene in government schools. Children are a good medium to spread knowledge because they can be the best triggers, The Community Led Total Sanitation (CLTS) movement in India and Nepal has well proven this fact. In the absence of basic sanitation and hygiene facilities, there is a high risk of school dropout leading to poor quality of education, health risks, and life ultimately. Nepal's government has prioritized school sanitation in its policies and plans with separate budgets but lagging behind on

implementation. Shree Adinath Madhyamik Vidayala was chosen as the study area because it is a government school and they are facing challenges with basic facilities like clean water, not enough toilets per child, hygienic disposal of sanitary napkins, physically challenged school infrastructure, etc. similar to many other government schools in Nepal. This study is done with the assumption to bring the actual sanitation and hygiene scenario of Shree Adinath Madhyamik Vidayala. Thus, the study area of this research article was Shree Adinath Madhyamik Vidayala in Kirtipur municipality ward number six of Kathmandu Valley, where most of the students are from middle-class backgrounds as the information received.

Objectives

The general objective of this study is to identify the situation of sanitation and hygiene in Shree Adinath Madhyamik Vidayala. The specific objective of this research article is to identify the knowledge about sanitation and hygiene among the students.

Methodology

The research design for this study is both exploratory and descriptive. This study is exploratory in nature because it seeks to investigate the situation of sanitation and hygiene in Shree Adinath Madhyamik Vidayala. At the same time, this study is descriptive in nature since it seeks to give knowledge about sanitation and hygiene among the students. There are a total of 35 students in grade 10 of the school. This is the universe of this study. All these students are included in this study and the census method is applied.

Discussion and Analysis of the study

General characteristics of the respondents

The general characteristics of the respondents, and the students are as described. the features of the detailed information the respondents provide are significant as they reflect the features of the individual to identify their background. The demographic behavior consists of gender, age, family type, and religion to find out the knowledge and practice of the respondents in terms of sanitation and hygiene. Comparison between the information male and female distinction is essential.

The family types of the respondents

To understand the sanitation hygiene knowledge and practice of the respondents, it is important to understand their family background. The families exist of mainly migrated from other parts of the country, started a different kind of job, and temporarily settled because of the facilities of a city providing easy access to education.

Table No.1 : Type of Family

Respondent	Nuclear family	Joint family	Total
Male	9	4	13
Female	12	10	22
Total	21	14	35

Source: Field study 2023

Table 1 represents the distribution of nuclear family and joint family. The male constituents of nine students in a nuclear family and four students in a joint family. In the case of female twelve students belongs to the nuclear family and ten students belong to the joint family.

Age and Sex types of the respondents

The study has also categorized the respondents by age and sex. It has helped to further study the knowledge and practice of the respondent by sub-categorization.

Table 2: Distribution of the respondents by age and sex

Age	14	15	16	17	18	19	Total
Male	0	1	7	3	1	1	13
Female	2	4	11	4	1	0	22
Total	2	5	18	7	2	1	35

Source: Field study 2023

Table 2 represents the age group belonging to males including one in the fifteen age group; seven in the sixteen age group; three in the seventeen age group; one in the eighteen age group; and one in the nineteen age group. So, in total thirteen students of male are being representative. In the case of female students, two are in the fourteen age group; four in the fifteen age group; eleven in the sixteen age group; four in the seventeen age group; and one in the eighteen age group. In total twenty-two students of female students are respondents.

Religion types of the respondents

The respondents follow more than one religion; therefore, they have been categorized according to their religion.

Table 3: Distribution of the Respondents by Religion

	Hindu	Buddhist	Christian	Others	Total
Male	9	1	2	1	13
Female	14	4	3	1	22
Total	23	5	5	2	35

Source: Field study 2023

Table 3 represents the religion followed by the students which includes nine male and fourteen female students follow Hindu religion; one male and four female students follow Buddhist religion; two male and three female students follow Christian religion and one male and one female student follow other religions.

Knowledge and Practice in Sanitation and Hygiene

Sanitation facilities

The study reveals that there is a separate toilet for boys and girls in a school which includes 8 toilets for boys and 8 toilets for girls. But there are no separate toilets for staff or teachers. According to education regulations in Nepal, a school toilet has to serve 50 students utmost. For around 35 students, the facts reveal that the available toilets are enough for the available students. The school areas provide adequate facilities for the available sanitation facilities. For boys and girls students, the most commonly available facility in the school is the oriental toilet. It was observed that there is a regular supply of water in the school. Further, the well has been constructed for the availability of water. The school does have a separate septic tank for the sewage system.

Drinking water facilities

The school uses the well with a filter installed system for drinking water purposes. It is placed at the underground of the main building premises. It is the drinking water certified. The role of the cleaner is important when it comes to monitoring and maintaining the facility.

Cleanliness

School premises are clean. There was no littering on the school premises, classroom was neat and tidy. No marks or dirt on the walls of the corridor or classroom were observed. The students seem clean and tidy with clean uniforms, shoes, and tidy hair with a fingernail trimmed. Teachers informed that the students are being aware of the necessity and knowledge of the hygiene and sanitation situation and its consequences.

Hand washing facilities

The school has a hand wash facility in an accessible area so that the student's frequency of cleaning hands is high along with soap facilities. No leakages were found in relation to the handwashing facility. The facility is being used by the teachers, staff, and students as well. While teaching and in other instances, one has to clean the hands especially so the easy access has definitely helped a lot to keep the hygiene in balance. In addition, the teacher is encouraging students to use the facility.

Knowledge of toilet use, waste disposal and practice.

The study reveals that there is a positive knowledge of proper toilet use among the students. The students do know about the importance of defecating in the toilet, as it directly relates to the spreading of disease through the flies.

Educational engagement in sanitation

The study reveals that the students are taught about sanitation and hygiene in school. The student spends a significant portion of their day at school and better WASH facilities and educational opportunities decrease the potential for disease transmission, in addition to addressing issues of

dignity, particularly for female students. The student is not confined to the four walls of a classroom, the whole school could be a source of knowledge in maintaining hygiene.

Various tools are used as teaching methods; so educational aids such as announcements, information on the board, and teachers' instructions to display and share important information. The school does have clubs to promote sanitation and hygiene education amongst the students. The club comprises students as well as teachers to facilitate them. The club consists with taking different programs for maintaining hygiene conditions in classrooms and school premises; school cleaning campaigns; use of peer learning/educating tools, drama, quizzes, etc.

Waste management

There school seems to have a proper waste management system. The students are also being taught regarding the separation of waste of solid and liquid along with recycling and non-recycling products; and degradable and non-degradable. So, the proper waste management system has been implemented by the school management.

Conclusion

Sanitation and hygiene are essential components among the students to create a behavioral impact for living a healthy lifestyle. The research work suggests that students possess knowledge of hygiene conditions. The school sanitation is just being in a state of satisfaction level but lacks adequate and comfortable positions. The problems include not having enough toilets and the problems include not having separate toilets for staff and students. The ratio of toilets to the number of girls is also not enough. This is as same condition of boys as well. The facilities of the toilet are oriented of using water poured and of flushing system.

The students have knowledge regarding the hygiene conditions and do follow the practices of hygiene situations. It is of student's goods situation of the criteria of the students do have the knowledge of hand washing after going to toilets before having meals and after urination and defecation. The school also had a soap day to celebrate the One Soap One Student concept on its uses. So, the clean and hygienic condition is being managed by the students of hygiene conditions.

Lack of facilities and poor hygiene conditions affect both girls and boys, although the poor conditions of sanitation have a greater effect on the health factors of the girls. Special care and need is essential to access safe, clean, separate, and private sanitation facilities in their schools. The girls having disposal of sanitary pads and access to waste disposal has given special care to the sanitation part of the school system.

The school management committee does play a significant role in the overall development of the school sanitation system and the hygiene conditions of the students. The system of own cleaning system of own involvement of cleaning classrooms as well as toilets and the school premises has been undertaken emphasizes on taking the responsibilities of the students upon taking up the practices of hygiene in the school premises. Furthermore, it makes them more alert and behavioral practices of the hygiene.

Furthermore, the continuous improvement in the sanitary system of the school is also being to an appreciation one. The construction of new toilets to separate for boys and girls is an important aspect. Further, the establishment of a well and installment of the filter of water for drinking

water is another step in creating a hygiene and sanitation system for the well-being to the students as well as to the teacher and staff.

The study reveals that students have of greater knowledge of using sanitation facilities for being in a state of hygienic conditions. Knowledge of hygiene has an interrelation of education interrelated with the economy. Maintaining the hygiene situation led to fewer diseases and a healthy lifestyle. Many of the student are found to be aware of basic hygiene and even teaching to their juniors are lacking and insufficient infrastructure and close monitoring from the school management.

Inadequate sanitation has been calculated to have a negative economic impact of 3% of GDP or more, World Bank (2017). Lack of proper sanitation may lead to economic stress. Some of the situations may of healthcare costs, loss of productivity, and decreased rate of education opportunities. A school with proper sanitation and hygiene facilities will retain a level of healthy students for living a better life. The knowledge of hand wash and the importance of the use of soap and water is being practiced by the students before eating foods and after urination and defecation which has led to the healthy lifestyle. Education which brings knowledge has to be continued as a lifestyle. Therefore, the study reveals there is a fulfillment of the research gap between knowledge and practice. The school management committee along with the staff and principals do realize that there is the ultimate necessity for improvement in the sanitation facilities.

The existing condition is just for the running of fulfilling the ultimate running but for the future these are not the adequate requirement for updating and upgrading the system to the modern era. The different club's existence relates to further creating awareness, and practices on maintaining hygiene conditions along with maintaining the lifestyle as a part.

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<https://www.researchgate.net/publication/329060098> Study on
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Tourism and Its Impact on The Growth of The Nepalese Gross Domestic Product

- Santa Prasad Bhusal¹

Abstract

This article aims to show the impact of Real Tourism Earnings (RTER) on Real Gross Domestic Product (RGDP). A time-series design was employed using secondary data of 1990–2022 AD. All data were obtained from the Central Bank of Nepal, the Ministry of Finance, and the Central Bureau of Statistics. In this respect, to capture short-run relationships among variables, the Pairwise Engel Granger Test (PRGT), and Error Correction Mechanism (ECM) were developed, and cointegration analysis was introduced to capture long-run relationships. In the paper, 100 percent increase in RTER leads to a 90 percent positive change in RGDP in the short run; the coefficient is positive as well as significant at the 5 percent level. The coefficient of ECM -0.96 and significance at 1 percent showed that it corrected all the disequilibrium at the convergent speed of 96 percent. All the stability and diagnostic tests of the model have no symbols of misspecification, and residuals are normally distributed, homoscedastic, and not serially correlated.

Key words: RGDP; RTER; ECM; Co-integration; Pairwise Engel Granger test;

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Introduction

Tourism is one of the fast-growing labor-intensive industries, and people have been traveling for leisure time spending according to their destination choice. Nepal opened its doors to tourism after the first successful ascent of the world's highest mountain Mt. Everest on May 29, 1953AD by Edmund Hillary and Tenzing Norgay Sherpa, (Thapa. B, 2003) raised curiosity worldwide. The Himalayan Mountain nation chain mystified a charm among a large number of tourists. An increase in tourism inflow and economic growth are interrelated and vice versa. (Dogru, T,. Bulut, U 2018) Therefore government has been working very hard to advance the tourism sector. The infrastructure in Nepal is improving, with new tourist destinations, luxurious hotels and resorts, good roads, and brand-new international airports opening up, the tourism business is growing. People are becoming more and more involved in this sector. Institutions that teach and study about the tourism industry are also expanding. Since Nepal embraced federalism, local governments are now in charge of the tourism sector. To improve the local level of the tourism business, each province and state can put their ideas and plans into action.

Tourism is a contributor to sustainable economic growth in many countries. Sequeira TN Nunes PM looked at the relationship between tourism inflow and economic growth has found that tourism is a good driver of economic growth. It can be a tool for increasing export earnings, generating new employment opportunities, enlarging consumer markets, and promoting rapid diversification of the economy. Belloumi (2010), Furthermore, it also contributes to government revenue. It has a spin-off effect on all sectors of the economy. Saleh et al. (2015) Nepal is a

developing nation with limited foreign sources; tourism receipts are one of the tools for high and sustainable economic growth. The increase in tourism arrivals resulted in an increase in tourism receipts. International tourism receipts have increased from Rs. 4459.7 million in 1990 AD to Rs. 75,374.1 million in 2018 AD. But after the unprecedented global pandemic COVID-19, Nepal's tourism went through a tumultuous period that restricted international travel movement. It decreased by 80 percent in 2020, followed by 35 percent in 2021 AD, reaching only Rs. 7874.4 million, but 2022 AD, the historic year for international tourist inflow as well as tourism receipts, increased by more than 306 percent, putting an end to the downward spiral, and reacted with 614,148 arrivals and Rs. 28620.6 million. Tourism spending increased by USD 48 every day, contributing thousands of jobs and a 2 percent share of Nepalese GDP despite the protracted COVID-19 pandemic and Ukraine-Russia war in the New Business Age (2023).

There are volumes of studies that have been done to show the relationship between tourism inflow and GDP growth. However, limited research has been done to connect relationships the after COVID-19 outbreak. Further tourism inflow is not only the element that impacts GDP growth, other factors such as foreign direct investment, remittance, domestic capital, export capacity, and import volume also have a considerable impact on the growth. In the previous works, there hasn't been more research conducted on the impact of tourism on the growth of Nepalese GDP. To cover this research gap, this paper examined the impact of real tourism earnings on the growth of the real gross domestic product of Nepal.

The findings of this research will have significant implications not only for the improvement of existing literature, but also for policymakers, stakeholders of the tourism industry, tourism investors, and other potential investors. It will provide insights into the current time series data which covered 32 years from 1990 -2022 AD. The goals of this research establish the impact of tourism and other factors like foreign direct investment, remittance, domestic capital, export capacity, and import volume, on the growth of Nepalese GDP and highlight the factors that contribute to its growth. Additionally, the research will help policymakers formulate policies that promote sustainable tourism development and ensure that the benefits of tourism are evenly distributed across the country. Therefore, this study aims to establish the relationship and explain the impact of tourism and other variables on real gross domestic product by addressing the potential gap in the literature.

Literature Review

There have been volumes of empirical studies examining the effect of tourism receipts on economic growth. Some literature shows that the effect of tourism on economic growth in the short and long run differs depending on the destination and nature of the tourism industry. Short-run positive effects were economic growth, infrastructure development, new jobs, and foreign exchange (Bouzahzah and Menyari 2013), Srinivasan et al. 2012, Pan and Dossou (2019), Lanza, A., & Pigliaru, F. (2000), Brida, J. G., & Zapata-Aguirre, S. (2010). On the other hand, some authors showed short-run negative effects, including inflation, pollution, and environmental degradation. Sinha, R. K. (2008), Brida Brida, J. G., & Risso, W. A. (2012); Gössling, S.; Scott, D.; & Hall, C. M. (2013). There are several

authors and studies that have shown the positive effects of tourism receipts on economic growth in the long run, including diversification of the economy, infrastructure development, stimulating entrepreneurship and innovation, and regional development.

Overall, the positive effects of tourism on economic growth in the long run can be significant and far-reaching. However, it is important to manage and regulate the industry to ensure that the benefits are maximized and the negative impacts are minimized. Mowforth, M., and Munt, I. (2009) highlighted the potential long-term benefits of tourism in developing countries, including employment opportunities, infrastructure development, and regional development. Balaguer, J., and Cantavella-Jordá, M. (2002) found that tourism had a positive and statistically significant impact on economic growth in the long run in Spain. (Dritsakis, N. 2004) found that tourism had a positive and statistically significant impact on economic growth in the long run in Greece. (Lanza, A., & Pigliaru, F. 2000) conducted a meta-analysis of various studies and found that tourism had a positive and statistically significant impact on economic growth in the long run in several countries.

Objective of the Study

The general objective of the paper is to identify the relationship between and among the real gross domestic product (RGDP), real tourism receipts (RTER), real foreign direct investment (RFDI), remittance inflow, export, import, and domestic capital. The specific objective is to examine the contribution of RTER to RGDP in Nepal.

Hypothesis of the Study

Null Hypothesis (Ho): RTER has no significant contribution to the RGDP growth of the Nepalese economy.

Alternative Hypothesis (H1): RTER has made a significant contribution to the RGDP growth of Nepal.

Methodology

This entire research design followed a quantitative research nature. This study employs annual time series data covering 33 years, from 1990 AD to 2022 AD. The model is developed based on the variables selected as real gross domestic product (RGDP), real tourism receipts (RTER), real foreign direct investment (RFDI), remittance inflow, export, import, and domestic capital of Nepal, guided by the functional relation between growth and RTER receipts. All the data are based on secondary sources published by the Nepal Tourism Board, Ministry of Finance, Ministry of Tourism, Culture, and Aviation, Nepal Rashtira Bank, World Bank, and others. Different econometric and statistical tools and models, such as regression analysis and error correction models, will be used to analyze the data using Excel, E-views-10, and Microfit software.

Measures of FDI Impact on RGDP (Model -1)

$$\text{RGDP} = f(\text{RTER}) \dots \dots \dots (1)$$

To show a functional relationship, the stochastic model becomes

$$\text{RGDP} = \beta_0 + \beta_1(\text{RTER}) \dots \dots \dots (2)$$

Workings of the model tested in its natural logarithm form,

$$\text{LN RGDP} = \beta_0 + \beta_1 \text{LN(RTER)} + \mu \dots \dots \dots (3).$$

Measure of RTER On Others Variables (Model 2)

$$\text{GDP} = f(\text{RTER}, \text{RFDI}, \text{RREM}, \text{RDK}, \text{REXP}, \text{RIMP}) \dots \dots \dots (1)$$

The functional relationships, stochastic model become

$$\text{RGDP} = \beta_0 + \beta_1(\text{RTER}) + \beta_2(\text{RFDI}) + \beta_3(\text{RREM}) + \beta_4(\text{RDK}) + \beta_5(\text{REXP}) + \beta_6(\text{RIMP}) + \mu \dots \dots (2)$$

Workings of model tested in its natural logarithm form

$$\text{LNRGDP} = \beta_0 + \text{LN}\beta_1(\text{RTER}) - \beta_2\text{LN}(\text{RFDI}) + \beta_3\text{LN}(\text{RREM}) + \beta_4\text{LN}(\text{RDK}) + \beta_5\text{LN}(\text{REXP}) + \beta_6\text{LN}(\text{RIMP}) + \mu \dots \dots (3)$$

Unit Root Test

The augmented Dickey-Fuller test as suggested by Dickey and Fuller (1979) has been applied to test the presence of a unit root in time series data. There are three versions of the ADF test.

$$\Delta Y_t = \beta_1 + ZY_{t-1} + \alpha_i + e_t \dots \dots \dots 1 \text{ (Intercept only)}$$

$$\Delta Y_t = \beta_1 + \beta_{2t} + ZY_{t-1} + \alpha_i + e_t \dots \dots \dots 2 \text{ (Trend and Intercept only)}$$

$$\Delta Y_t = ZY_{t-1} + \alpha_i + e_t \dots \dots \dots 3 \text{ (no trend, no Intercept)}$$

The basic objective of this test is to examine the null hypothesis and alternative hypothesis.

Null hypothesis (Ho): Variables are not stationary or have unit roots, Alternative hypothesis (H1): Variables are stationary.

Engle-Granger Co-integration

If the regression model with non-stationary variables is run the regression model may be spurious or nonsense like model 1.1

$$\text{LNRGDP} = \beta_0 + \beta_1\text{LN}(\text{RTER}) - \beta_2\text{LN}(\text{RFDI}) + \beta_3\text{LN}(\text{RREM}) + \beta_4\text{LN}(\text{RDK}) + \beta_5\text{LN}(\text{REXP}) + \beta_6\text{LN}(\text{RIMP}) + \mu \dots \dots (1.1)$$

The symptom of a spurious regression of R-squared value would be greater than Durbin Watson Statistics. So Engle-Granger Model (ECM) is to be used as given below.

$$DLNRGDP = \beta_0 + \beta_1 D(LNRTER) - \beta_2 D(LNRFDI) + \beta_3 D(LNRREM) + \beta_4 D(LNRDK) + \beta_5 D(LNREXP) + \beta_6 D(LNRIMP) + \mu \dots (1.2)$$

The standard Granger Causality Test seeks to determine whether the past value of a variable helps to predict change in another variable. The definition states that in the conditional distribution, the lag value of Y_t adds no information to the explanation of the movement of X_t beyond the provided by the lag value itself.

Empirical Analysis

To examine the impact of LNRTER, LNRGDP is assumed as a function of LNRTER. The regression model has been employed to examine the impact of the variables. It was hypothesized that all the independent variables in the model have a significant positive impact on the Nepalese economy which is a proxy by LNRGDP growth and actually following results are obtained. Following the Augmented Dickey-Fuller (ADF) test, all series are non-stationary at level but stationary at first difference. However, ADF tests are often affected by the choice of the lag length (p) and lose power while estimating a large sample.

Unit Root Results at Log Level and First Difference

Variables	Log Level Form		First Difference	
	t-statistics	p-value	t-statistics	p-value
LNRGDP	-2.3826	0.1548	-7.2107	0.0000
LNRT_ER	-1.7414	0.4010	5.5653	0.0000
LNRFDI	-2.3090	0.1754	-7.7925	0.0000
LNRREM	-2.1970	0.2113	-7.2692	0.0000
LNRDK	-1.3638	0.5873	-6.4356	0.0000
LNREXP	-2.6435	0.0951	-7.7946	0.0000
LNRIMP	-2.7728	0.0742	-6.8554	0.0000

Source: Author's estimation results using Eviews-10, 2023

Since all the variables are stationary at the first difference using Schwarz info Criterion at maximum lag 2. So we should use the OLS technique. The results show that LNRTER is significant at 5 percent meaning the positive impact of LNRTER meaning a 100 percent increase in LNRTER leads to about 90 percent change in LNRGDP. If we drop all other variables there is positive relation between LNRGDP and LNRTER.

$$\text{LNRGDP} = 2.84 + 0.90\text{LNRT_ER},$$

$$\text{P-value} = 0.0816 \text{ at } 0.0000, \text{ t-value} = (1.7819) (5.5322)$$

$$R^2 = 0.4967, F - \text{test } 3060, \text{ SD} = 1.14, \text{ DW} = 0.81 \text{ (See Appendix)}$$

In the second model, the coefficient of LNRTER, LNRREM, LNRDK, LNREXP LNRIMP are positive as well as significant at a 5% level but LNRFDI is not significant at 5 percent as well as negative. It may be due

to a larger portion of spending driven out towards consumption of foreign produce goods from import.

$$\text{LNRGDP} = 3.2335 + 0.1016 \cdot \text{LNRTER} - 0.0046 \cdot \text{LNRFDI} + 0.0616 \cdot \text{LNRREM} + 0.0822 \cdot \text{LNRDK} + 0.1390 \cdot \text{LNREXP} + 0.6527 \cdot \text{LNRIMP}$$

P- value = 0.0000, 0.0106, 0.8295, 0.0317, 0.0296, 0.0036, 0.0000

t-value = (6.1852) (-2.7537) (0.2175), (2.2698) (1.2865) (3.1975)

(6.9449) $R^2 = 0.9935$, F – test 662.51, SD = 1.44, DW = 1.6973

(See Appendix)

To observe the long-run relation between the variables we approach Engle Granger which shows the residual term for stationary. The P-value is less than 1% and the absolute value of t-statistics is greater than the critical value of 10 percent, 5 percent even 1 percent. We reject the null hypothesis and accept the alternative hypothesis. So there is co-integration in order zero $I(0)$. Thus, the residual term being stationary at the level we can say there was the existence of co-integration in the long run. Therefore, we converted to the first difference for error correction.

Augmented Dickey-Fuller Unit Root test on ECM

Null Hypothesis: ECM has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=2)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-5.341301	0.0001
Test critical values:	1% level		-3.653730	
	5% level		-2.957110	
	10% level		-2.617434	
*MacKinnon (1996) one-sided p-values.				

In the third model, we see the ECMt-1 is known as equilibrium error its coefficient tells us the rate that corrects the disequilibrium of the previous period. The ECM coefficient must be negative for convergent equilibrium which is fulfilled in the model. Other coefficients of LNRDK LNRREM, and LNREXP are positive but not significant at the 5 percent level but LNRFDI is negative and insignificant at a given level. LNRIMP is positive and significant at 5 percent, which is shown in the following table.

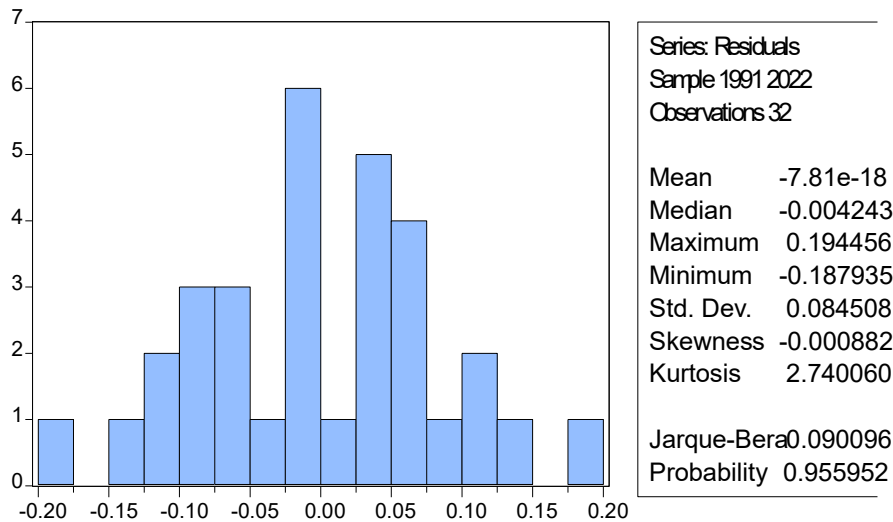
Table: The ECM Model

Dependent Variable: DLNRGDP				
Method: Least Squares				
Date: 04/29/23 Time: 19:32				
Sample (adjusted): 1991 2022				
Included observations: 32 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.0077	0.0184	-0.4188	0.6791
DLNRT_ER	0.0781	0.0400	-1.9532	0.0625
DLNRFDI	-0.0132	0.0148	-0.8909	0.3818
DLNRREM	0.0347	0.0333	1.0408	0.3083
DLNRDK	0.1681	0.1070	1.5701	0.1295
DLNREXP	0.0449	0.0942	0.4772	0.6375
DLNRIMP	0.6851	0.0902	7.5886	0.0000
ECM(-1)	-0.9672	0.2228	-4.3407	0.0002
R-squared	0.9758	Mean dependent var		0.1106
Adjusted R-squared	0.9687	S.D. dependent var		0.5432
S.E. of regression	0.0960	Akaike info criterion		-1.6356
Sum squared resid	0.2213	Schwarz criterion		-1.2692
Log likelihood	34.171	Hannan-Quinn criter.		-1.5142
F-statistic	138.26	Durbin-Watson stat		1.9046
Prob(F-statistic)	0.0000			

Source: Author's estimation results using Eviews-10, 2023

All the variables included in the model show the existence of regression. The R^2 of the model estimation is obtained at 0.97 which indicates that 97 percent of the variation in RGDP can be explained by the variation of independent variables. The computed F test is 138 is higher than the table value. The value of D-W is greater than R^2 indicating the model is free from the autocorrelation; Augmented Dickey-Fuller test has revealed non-stationary at the level and stationary when the variables are converted into the first difference. Similarly, the Angle Granger approach shows the long-run relation, the residual term is stationary at the level and the p-value is less than 5 percent. Similarly, the Error Correction Term (ECM) has a negative sign after estimation and is significant at the 5 percent level. If the P-value is less than 5 percent it corrects the error at the speed of 97 percent annually.

Model stability is checked by normal distribution, by observing R^2 and corresponding and corresponding P-values which are all greater than 5 percent. The result of Jarque-Bera statistics showed that J-B is 0.09 having a probability value of 90 percent. As the probability value is reasonably high, the residuals are normally distributed so the null hypothesis cannot be rejected following figure conforms to the normal distribution.

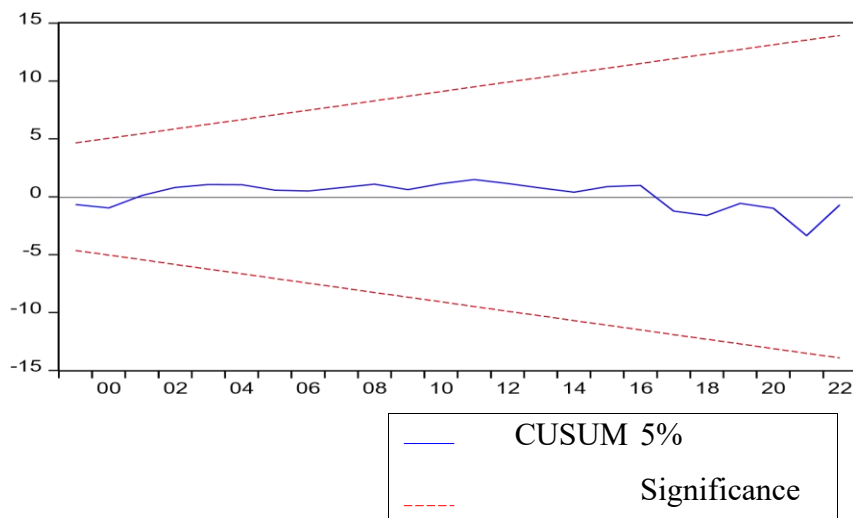


Source: Author's estimation results using Eviews-10, 2023

Similarly, the CUSUM test has no structural break limiting within the 5 percent boundary shown in the following figures.

Figure Residual Stability Test

CUSUM



Source: Author's estimation results using Eviews-10, 2023

Conclusion

This paper analyzes the impact of tourism receipts on real GDP growth in Nepal. Real GDP is the outcome variable, tourism income is the interest variable, and other variables like real foreign direct investment, remittance inflow, real domestic income, export earnings, import outflow, etc. are control variables. The Engle-Granger-Granger (ECM) with time series data starting from 1990 AD to 2022 AD was used. The findings of the paper show that there is a positive and significant relationship between tourism income and economic growth in the short run as well as the long run. The short-run result was shown by the OLS that the tourism receipts are positive as well as significant at 5 percent; in the paper, a 100 percent increase in LNRTER leads to about a 90 percent change in LNRGDP if all the variables are dropped. The unit root test of the ECM residual term being stationary at level proved that there is co-integration in the long run since $ECM_{(t-1)}$ was negative with a coefficient of 0.96 and significant at 10 percent, which showed that it corrected all the disequilibrium at convergent speed of 96 percent. However, the study shows that foreign direct investment and remittances had no significant relationship with RGDP. Statistically, FDI was not significant or negative. Both FDI and remittances are directed toward capital transfer and service duplication in the long run, rather than creating value for societies. FDI priorities have shifted from productive to non-productive sectors. This may be due to consumption from national sources. It shows cases of production from imported raw materials. Meanwhile, exports show a positive but insignificant relationship with RGDP, which implies that increasing export production from imported raw materials

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APPENDIX –I Pairwise Granger Causality

Pairwise Granger Causality Tests

Date: 04/29/23 Time: 20:03

Sample: 1990 2022

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
DLNRT_ER does not Granger Cause DLNRGDP30	0.01847	7	0.98
DLNRGDP does not Granger Cause DLNRT_ER	0.20037	7	0.81
DLNRDK does not Granger Cause DLNRGDP 30	0.01178	3	0.98
DLNRGDP does not Granger Cause DLNRDK	1.24286	8	0.30
DLNRFDI does not Granger Cause DLNRT_ER	1.39249	1	0.26
DLNRT_ER does not Granger Cause DLNRFDI	1.19187	3	0.32
DLNRREM does not Granger Cause DLNRT_ER	0.32535	3	0.72
DLNRT_ER does not Granger Cause DLNRREM	0.32514	4	0.72

DLNRDK	does	not	Granger	Cause			0.41
DLNRT_ER					30	0.91937	8
							0.66
DLNRT_ER	does	not	Granger	Cause	DLNRDK	0.41186	8
<hr/>							
DLNREXP	does	not	Granger	Cause			0.81
DLNRT_ER					30	0.20355	2
							0.89
DLNRT_ER	does	not	Granger	Cause	DLNREXP	0.10716	8
<hr/>							
DLNRIMP	does	not	Granger	Cause			0.65
DLNRT_ER					30	0.43427	5
							0.80
DLNRT_ER	does	not	Granger	Cause	DLNRIMP	0.21927	6

Source: Author's estimation results using Eviews-10, 2023

APPENDIX-II Lag order selection Criteria

VAR Lag Order Selection Criteria

Endogenous variables: LNRGDP LNRT_ER LNRFDI

LNRDK LNRREM LNREXP LNRIMP

Exogenous variables: C

Date: 04/29/23 Time: 20:10

Sample: 1990 2022

Included observations: 31

Lag	LogL	LR	FPE	AIC	SC	HQ
	-134.834	NA	2.22e-0	9.15061	9.47442	9.25617
	-20.5434	169.593*	3.58e-0*	4.93828	7.52871*	5.78269*
	30.5066	52.6968	5.35e-0	4.80602*	9.66307	6.38929

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Source: Author's estimation results using Eviews-10, 2023

APPENDIX-III Unit Root Error Correction

Null Hypothesis: ECM has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=2)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.341301	0.0001

Test critical values: 1% level	-3.653730
5% level	-2.957110
10% level	-2.617434

*MacKinnon (1996) one -sided p-values.

Source: Author's estimation results using Eviews-10, 2023

APPENDIX –IV Measure of LNRTER Impact on LNRGDP

Dependent Variable: LNRGDP

Method: Least Squares

Date: 04/29/23 Time: 18:22

Sample: 1990 2022

Included observations: 33

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.842377	1.595084	1.781961	0.0846
LNRT_ER	0.908807	0.164276	5.532214	0.0000
R-squared	0.496797	Mean dependent var	11.63070	
Adjusted R-squared	0.480565	S.D. dependent var	1.147579	
S.E. of regression	0.827081	Akaike info criterion	2.516864	
Sum squared resid	21.20595	Schwarz criterion	2.607561	
Log-likelihood	-39.52825	Hannan-Quinn criteria	2.547381	
F-statistic	30.60540	Durbin-Watson stat	0.804504	
Prob(F-statistic)	0.000005			

Source: Author's estimation results using Eviews-10, 2023

APPENDIX V Measure of LNRTER and Other Variables

Dependent Variable: LNRGDP

Method: Least Squares

Date: 04/29/23 Time: 18:38

Sample: 1990 2022

Included observations: 33

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.233570	0.522785	6.185282	0.0000
LNRT_ER	0.101659	0.036916	-2.753768	0.0106
LNRFDI	-0.004694	0.021576	-0.217564	0.8295
LNRRREM	0.061660	0.027165	2.269827	0.0317
LNRDK	0.082209	0.063899	1.286544	0.0296
LNREXP	0.139045	0.043485	3.197529	0.0036
LNRIIMP	0.652779	0.093994	6.944902	0.0000
R-squared	0.993502	Mean depend	ent v	11.6307
Adjusted R-squared	0.992002	S.D. dependent var		1.1475
S.E. of regression	0.102629	Akaike info criterion		-1.5295
Sum squared resid	0.273849	Schwarz criterion		-1.2121
Log-likelihood	32.23786	Hannan-Quinn criteria.		-1.4227
F-statistic	662.5137	Durbin-Watson stat		1.6973
Prob(F-statistic)	0.000000			

Source: Author's estimation results using Eviews-10, 2023

NCCS Research Journal

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Thank you.



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