

Research Article

Chi Square Test Analysis in Use of Digital Library on the Basis Gender, Education Levels, and Regional Differences

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Abstract

Library and Information Science (LIS) relies on effective management to organize, deliver, and enhance information services, ensuring efficient resource use and meeting user needs. In today's digital age, access to online resources is crucial, especially in education. Universities, including Nepal Open University (NOU), have ensured students, teachers, and researchers across all levels—from Bachelor's to PhD—can easily use digital libraries, regardless of their location. This study, involving 200 respondents, basically used Likert Scale questions which were validated through SPSS data analysis tool, explored the impact of gender on digital resource usage, revealing a significant link between gender and resource access but no strong correlation with education level or urban-rural residence or region. Value (V) represents Chi Square Statistics, Degree of Freedom (df) represents to the number of categories in the data and affects how the test is calculated. And P Value relationship between the two variables. In this study, ultimately, gender shows the association in use of digital resource but education level and region validate the no strong association or relation in the use of digital resources which is experimented though the lens of Chi Square hypothesis highlighting their broad accessibility. Regardless of their geographical setting, individuals proficient in internet usage can seamlessly access digital resources, emphasizing the universal accessibility of these resources and education level doesn't affect in the use of digital resources.

Keywords

Digital Resource, Chi Square, P Value, Digital Literacy, Level, Gender, Region

1. Introduction

Library is the paramount factor of disseminating the information of different enterprises and their products. Information management system includes strategic planning, resource allocation, staff coordination, and service delivery, all of which are vital to maintaining a well-functioning library system. In modern libraries, management also involves the integration of technology, digital resource management. A leading PDM (Product Data Management) system is used to

manage all the information and knowledge that is made available to internet/intranet users in a controlled manner [1]. Digital resource management improves the services to meet evolving user demands. Nepal Open University Central Library is part of a collection of academic libraries and was established in 2016 to support educational endeavors. Initially, NOUCL faced challenges due to a lack of books and adequate facilities. The library's collection consisted of a mere 350

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Received: 7 February 2025; **Accepted:** 21 February 2025; **Published:** 6 March 2025



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books, stored haphazardly on stacks made from bricks and wooden planks in a cramped space. Generous donations from Informal Sector Service Center for Human Rights and Social Justice (INSEC) and Substitute Recruitment Initiative (SUBIN) helped initially stock the library. Unfortunately, without a trained librarian, the books remained disorganized and lacked a systematic arrangement. Digital assets like texts, images, audio files, videos, datasets Metadata provides information about the digital assets such as title, author, publication date, subject, and keywords. It helps users to search, identify, and retrieve relevant resources efficiently. Digital library of Nepal Open University has significant storage capacity to store large volumes of digital assets. This includes servers, data centers, and cloud storage solutions. By leveraging these means and resources, digital library of Nepal Open University has offered users convenient access to a wealth of digital resources while ensuring the preservation and integrity of the collections.

Ranganathan's five laws of library science prioritize the harmonious collaboration between users' demands and needs, aiming to minimize time, budget, and effort while embracing the concept of the library as a growing organism. 'Every reader his/her book' [2] is the second law of Ranganathan which focuses on readers should have the priority of selection of books.

Digital library possesses books, magazines, pamphlets, reports, microfilms, maps, manuscripts, motion pictures, and any other types of audiovisual records are included [3]. Libraries play a crucial role in acquiring, processing, and storing a diverse range of materials, both in print and non-print formats. This encompasses books, magazines, pamphlets, reports, microfilms, maps, manuscripts, motion pictures, and various audiovisual records. The library's comprehensive collection ensures accessibility to a wealth of information for its users, fostering education, research, and cultural exploration.

A reference service which Nepal Open University provides are all digitized documents excepts some books. However, the enjoyment of comprehending human nature and dealing with complex issues should not be seen as the beginning and end of librarianship. They serve simply as a means to an end. What exactly is a library? A library is a collection of books that are stored for public use. Librarianship, then, serves as a link between a user and a book. As a result, the very life of a library is the personal service provided to the public [4]. Within a library, various sections can be found, one of which is the reference section. This section houses collections of reference materials designed to assist users in locating specific information. Reference materials encompass a wide range of resources, including bibliographies, dictionaries, directories, encyclopedias, and more. These materials serve as valuable tools for delving deeper into various subject fields. Referred to as reference sources, they act as a guide, leading users to the desired destination of information in a comprehensive manner [5]. For librarians, reference materials serve as instructions to aid users effectively. Without these reference materials, the

provision of reference services would lose its purpose and value.

1.1. Hypotheses

H0: There is no relationship between gender and use of digital resource

H1: There is relationship between gender and use of digital resource

H0: There is no relationship between education level and using section of library.

H2: There is relationship between education level and using section of library.

H0: There is no relationship between users' group of rural or urban and digital resource.

H3: There is relationship between users' group of rural or urban and digital resource.

1.2. Objectives

This study has some objectives which are listed below:

1. To explore the relation between gender and digital resource use.
2. To find out relation between education level and using section of digital resource
3. To compare between rural and urban residing students digital resource use.

2. Literature Review

Digital literacy is a crucial component of modern library services. Libraries have evolved from being primarily repositories of physical books to dynamic centers of information and knowledge that provide access to digital resources, technology, and expertise. Here's how digital literacy is integrated into library services. "Digital literacy researchers explore a wide variety of topics including how people find, use, summarize, evaluate, create and communicate information while using digital technology" [6], p, 297. He studied about the importance of digital literacy in public libraries in West Bengal of India. And further clarifies about the meaning and reference of digital literacy here.

Gender is one of the important factor which affects in the workplace and varies the priorities of getting employment as the librarian. The recent study of 2025 Ashiq et. al. of Pakistani library has found that 'the circumstances of professional employment and leadership roles for women starkly contrast with those in emerging nations and among minority populations' [7] Here women get less priority to get job and to use the digital library. It vividly shows the strong relationship of using digital resources in gender basis.

In the realm of digital content creation competency, a notable gender disparity emerges, with male students often exhibiting greater proficiency compared to their female counterparts. In Nepal Open University also, there is a smaller

number of female students. This discrepancy is attributed, in part, to the differing roles and time commitments experienced by individuals based on gender within the home environment. Historically, societal norms have placed a heavier burden on females for domestic responsibilities, leaving them with limited time and resources to dedicate to developing digital content creation skills. Conversely, male students may encounter fewer household obligations, affording them more opportunities to engage in activities conducive to honing digital competencies. In the digital content creation competency area, the superiority of male students appeared over female students because of their time and different role in home [8], p7. This imbalance underscores the importance of addressing gender-specific barriers and promoting equitable access to resources and opportunities in digital skill development.

Chi Square Test is appropriate when two variables are observed. To apply Chi Square Test a scholar Nihan Sölpük Turhan presents says ‘Observed and expected observations are to be collected randomly. All the members (or items) in the sample must be independent. None of the groups must contain very few items (less than 10). The number of total items must be quite large (at least 50)’ [9], P 567 Here, the author brings the parameters of observing the two values. In this thesis all the variables are observed in two categories. To interpret the Chi Square test the value plays the important role. P value shows the association or dissociation of the variables.

Bekerson says “Values over 0.999 have sometimes been reported which, if the hypothesis were true, would only occur once in a thousand trials. In these cases, the hypothesis considered is as definitely disproved as if P had been 0.001.” I can only interpret this to mean, applied here, that the hypothesis that the distribution comes from a normal universe is to be rejected just as definitely as it would have been if the P had been 0.004 [10], P527. In this excerpt, we detect that when P value is less when the taken samples are more in numbers or more than 50.

3. Research Methodology

To study this topic ‘Chi Square Test Analysis in Use of Digital Library on the Basis Gender, Education Levels, and Regional Differences’ a procedure is essential. So, to penetrate in the study area certain methodology was applied which is mentioned below. Research methodology is a procedure and data analytical process from which a result is found out [11]. Research methodology refers to the systematic, theoretical framework that guides the entire research process. It encompasses the principles, procedures, and rules employed by researchers to design, conduct, and analyze a study or investigation. The methodology serves as a roadmap, outlining the steps and techniques researchers will use to collect, analyze, and interpret data, ensuring the reliability and validity of their findings. It involved the selection of appropriate research design, data collection methods through the questionnaire and

statistical or qualitative analysis techniques. The total population of the students of Nepal Open University is around 3700 from where random sampling method was implemented and 200 population samples were collected whose inferential answers were quantified and proceed with applying different formulae to mitigate the current issue of Nepal Open University.

200 samples or responses were recollected from PhD, MPhil, Masters and Bachelors Students. There were two types of questions, General types of questions which helped to explore mean, median, mode and standard deviation. But Likert Scale questions helped to observe relation of gender, region and education level with the help of Chi Square hypothesis testing. The analytical part was developed by observing the result of the testing and was found out the relation of education level, gender and geographical location.

The chi-square test is a statistical method used to determine if there is a significant association between two categorical variables. To interpret the data of Nepal Open University Chi Square hypothetical testing was used. SPSS data analysis helps to find out the correlation also, ‘correlation is done to determine the strength and direction of a linear relationship between two variables’ [12], P 76. In this study two variable are observed and P value is calculated there. It also proved the evidences giving the concrete result to apply the Chi Square hypothesis analysis. The chi-square test calculated a test statistic, known as the chi-square statistic, which measures the discrepancy between the observed and expected frequencies. The larger the difference between observed and expected values, the larger the chi-square statistic. The test then assesses whether this difference is statistically significant. “The chi-square test is computationally simple. It is used to examine independence across two categorical variables or to assess how well a sample fits the distribution of a known population goodness of it” [13], P 449. The chi-square test is a straightforward statistical tool used to check if two things, like preferences for different categories, are connected or independent. Chi Square test is used to check if a small group of data matches what we expected from a larger population, ensuring that our sample accurately represents the overall distribution.

In a nutshell, the Chi Square test was the appropriated and simple method to explore connections between categories or to validate if our data aligns well with expectations from a bigger picture regarding the use of digital resources of Nepal Open University Central Library.

4. Material and Methods

This chapter elucidates the process of evaluating and presenting data to the acquired data for its validation. The primary goal of analyzing and presenting data is to transform information from an unprocessed form to a processed one in an intelligible presentation utilizing various presentation tools such as tables, charts, and diagrams, among others. Data analysis entails arranging, tabulating, and doing statistical

analysis. Basic data organization is accomplished through data analysis and presentation. The results of the analysis are reported in the following sections utilizing various statistical tools based on questionnaire replies. Descriptive analysis through the SPSS tool and finding the association of level, gender and location of users of Nepal Open University and analyzing through Chi Square hypothesis experimentation is the main focus of this study.

4.1. Studying the Relation Between Gender and Use of Digital Resources

Gender differences in the use of digital resources has been studied in this research study that is great scrutiny in recent years after the Covid 19 period. This research focuses on the notable variations in how individuals on the basis of genders are engaged with digital resources of digital library of Nepal Open University on the basis of gender, education level and location from where the users use. Traditionally, men have been more inclined toward technology-related fields but this study has mentioned the effective participation of women although they have the barriers of society and household works. Efforts are underway to bridge this gap by promoting gender-inclusive digital education, encouraging diverse participation in STEM (Science, Technology, Engineering and Mathematics) fields, and fostering an environment that empowers individuals of all genders to harness the benefits of digital resources.

In contemporary society, however, the digital landscape is evolving, and so are the patterns of digital resource utilization among different genders. The ongoing shift towards a more interconnected and tech-driven world is gradually breaking down traditional gender norms associated with technology. As digital literacy becomes an essential skill across various sectors, both men and women are increasingly recognizing the importance of leveraging digital resources for personal, academic, and professional growth. Nepal Open University Central Library is being prominent source for the students of Nepal and across the country. In this situation, various questionnaires are prepared and asked to the users. Here are some Likert Scale questions to find out the objectives. The table is mentioned below.

Table 1. Digital resources used by female and male.

Digital Resources	Female	Male
Journal	62	123
Teacher hands out	24	101
Text Book	27	78
Google Scholar	41	162

Table 2. Chi square experimentation of gender and use of digital resources.

Chi Square Test	Value	df.	P Value
Pearson Chi-Square	11.94378	3	0.008

The Table 2 presents the inferences of the respondents through the Likert Scale questions. And the answers were calculated and are mentioned in the above tables. In surface, we can evaluate that female category has preferences in number 154 among journal, teachers hand out, text books and Google Scholar and there are 464 preferences of male are accumulated here among journal, teachers hand out, text books and Google Scholar. And there are 618 preferences among males and females.

4.2. Relation Between Gender and Use of Digital Resources

Chi Square Test Results

Chi Square Statistics: (χ^2): 11.94378

Degree of Freedom: 3

P- Value: 0.008

Effect Size (Cramer's V): 0.139

Interpretation

Statistical Significance: The P value being less than 0.05 indicates a statistically significant association between gender and digital resource. In this study, there are 155 males and 45 females participated in the correspondence among more than 3700 students.

Effect Size: The effect size of 0.139, although statistically significant, is on the smaller size, suggesting that while gender and digital resources have the moderate relation.

Practical Implication: Most of the users are job holders and adult aged, basically diverse area, remote and town. On gender basis, female are more occupied in household works who have the hinderance of using devices all the time. Although, the women are also benefited through the digital resources of Nepal Open University Central Library.

Result Presentation

To judge the relation between gender and use of digital resource, Chi Square test of independence was found out. Our observed frequencies were 200 among more than 3700 students. From there, 155 males and 45 females are taken as sample.

The analysis resulted in a Chi Square Statistics (χ^2): 11.94378, with 3 degrees of freedom. The associated P value is 0.008, below the alpha level of 0.05, suggesting a statistically significant association between gender and use of digital resources.

4.3. Relation Between Education Level and Use of Digital Section

Table 3. Education level and use of digital section.

Level	Sections		
	Journal	Text Book	Dissertation
Bachelor & Master	23	18	5
MPhil & PhD	9	2	3
Total	32	20	8

Table 4. Chi-Square Test on education level and use of digital section in SPSS.

Test	Value	df.	P Value
Pearson Chi-Square	3.29580745	2	0.192

The Table 4 represents the distribution of sections across different educational levels and types of publications, namely journals, textbooks, and dissertations. Firstly, the data is categorized into two educational levels: Bachelor & Master, and MPhil & PhD. For the Bachelor & Master level, there are a total of 23 sections in journals, 18 sections in textbooks, and 5 sections in dissertations. This means that when people are studying at the Bachelor's and Master's level, they tend to contribute more to journals and use textbooks extensively, while the number of dissertation sections is comparatively lower.

On the other hand, for the MPhil & PhD level, there are 9 sections in journals, 2 sections in textbooks, and 3 sections in dissertations. This indicates that at the MPhil & PhD level, students and researchers focus more on contributing to journals and writing dissertations, with a relatively lower emphasis on textbooks. In total, when you combine both educational levels, there are 32 sections in journals, 20 sections in textbooks, and 8 sections in dissertations. This overall summary shows the combined contributions and usage across all levels, providing an overview of the distribution of sections in different types of publications.

Chi Square Test Results

Chi Square Statistics: (χ^2): 3.29580745

Degree of Freedom: 2

P- Value: 0.192

Effect Size (Cramer's V): 0.234

Interpretation

Statistical Significance: The P value being more than 0.05 indicates a statistically no association between education level

and section of digital resource. In this study, there are two level which are merged in one table of Bachelors and Masters and other MPhil and PhD are also kept in one category, from there samples were carried out and explained.

Effect Size: The effect size of 0.234, presents statistically no relation between education level and section of digital resource, is on the bigger than alpha value, size, suggesting that while education level and section of digital resource have no relation.

Practical Implication: The users of Nepal Open University library are associated with device and internet services, Bachelor and Master students also have the preferences in digital section of journal and articles and PhD and MPhil students also use textbook there, in this case, there is no relation of education level and use of digital sections of Nepal Open University Central Library.

Result Presentation

In the findings of relation between education level and digital section, Chi Square test of independence was found out. Among the 3700 users 200 respondents were taken as a sample. In education level 53 students from Bachelor, 80 students from Masters, 57 from Mphil and 10 from PhD level were chosen. They have voluntarily participated in answering the questionnaires.

The analysis resulted in a Chi Square Statistics (χ^2): 3.29580745, with 2 degrees of freedom. The associated P value is 0.192, above the alpha level of 0.05, suggesting a statistically no relation between education level and digital section.

4.4. Use of Digital Resources Through Urban and Rural Residential Users

Table 5. Chi Square test on rural and urban users and digital resources SPSS.

Test	Value	Df	P Value
Pearson Chi-Square	1.220555	3	0.748

4.5. Relation Between Use Digital Resources and Regions

Chi Square Test Results

Chi Square Statistics: (χ^2): 1.220555

Degree of Freedom: 3

P- Value: 0.748

Effect Size (Cramer's V): 0.045

Interpretation

Statistical Significance: The P value 0.748 being more than 0.05 indicates a statistically no association between rural and urban users and use of digital resource. In this study, there are 200 participants who have the choices of Rural municipality, Municipality, Sub Metropolitan City and Metropolitan City. Rural was one and other three were merged in urban living respondents. In this census, 56 respondents are from rural area and other 144 respondents belong to urban area.

Effect Size: The effect size of 0.045, presents moderate relation between education rural and urban users and use of digital resource, is almost similar to alpha value size, suggesting that while rural and urban users and use of digital resource have no relation from Chi Square test but moderate relation from effect size.

Practical Implication: The preferences of respondents from various places presents that all people can participate in teaching learning activities of NOU using digital library. There is no association between rural and urban users and use of digital resources.

Result Presentation

The result displays the no relation between users of rural and urban and use of digital resources. Chi Square test of independence was found out. Among the 3700 users 200 respondents were taken as a sample. 56 respondents were from rural and far villaged students who are truly benefited through the digital resources. And even urban people also have used this. It indicates that there is no relation of geographical region.

The analysis resulted in a Chi Square Statistics (χ^2): 1.220555, with 3 degrees of freedom. The associated P value is 0.748, above the alpha level of 0.05, suggesting a statistically no relation between rural and urban users and use of digital resources in Nepal Open University Central Library.

5. Conclusion

In conclusion, Chi Square hypothesis test was examined in the study. The variables affecting in the use of digital resources like gender, education level and regions were relationally studied. The gender and use of digital resources showed the strong relation. Likewise, education level and use of digital sections carried out the result about no relation, it genuinely showed that Bachelor/Master students are prompt up in using digital resource. The third hypothesis about studying the relation of use of digital resource and regions (rural and urban) brought out the result of no relation. It vividly

proved that users from anywhere else can use the digital resources.

Hypothesis about gender and use of digital resources is examined through Chi Square test, and various Likert Scales questions. It is found that gender also is issue influencing in of use of library and digital resources. Through Chi Square test it is found that there is strong relationship between the variables (gender and use of digital resources) which is experimented here. The p-values are relatively high, suggesting that the observed associations couldn't be matched as we have expected. So, null hypothesis is rejected and alternative hypothesis H1 is accepted. Objective first is applied here but it had two options to experiment whether there is relation of gender and use of library or not. But through this analysis, we can prove that alternative is applied. There is strong relationship between gender and use of digital resource or digital library of Nepal Open University. This is a statistical test used to determine if there is an association between two categorical variables.

Similarly, finding out relation between education level and using section of digital resource can be concluded as: Here is no association between the digital section and education level. Bachelor level students and Masters level students they use the digital resource effectively and PhD and MPhil students also effectively use the digital resource so, we do not find strong association between education level and use of digital sections. So, education level contributes in diversification in the choices and preference. Here, it is closely associated with the null hypothesis, the both variables education level and use of digital resources don't show the strong association. And the P value from SPSS application is found 0.192. It is $0.192 > 0.05$, which suggests there is no strong relationship between the education level and use of digital resources.

In the third hypothesis, Rural and Urban residing users and use of digital resources also doesn't show the significance relation of use of digital resources, there is no association of region and the use of digital resources. So, null hypothesis is applied here, the student who is friendlier enough with internet can use the digital resource of library using the device from anywhere else. Through SPSS data validation process also is analyzed from P Value, it is $0.748 > 0.05$. It confidently suggests that null hypothesis is accepted in this third hypothesis.

It is very important facts found in the study that the users from any region can promptly use the digital resource which is proved through hypothesis 3. Nepal Open University has to develop the high bandwidth services for the users. Similarly, gender is the factor which could affect the use of digital resources. Through the participation of the respondents also there are less participants of female. The first hypothesis proved the strong relation of gender and use of digital resource. Another study of relation between education level and use of digital sections proved the null hypothesis. Nepal Open University has to make the plan of incorporating all students of all level. Bachelor and Master students they are using

books, journal and digital resources all and MPhil and PhD students also have the preferences of books and other digital resources. These are the important things to be adopted by Nepal Open University. Library and Information System (LIS) is a discipline that promotes an integrated approach to identifying, capturing, evaluating, retrieving and sharing of an enterprises' information assets in the management system [14]. Library and Information Science (LIS) and management are closely intertwined, as effective management principles are essential for the efficient operation of libraries and information centers. Management practices in LIS ensure the proper organization, access, and preservation of information resources while addressing the needs of users.

In nutshell, in the experimentation of the hypothesis regarding gender and the use of digital resources the second hypothesis, exploring the connection between education level and the use of digital resources, the third hypothesis, investigating the relationship between rural and urban residential users and the use of digital resources suggest that individuals proficient with the internet in both rural and urban settings can utilize digital resources comfortably. Nepal Open University digital library has the significance of using its resources is applied by Department of Law and Management, Department of Social Science, Department of Science and Technology and many other users from different spectrum.

Abbreviations

LIS	Library and Information Science
NOU	Nepal Open University
PDM	Product Data Management
NOUCL	Nepal Open University Central Library
INSEC	Informal Sector Service Center for Human Rights and Social Justice
SUBIN	Substitute Recruitment Initiative

Acknowledgments

The authors are really grateful to the correspondents who filled up the questionnaire. They worked together to explore this issue about the digital resources use of Nepal Open University. They are thankful to the other experts who directly and indirectly helped them.

Author Contributions

Pooja Dhakal: Conceptualization, Data Collection, Investigation, Final draft writing

Lila Nyaichyai: Data analysis, Validation, Methodology, Resources, Visualization

Funding

There is no source of funding used in this research paper.

The researchers genuinely are dedicated to explore the issue of using digital resource in university level education.

Conflicts of Interest

The authors declare no conflicts of interest.

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