Investigating Gender Differences in Green IT Awareness among University Librarians

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Abstract

Gender differences in green IT awareness and practices were the primary focus of the study. This study was carried out in the Libraries of Public and Private Universities in the Lahore and Gujranwala Divisions. This study aimed to investigate the gender differences regarding personal norms of university librarians, gender differences regarding the behavioral intention to use green computing in libraries, gender differences regarding the ascription of responsibility regarding the use of green computing in libraries, and gender differences in terms of green computing for environmental concerns regarding the use of green computing in libraries. This study adopted a quantitative research design. The data were collected from 46 universities located in Lahore and Gujranwala. Seventy-five male and 57 female librarians provided data to complete this research. In data collection, the researcher employed a closed-ended questionnaire. According to the current study, respondents agreed that they are aware that e-waste generated by computer equipment contributes to global warming, that informal disposal is harmful to our environment, and that operating systems cause significant local ecological damage. The majority of respondents agreed that green computing practices could help libraries save energy and help reduce local environmental damage, as demonstrated by the results.

Keywords; Gender differences, Green IT awareness, University Librarians, Lahore, Gujranwala

Introduction

The environment is affected by climate change all over the world. Right now, the demand for new green-electronic devices is rising at an alarming rate. To meet the rising demand for these electrical and electronic devices, production is expanding rapidly. In this century, when

going green is a pressing requirement in many areas of life, then IT organizations must support the green agenda. In accordance with this agenda, Green Information and Communication Technologies" (GICTs) were created with the intention of assisting in the implementation of environmentally friendly technologies as a direct result of this. green technologies are popular as green computing that refers to efficient and cost-effective use of a laptop and other IT tools. The authors Dookhitram et al. (2012) state that the term green computing is the study with this application of computational resources in a way that is both energy efficient and friendly to the environment. Podder and Smanta (2022) argue that green computing technology creates a friendly environment by ensuring minimum energy consumption and decreasing environmental waste when a user uses a computer.

Shehzad (2023) argues that one of the main factors altering global climate designs is changed. Pakistan is one of the ten most affected countries by global warming. Climate change is a serious threat to social, environmental, and economic development in developing nations like Pakistan. This climate change also causes migration within and outside the country. In Pakistan, the increasing frequency of droughts, flooding, increasingly intermittent weather behavior, shifts in agricultural patterns, a decrease in the supply of fresh water, and the loss of biodiversity are all indicators of the possessions of global environment transformation. Climate change can be combated primarily through mitigation and adaptation measures. Preparing for adaptation to climate change is the nation's most immediate and pressing task (NCCP, 2021)

In accordance with the Ministry of climate change (2022), the major aim of the government is to formulate environmental legislation, which includes interprovincial, regional, and international laws. Sustainable development, water and sanitation, and sustainable urbanization are also emphasized. The Ministry of Climate actively participates in national disaster management policy, plans, and programs and is concerned with climate change, desertification, environmental preservation, pollution, ecology, forestry, wildlife, and biodiversity.

Additionally, it works by implementing environmental agreements with other nations, international organizations, and forums, as well as by coordinating, monitoring, and coordinating. In addition, the ministry is a part of the process of developing policies, coordinating efforts, and reporting on human settlements, such as urban sewage, drainage, and

water supply. Bhandari (2022) argues that the establishment of SDPI in August 1992. The NCS incorporated a national environmental plan into Pakistan's socioeconomic development. NCS main objective is to serve as an example of sustainable development, which strives to enhance peace, social justice, and general well-being for people of all ages.

Since 1995, a series of Sustainable Development Conferences (SDCs) have been held by the Sustainable Development Policy Institute (SDPI). The SDPI's flagship event, the SDC, is a chance for other regional researchers, practitioners, policymakers, and academics to present their work and interact with other panelists and the audience simultaneously. Because it focuses primarily on Asia, this annual event has developed into a significant South Asian conference. =

. The anthology is then made widely available by the publisher and Sustainable Development Policy Institute at the subsequent SDC (Sustainable Development Policy Institute, 2022). In accordance with the Pakistan Environmental Protection Ordinance, the Provincial Environmental Protection Agency was established on December 31, 1983. In 1985, the Housing Physical and Environmental Planning (HP and EP) Department was asked to delegate authority by the Federal Government. The Punjab Environmental Protection Agency (EPA) was established on July 1, 1987. Punjab was the first province to establish an EPA for its citizens' benefit. The EPCO staff individuals' migration to EPA, Punjab, was dealt with by the HP and EP Division.

The Environment Protection Department (EPD), a distinct Punjab Government administrative unit, was established on December 31, 1996. The EPA Punjab now functions as a functional unit under the EPD, Punjab, having been separated from the HP and EP Department at that time. The current Pakistan Environmental Protection Ordinance (PEPO) from 1983 was overturned on February 11, 1997, when the Pakistan Environmental Protection Act (PEPA) of 1997 was declared. The PEPA Act 3 entrusted some responsibilities to the EPA, Punjab. The Environment Protection Agency (EPA) Punjab is a subordinate division of the Environment Protection Department (EPD) with the following duties:

Implements international agreements, identifies legislative needs in a variety of environmental fields, ensures field visits for the anti-dengue campaign in four designated locations, and gives the general public information and direction on environmental issues

(Environmental Development Program, Punjab, 2022). EPA promotes tree planting for Clean Green Pakistan and raises environmental awareness through seminars, workshops, and training.

Literature Review

Obafemi et al. (2023) argue that green computing has been researched by many researchers in the recent years as green computing is very significant in this era, the era of global warming. One of the most significant aspects of planet Earth is the environment. The environment plays an important role in the sustenance of living organisms on the planet. The environment quality has a direct impact on the quality of the species that inhabit it (Habibullah, 2018). As a result, understanding the relevance of the environment for the existence of all living organisms is critical. Nowadays environment is wooded, which has the most natural resources while also providing a habitat for a variety of living creatures. However, the preponderance of the world's forests has started to disintegrate as a result of human acts such as felling trees without considering the consequences (Hajar & Waluyo, 2017).

Sustainable Developments in Libraries

It is important to define words linked to environmental education and show how they connect. In this perspective, sustainable development (SD) is critical; it is a solution to modern-day concerns, such as the environment plays a significant role life. While the most commonly cited SD description obtained from the "World Commission on Environment and Development's Our Common Future" report states that "sustainable development is a development that meets the needs of present generations without jeopardizing future generations' ability to meet their own needs." SD has three complementing objectives: societal, economic, and environmental (Fedorowicz, 2020).

American Library Association ALA identified development stages of sustainability as a fundamental objective of the profession in 2019 (ALA, 2019). Various aspects of library sustainability are examined One of these is the ecological context, which is discussed from the standpoints of sustainable development, greening as a marketing technique, sustainability initiatives, sustainable IT, collection management, environmental consciousness, and awareness campaigns (Gisolfi, 2015).

Knowledge, abilities, and behaviors gained on the basis of activities in the education are critical in a globalized society that is confronted with numerous issues, including environmental destruction and natural resource depletion, smog, overconsumption, climate change, extreme weather, and forest destruction. Environmental education aims to improve ecological consciousness, spread natural-environmental information, as well as create sensitivity and encourage pro-environmental behaviors. As a result, libraries became "green educators"/"green instructors," and environmental education, along with environmental leadership, is recognized as a major issue for contemporary libraries (Ghorbani et al., 2016).

Proposed Framework of the Study

"Norm-activation Theory (NAT)" was introduced by Schwartz (1977) to define the relationship between "activators", "personal norms", and behavior" (Harland et al., 2007). NAT was originally designed to explain helpful behavior, but it was later broadened to include all altruistic pro-social activity, and it is commonly used to characterize moral decision-making, such as pro-environmental behavior (Harland, 2007). However, activating personal standards is insufficient for pro-social conduct since they can be negated by rejecting the implications of individual acts on others or denying the obligation to act. Following is the proposed theoretical frame work of the current study.

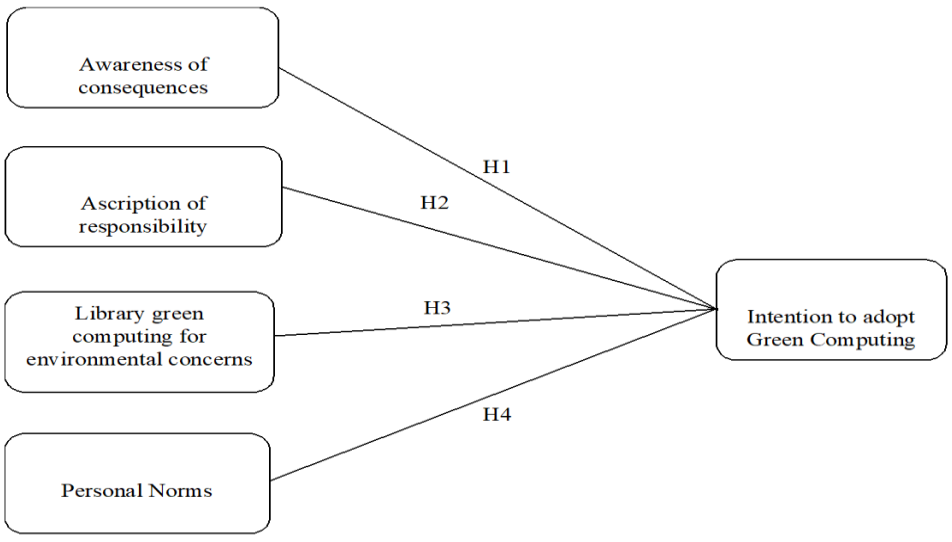

Figure 1. Research model

Hypotheses of the Study

H1. "Awareness of consequences has a direct effect on use of green computing in libraries"

H2. "Ascription of responsibility has a direct effect on use of green computing use in libraries"

H3. "Personal norm is positively related to behavioral intention to use green computing in libraries"

H4. "Libraries green computing for environmental concerns is positively related green computing use in libraries"

Intention to Adopt Green Computing

Cordero et al. (2022) argue that in any organization green computing has a significant role. The component is a key detail with inside the principle of deliberate conduct, and the more the aim to have interaction in a conduct, the more the probability to act appropriately. It is the willingness and backbone positioned up via way of means of the human beings that shape conduct. Behavioral aim refers to a person's subjective possibility that he'll carry out a few conducts. The TPB says that conduct is particularly pushed via way of means of the aim to carry out, so the primary predictor of a conduct is the aim. This relationship has been tested via way of means of many researchers. Esfahani et al. (2015) found that aim to undertake inexperienced IS won the primary rank most of the different elements concerning the significance of its have an effect on on adoption conduct. This is likewise real with Zhang et al. (2020) regarding Chinese resident waste classification.

The concept of Awareness of Consequences

Liehr, & Smith (1999) argued that this construct is very influential and important in the theory and is related activation theory. This theory argues that the person's behavior can be activated through this construct and this theory proposes that awareness of consequences is very influential factor to activate a person's personal commitment in his or her performance. This means that the more people are aware of the positive effects of adopting sustainable agricultural practices, the more they may feel the social pressure to adopt them and form positive judgments about them. Liu et al. (2017) have found that awareness of consequences is positively correlated with personal norms and attitudes toward pro-environmental intentions, such as B. less car use or environmentally conscious congress attendance.

Ascription of Responsibility

The ascription of responsibility is to acknowledge the norms of environmental safety. Schwartz (1977) explained that in active situations norms are based primarily on sets of values related to actions taken. In the literature on norm-supporting software for environmental behavior ideas, altruism (or various human concerns) is viewed as a cost orientation that can be applied to norm construction in the context of environmental behavior. However, Stern (1999) found that in addition to non-official norms based solely on altruistic values for various human beings, norms based solely on altruism and the closest to non-human species also promote individual philanthropy. , claims. Furthermore, the idea of guiding the environmental movement through these three cost directions has also led to the refinement of the Value Belief Norm (VBN) principle by Stern (1999). VBN's philosophy believes that the relationship between values and authentic behavior is influenced by a wider range of factors than one's inherent attitudes towards the environment.

Library green computing for environmental concern

Noh (2020) argued that the library inexperienced computing is very terrific for the pleasant environment. He observed that in his lookup the concrete approaches to make contributions to the sustainability of the planet by way of actively making use of and the use of digital and IT assets in libraries. To this end, we once conducted a survey of public library librarians and got the following results: First, librarians have a very high interest in the seriousness of environmental issues and greening work, but have little experience in computer science in the library of people and their libraries have low levels of awareness. Familiarity with context-related words is low. However, the importance of the immature application of library information technology was once recognized by people. Second, the areas identified as most likely to promote environmental considerations and library greening were tool and product operation areas observed at vendor locations as well as community and gadget areas. Third, what impact do you think the lack of library IT will have on society? Once, the simpler view was that we should expand our awareness of the social obligations of libraries as social infrastructure. In conclusion, immature information technology in libraries seems to be able to help improve the appreciation of libraries as social infrastructures that are generally considered socially responsible organizations.

The Personal Norms

Harlan et al. (1999) interpret personal norms as personal expectations based on inner values. It reflects a commitment to inner values and is experienced as a sense of personal obligation to engage in certain behaviours. Previous research has shown that personal norms are positively associated with environmentally friendly behavior. Just like Lewis et al. (2017) show that those who feel a moral obligation to protect the environment are more likely to try to reduce their personal car use. This also applies to taking public transport and buying organic food. and Zhang et al. (2017) confirmed the indirect effect of consequence perception on behavioral intentions through subjective norms and personal norms. That's why we make these recommendations. Central to this concept is that prosocial behavior is influenced by activating what I consider to be a moral norm.

Research Gap

Green IT awareness has become a great need of the time. Importance of the green can never be flouted. In the context of green IT University libraries can play pivotal role. As long as the role of libraries is very significant, there the role of gender is also very crucial in making libraries green. Though, over the past years, lots of research work has been done on green computing but the role of gender has not been researched much. Kaakeh et al. (2021) also conducted research to investigate gender role in green environment. In this context Khan (2023) conducted research to explore gender role in green environment. Above discussed literature revealed that there are no studies conceiving the concept of sustainable green IT awareness and practices in the universities located in Lahore and Gujranwala Division. Moreover, the literature also demonstrates that no prior study has applied Norm-activation. So, the researchers in this research applied NAT theory to examine the gender differences in terms of awareness of green IT and practices carried out in university libraries of Pakistan.

Research Methods

Quantitative research design was employed in this research. The questionnaire was developed to collect the data from the respondents. The questionnaire had five sections. The first section was about demographic information. The second section covered the “awareness of consequences”. The third and fourth sections consisted ascription of responsibility and library

green computing for environmental concerns respectively. The fifth section was about personal norms of the university librarians about green computing. The population of this research work comprises university librarians in Lahore and Gujranwala Division.

The data were collected from 46 universities located in the Lahore and Gujranwala Division. There were 200 male and female librarians working in these 46 university libraries. The Raosoft link of URLS (http://www.raosoft.com/samplesize.html) was taken into consideration to determine the size for sample. The sample size was determined taking into account the 0.5% "margin of error", 95% "confidence level", 200 "population size", and 50% "response distribution". After computation on the aforementioned website, the sample size was discovered to be 132. There were 75 males and 57 females in the sample of the study. The SPSS software was used to examine the data. The conclusions based on “frequency”, “percentage”, “mean” and "standard deviation". T-test was also used to look at the gender based difference. The hypotheses were put to the test using a simple linear regression test. Below, in the form of charts and tables a detailed explanation of the data analysis had done using questionnaires.

Data Analysis

Results of the research are described in the form of graphs, figures, and tables.

Demographic Information

The outcomes (Fig. 4.1) showed that a larger proportion of responses 75 (56.8%) were male as compared to female 57 (43.2%).

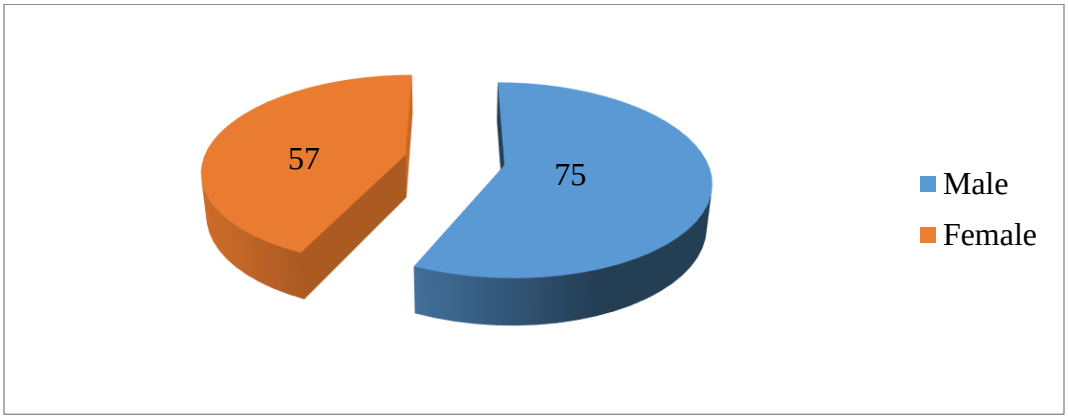

Figure-1 Genders

The results (Fig 4.2) demonstrated that larger proportion of responses 89 (67.3%) from urban area. However, a large number of respondents were from rural 43 (32.7%) areas.

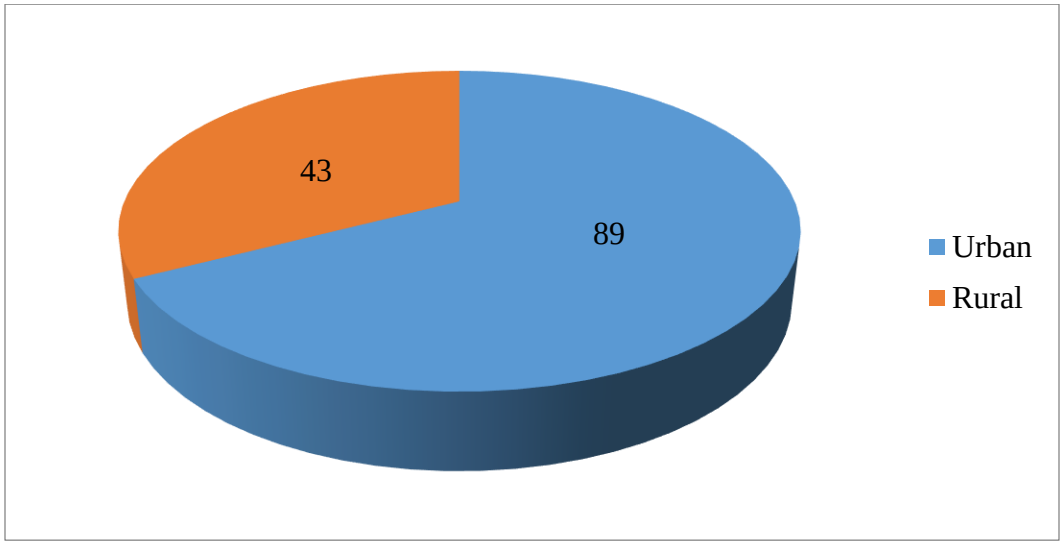

Figure -2 Community

The results (Figure 4.3) demonstrated that larger proportion of responses 55 (41.6%) were belonged to age group of 26-30. The figure showed that the large number of respondents 27 (20.4%) and 21 (15.9%) fallen in age group of 20-25 and 36-40 respectively.

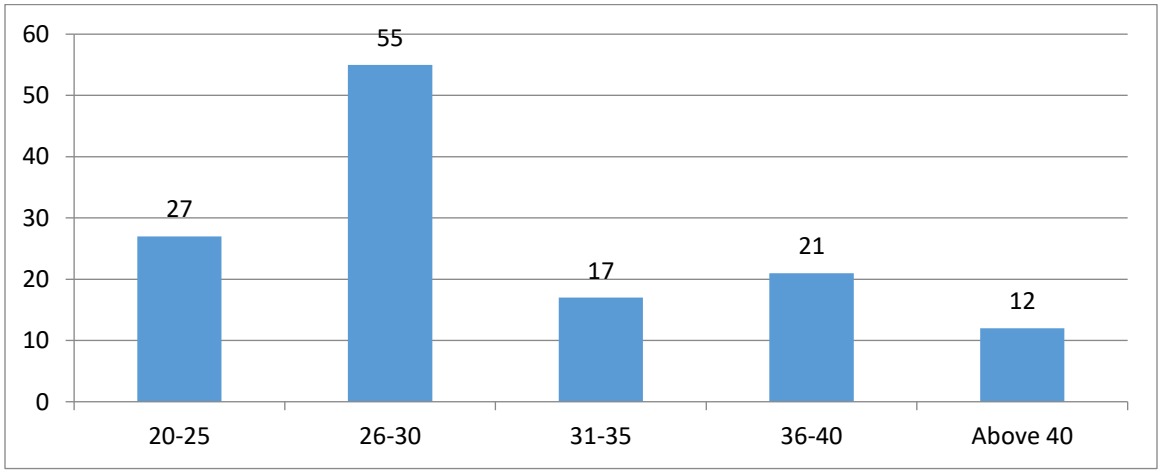

Figure -3 Ages

The results (Figure 4.4) showed that larger proportion of responses 84 (63.6%) had Master degrees. A high number of respondents 42 (31.8%) have MPhil degree, followed by PhD 06 (4.54%).

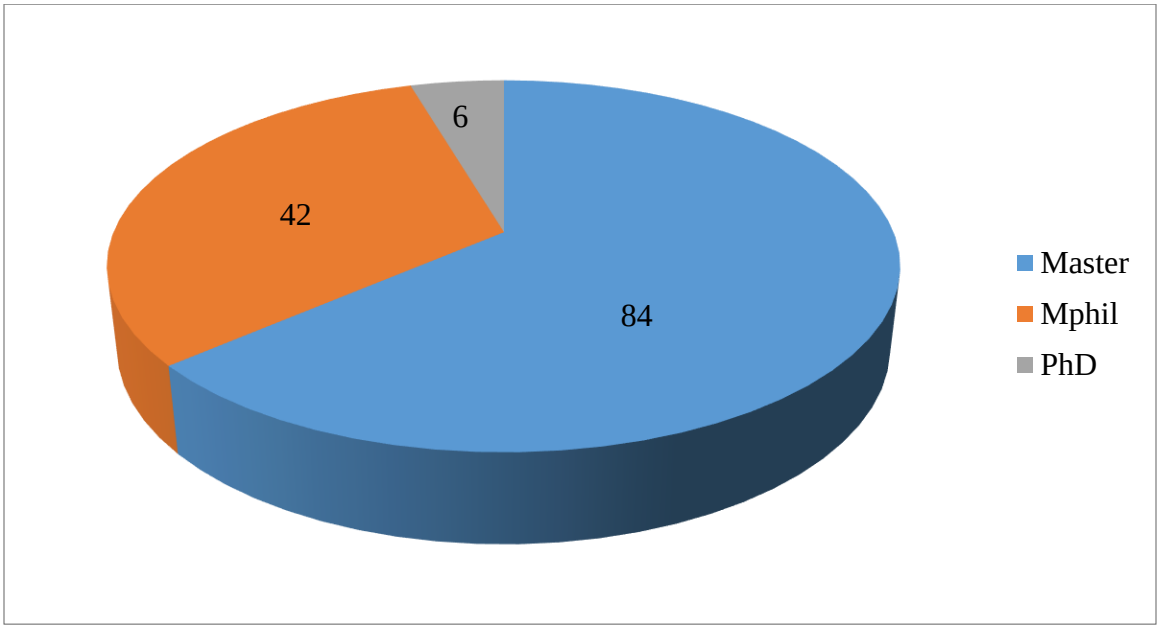

Figure -4 Qualification

The findings (fig 4.5) showed that larger proportion of responses 72 (54.5%) were belonged to private sector university libraries. A large number of respondents 60 (45.6%) were working in public sector university libraries.

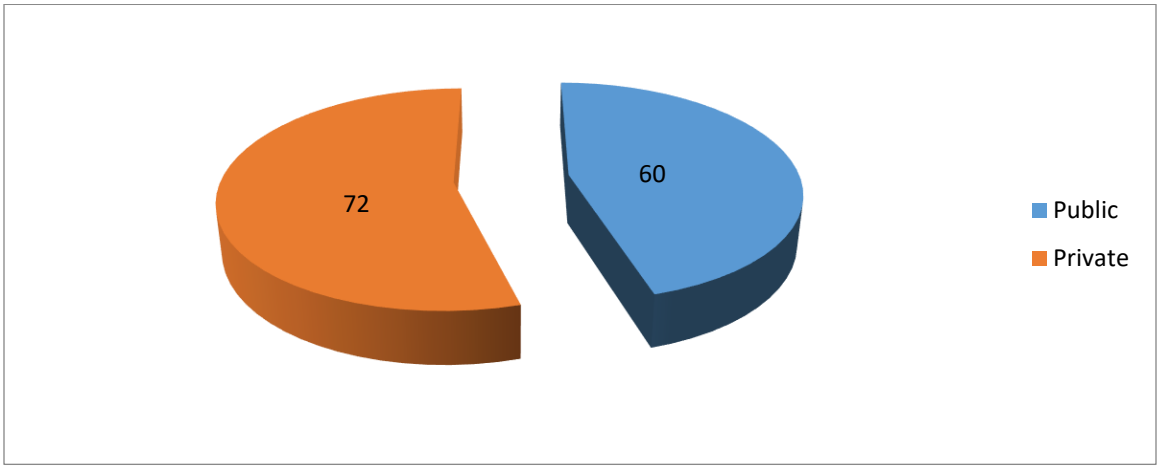

Figure -5 Types of university

The results (Figure 4.6) showed that larger proportion of responses were either librarian 55(41.7%) or assistant librarian 55(41.7%). The findings showed that nine (6.8%) respondents were senior librarian while 7 (5.3%) were chief librarian. The results demonstrated that only six (4.5%) respondents were deputy chief librarian.

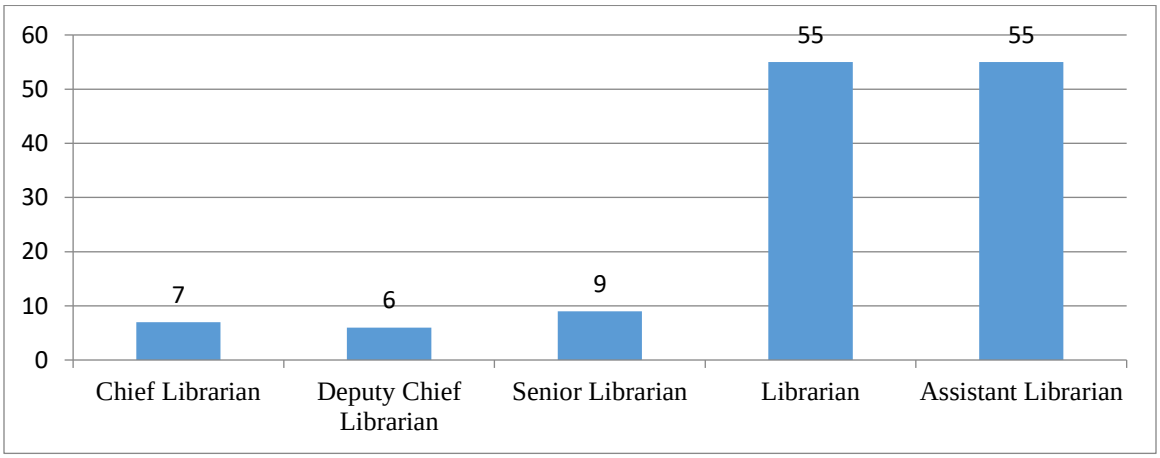

Figure -6: Designation

The findings (Fig. 4.7) showed that larger proportion of responses 59 (44.6%) responded that they doing their job from 6-10 years, followed by 32 (24.2%) to age group of 11-15. A high number of respondents 24 (18.1%) have teaching experience 1-5 years.

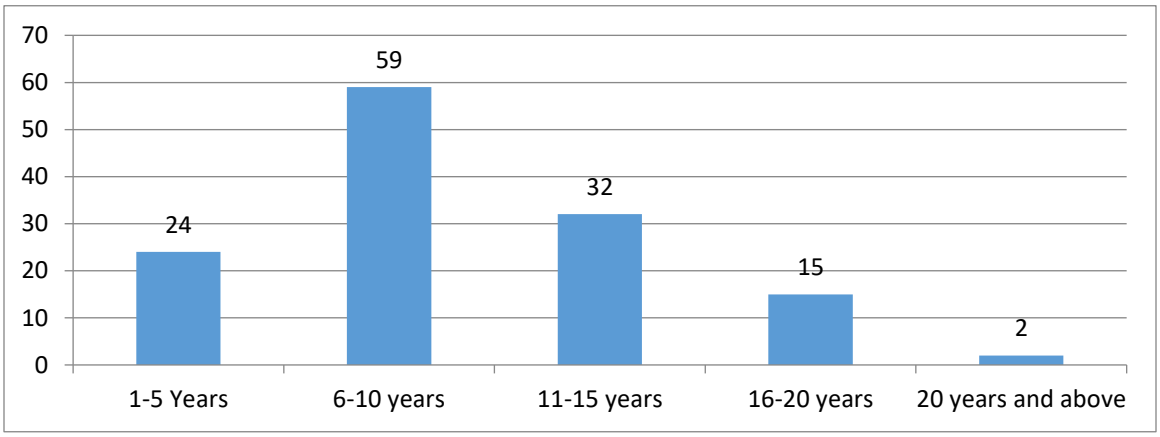

Figure -7Work experience

Investigating Gender Based Differences

To investigate the gender-based differences, following data were analyzed. The analysis of the data shows the following gender-based differences. To know the gender-based differences

in the intention to adopt green computing, T-Test was developed. After the analysis of T-test data, no considerable gender-based difference was found.

Table 1: ***Gender Based Differences In The Intension To Adopt Green Computing***

Sr. No	Statements	Mean		t-value	Sig.
		Male (75)	Female (57)		
i)	ITAGC1. I will make extra efforts to purchase green IT devices	4.15	4.14	0.02	0.86
ii)	ITAGC2. I will inform my colleagues about green computing benefits	4.01	4.12	-0.55	0.41
iii)	ITAGC 3. I will inform authorities about savings from green computing	3.95	4.15	-1.56	0.07

Gender Based Differences in Personal Norms

To explore the gender-based difference in the personal norms of the respondents, t-test was developed, and after the analysis of t-test no prominent difference was discovered. The opinions against the statements of both genders do not show considerable difference.

Table 2 ***Gender Based Differences in the Personal norms between genders (N=132)***

Sr. No	Statements	Mean		t-value	Sig.
		Male (75)	Female (57)		
i)	PN1. It would be against my moral principles not to use five star energy computers in my library	4.25	4.24	0.04	0.96
ii)	PN2. Not caring the environment would go against my principles	4.12	4.21	-0.65	0.51
iii)	PN3. I have a moral obligation to use green e-devices in my library	4.05	4.26	-1.66	0.09

iv)	PN4. I would feel guilty about not using green e-devices in my library	4.09	4.24	-1.22	0.22

Gender Based Differences in the Ascription of Responsibility

To know the gender-based differences in the ascription of responsibility, a t-test was carried out which shows that there was considerable difference between the genders. The male respondents were significantly agreed that green computing practices can reduce global warming *(p=0.04)* as compared to female.

Table 3 ***Gender Based Differences in The Ascription Of Responsibility Between Genders***

Sr. No	Statements	Mean		t-value	Sig.
		Male (75)	Female (57)		
i)	AR1. Practicing green computing is beneficial for libraries	3.60	3.73	-0.63	0.52
ii)	AR2.Practicing green computing can save libraries' budget	3.64	3.96	-1.82	0.07
iii)	AR3.Green computing practices are valuable in reducing local ecological damage	3.48	3.68	-1.14	0.25
iv)	AR4.Green computing practices can reduce global warming	3.60	3.24	2.02	0.04*

Gender Based Differences in the Awareness of Consequences

To investigate gender-based differences in regards with knowing the awareness of consequences, the results of the analysis show that that majority of the respondents revealed that male respondents were significantly agreed that "they know CO2 release cause impact on our environment like acid rain and global warming *(p=0.05)".*

Table 4: ***Gender Based Differences in the Awareness of consequences (N=132)***

Sr. No	Statements	Mean		t-value	Sig.
		Male (75)	Female (57)		
i)	AC1. "I know operating systems that causes huge local ecological damage"	3.85	4.05	-1.02	0.30
ii)	AC2. "I know about e-waste generated from computing equipment increase global warming"	3.85	4.10	-1.67	0.09
iii)	AC3. "I know informal disposing of is harmful to our environment"	3.97	3.92	0.25	0.79
iv)	AC4. "I know formal disposing of is costly but sustainable to our environment"	3.81	3.80	0.04	0.96
v)	AC5. "I know about carbon release (CO2) generated by computers and their devices has negative consequences"	3.53	3.38	0.83	0.40
vi)	AC6. "I know CO2 release cause impact on our environment like acid rain and global warming"	3.52	3.17	1.93	0.05*

Gender Based Differences about the Library Green Computing for Environmental Concerns

The results shows an independent t-test showed that one statement got significant difference between the opinions of both genders. This finding shows considerable gender based differences. The findings show that male respondents significantly agreed that their library is activity committed on buying green computing *(p=0.05)*.

Table 5: ***Library green computing for environmental concerns between genders (N=132)***

Sr. No	Statements	Mean		t-value	Sig.
		Male (75)	Female (57)		
i)	LGC1. My library encourages green computing	4.10	3.92	0.89	0.37
ii)	LGC2.My library puts much value on energy saving devices	3.90	3.77	0.97	0.31

Hypotheses Testing

H1. "Awareness of consequences has a direct effect on use of green computing in libraries"

The study discovered a direct favorable effect (p<.05) of awareness of consequence son the use of green computing in libraries. As a result, the hypothesis's status has been acknowledged.

H2. "Ascription of responsibility has a direct effect on use of green computing use in libraries"

The study discovered that Ascription of responsibility had a direct favorable impact (p<.05) on use of green computing use in libraries. As a result, the hypothesis's status has been acknowledged.

H3. "Personal norm is positively related to behavioral intention to use green computing in libraries"

The study discovered that personal norms had a direct favorable impact (p<.05) on use green computing in libraries. As a result, the hypothesis's status has been acknowledged.

H4. "Libraries green computing for environmental concerns is positively related green computing use in libraries"

The study discovered that libraries green computing for environmental concerns had a direct favorable effect (p<.05) on green computing use in libraries. As a result, the hypothesis's status has been acknowledged.

Discussion

The following data were analyzed for gender-based differences. The gender-based differences that are revealed by the data analysis are as follows:

T-Test was created to determine gender differences in green computing intentions. There was no significant gender-based difference found in the T-test data after it was analyzed. The t-test was developed in order to investigate the gender-based difference in the personal norms of the respondents. Following the analysis of the t-test, no significant difference was discovered. There isn't much of a difference between the opinions held by both genders against the statements. A t-test was used to determine the gender-based differences in the attribution of responsibility. The results indicate that there was a significant gender difference. Compared to the female respondents, the male respondents were significantly more in agreement ($p=0.04$) that eco-friendly computing practices can reduce global warming. The analysis reveals that the majority of respondents were significantly in agreement that "they know CO2 release cause impact on our environment like acid rain and global warming ($p=0.05$)" in order to investigate gender differences in awareness of consequences.

According to the independent t-test, there was a significant difference in opinion between the two genders regarding one statement. This finding demonstrates significant gender differences. According to the results, the majority of male respondents ($p=0.05$) agreed that their library is actively investing in green computing.

Conclusion

In addition to promoting eco-friendly products, researchers worked hard to reduce the market's environmental costs. Ping and Linxiao (2020), Zhao et al. (2021) and Yavari and Ajalli (2021), carried out research to investigate gender differences while using green computing. Yavari and Ajalli (2021) presented an effective method for lowering total environmental costs by developing a supply chain that is cooperative to environment. An Examination of the Libraries of Public and Private Universities in the Lahore and Gujranwala Division.

In this perspective for research perspective, a quantitative research method was used. 132 university librarians from Lahore and Gujranwala Division were the target population of the

study out of which 46 universities were sampled for the study. The purpose of data collection was fulfilled by using a questionnaire.

According to the current study, respondents agreed that they are aware that e-waste generated by computer equipment contributes to global warming, that informal disposal is harmful to our environment, and that operating systems cause significant local ecological damage. The majority of respondents' green computing practices can help libraries save energy, are beneficial to libraries, and are helpful in reducing local ecological damage, as demonstrated by the results.

The respondent to this study agreed that their libraries support green computing, place a high value on energy-saving devices, and is actively committed to purchasing green technology. According to the findings of this study, respondents agreed that it would be against their moral principles if they did not use computers with five stars of energy efficiency in the library. They also agreed that neglecting the environment would be against moral principles, and they agreed that they would feel guilty about not using environmentally friendly electronic devices in their libraries. Furthermore, each hypothesis was accepted. The data analysis reveals that male respondents were more concerned about green IT awareness as compared to female participants.

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