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From awareness to action: Evaluating green computing engagement among IT professionals for effective policy design

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Abstract

Green computing has become increasingly relevant in today's digital era. This approach is aimed at minimizing environmental impact through the efficient use of computing resources. This study evaluated the awareness, knowledge, and practices of IT professionals regarding green computing to understand their role in promoting sustainable technology use. Utilizing a mixed-methods approach, the research combined quantitative surveys and qualitative interviews, collecting data from 100 IT experts across 32 randomly selected IT companies in Manila. The quantitative analysis involved calculating means and standard deviations to assess the central tendencies of green computing adoption, while Levene's test and a t-test were conducted to compare variances and means between the two groups. The findings indicate no significant differences in awareness and knowledge of green computing between public and private sector IT professionals, with public sector professionals showing slightly higher awareness and knowledge scores. However, the practices of green computing differ significantly, with private sector professionals demonstrating a higher level of application. These results suggest the need for targeted initiatives to enhance green computing practices across both sectors, with policy recommendations aimed at fostering greater adoption of sustainable IT practices.

Keywords: Green Computing; IT Professional Assessment; information technology; Assessment; Evaluation

1. Introduction

As the world becomes increasingly digital, the environmental impact of our reliance on technology is growing at an alarming rate. Green computing has emerged as a critical paradigm in the information technology (IT) industry, addressing the urgent need to reduce this environmental footprint. Sustainable IT practices, also known as sustainable computing, are at the forefront of this movement. They focus on minimizing electronic waste, optimizing energy consumption in data centers, and leveraging renewable energy sources to power computational processes. These practices are designed to efficiently utilize computing resources, minimizing environmental impact while ensuring economic and social benefits for both current and future generations [29][33]. Sustainable computing involves a holistic approach to optimizing various components of IT infrastructure, including computer chips, systems, networks, and software, to enhance efficiency and reduce environmental harm [36]. Additionally, it promotes the biodegradability and recyclability of outdated products and industrial waste, contributing not only to the reduction of health risks but also to the broader goals of sustainable development [33][2].

The implementation of sustainable practices such as carbon-free, solar-powered, and quiet computing, as well as the use of optimal programming languages further amplifies the environmental benefits of green computing [21]. Effective management of green computing practices and carbon footprints in the IT sector is essential for promoting environmental sustainability while maximizing economic and social benefits. These practices align with the broader

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goals of sustainable development and environmental stewardship, ensuring that the IT sector's impact on the environment is minimized [29][2].

The adoption of green computing practices is reshaping various aspects of the IT landscape. Organizations are increasingly exploring innovative infrastructure solutions that enhance energy efficiency and reduce environmental harm by implementing eco-friendly strategies. Software developers are designing systems that optimize resource utilization and minimize power consumption, while companies are adopting organizational policies that promote sustainable IT practices. These collective efforts are fostering a culture of environmental responsibility within digital operations, paving the way for a more sustainable and environmentally conscious future.

Higher education curricula also play a pivotal role in this green revolution. Beyond preparing students for the evolving demands of the workforce, educational institutions are critical in advocating for sustainable practices. By equipping students with the knowledge and skills to address environmental challenges, these institutions ensure that the next generation of IT professionals is well-prepared to champion green computing. However, there is resistance within the current IT workforce, largely due to a reluctance to adopt new technologies and practices that support green computing. This resistance stems from a lack of knowledge and understanding of the significance and benefits of sustainable IT practices [4].

Despite the clear advantages of green computing, several barriers hinder its widespread adoption. These include upfront costs, technological constraints, and organizational hesitation [18]. Addressing these challenges requires a collaborative effort among industry players, decision-makers, and researchers. By working together to advance relevant projects through innovation, cooperation, and education, these stakeholders can drive the adoption of green computing practices across the industry. To contribute to this effort, this study has evaluated the awareness, knowledge, and practices of IT professionals in both the private and public sectors. The insights gained from this are instrumental in developing policies and strategies that can enhance green computing practices within the IT industry. These findings also provide valuable data for longitudinal studies to help track progress over time and identify areas for further improvement.

1.1. Statement of the problem

- How did the IT professionals assess their awareness, knowledge, and practices on green computing?
- Is there a significant difference in the awareness, knowledge, and practices of green computing in terms of their classification?
- What are the underlying barriers and challenges preventing the widespread adoption of green computing practices among I.T. Professionals?
- Based on the findings of this study, what green computing policy practices could be developed?

1.2. Hypothesis

1.2.1. Null Hypotheses (H0):

- There is no significant difference in the awareness of green computing between IT professionals in the private and public sectors.
- There is no significant difference in the knowledge of green computing between IT professionals in the private and public sectors.
- There is no significant difference in the practices of green computing between IT professionals in the private and public sectors.

1.2.2. Alternative Hypotheses (H1):

- There is a significant difference in the awareness of green computing between IT professionals in the private and public sectors.
- There is a significant difference in the knowledge of green computing between IT professionals in the private and public sectors.
- There is a significant difference in the practices of green computing between IT professionals in the private and public sectors.

2. Conceptual framework

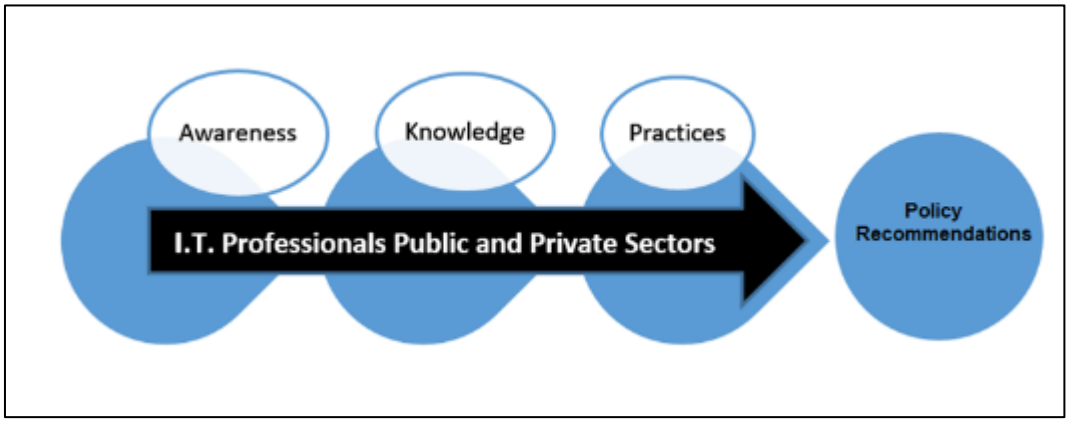

Figure 1 Conceptual Framework

3. Review of related literature

In today's era, where environmental sustainability is a critical concern, green computing, also known as green IT, has emerged as a pivotal strategy for organizations aiming to minimize their ecological footprint. Green computing involves the responsible and efficient use of information technology (IT) to reduce waste, conserve energy, and promote environmental stewardship. This article delves into various aspects of green computing, including its definitions, business adoption, IT professionals' perspectives, case studies, and the successes and failures within this field. Green computing refers to the environmentally responsible design, usage, and disposal of computers and related technology. This encompasses reducing energy consumption from the manufacturing stage to the disposal of electronic waste (e-waste) [38]. Key principles include energy efficiency, reducing hazardous materials in production, and designing products that are easier to recycle or biodegrade [3].

Adopting sustainable IT practices is crucial for organizations striving for eco-friendliness. Businesses have implemented various green computing techniques, such as energy-efficient hardware, virtualization, and recycling systems [38]. Understanding the attitudes of IT professionals towards these practices is vital for effective implementation strategies. Many IT professionals advocate for sustainable practices and energy-efficient technologies, recognizing the necessity of green [11]. Several organizations have successfully embraced green computing techniques, providing valuable insights into practical implementation and benefits. For instance, companies like VIA have introduced energy-efficient processors and adhered to the Restriction of Hazardous Substances Directive (RoHS) to develop eco-friendly products [23]. These case studies highlight the advantages of green computing, such as cost savings and reduced carbon footprints, demonstrating its feasibility in daily operations.

Despite the benefits, the adoption of green computing faces several challenges. These include a lack of awareness and understanding of its importance, resistance to change, limited expertise in integrating energy-saving techniques, financial constraints, and inadequate monitoring systems [24]. Overcoming these barriers requires raising awareness, fostering innovation, providing adequate training, and developing robust policies that encourage green computing practices [24]. Data centers, housing vast amounts of computing power, pose a unique challenge due to their significant energy requirements for cooling. Green computing initiatives in data centers focus on combining idle computers to reduce overall power consumption, optimizing server placement for better ventilation, and using energy-efficient cooling systems [41].

Education plays a crucial role in promoting green computing. Integrating green computing techniques into higher education curricula can prepare students for the growing demand for green IT skills in the work force[22]. Furthermore, continuous education and support are essential for responsible technology usage and fostering a greener future [6]. Edge computing and fog computing represent innovative approaches to green computing. Edge computing reduces energy consumption and enhances sustainability by processing data closer to the source [9]. Similarly, fog computing places processing power nearer to IoT applications, reducing the environmental impact of data centers [5].

Green computing is an ethical IT strategy that significantly reduces the environmental impact of our rapidly growing digital world. By embracing energy-efficient practices, promoting recyclable hardware, and advocating for renewable

energy sources, organizations can contribute to a more sustainable future. As the field continues to evolve, understanding the successes and failures of green computing initiatives will provide valuable insights for future growth and development. Adopting green computing is not just a technological choice but a necessary step towards a sustainable and environmentally responsible future.

4. Research methodology

An inferential research design was employed to investigate the awareness, knowledge, and practices of green computing among 100 IT experts from 32 randomly selected private and public IT companies in Manila. Data collection involved a survey questionnaire and interviews, administered through Google Forms. This mixed-method approach integrated both quantitative and qualitative analyses to provide a comprehensive understanding of the topic.

Quantitative data analysis included calculating the mean and standard deviation to measure the central tendency of green computing adoption among IT professionals. To assess the equality of variances between the two groups, Levene's test was conducted. Subsequently, a t-test was performed to compare the means, determining whether any observed differences between the groups were statistically significant.

4.1. Awareness of I.T. Professional in Green Computing

Table 1 Awareness of I.T. Professionals in Green Computing

Indicators	**Private**			**Public**		
	M	**SD**	**V.I**	**M**	**STD**	**V.I**
I am well aware of the green computing and its concepts.	2.99	0.78	Agree	3.35	0.49	Agree
I am aware of the impact of green computing practices on the environment.	3.14	0.86	Agree	3.32	0.47	Agree
I am well aware of our company's policies that contribute to green computing.	3.03	0.84	Agree	3.32	0.47	Agree
I am aware that green computing practices are essential to our company.	3.17	0.80	Agree	3.35	0.49	Agree
I am aware that the practice of green computing is a must.	3.17	0.77	Agree	3.29	0.58	Agree
I look for information on green practices actively.	3.07	0.76	Agree	3.21	0.59	Agree
I recognize that our company's green computing goals will start with individual initiatives.	3.18	0.60	Agree	3.38	0.65	Agree
I know that green computing should be made compulsory.	3.20	0.73	Agree	3.24	0.70	Agree
I am aware of the consequences of green computing practices.	3.09	0.75	Agree	3.47	0.51	Agree
I am aware of being part of practices in green computing.	3.16	0.78	Agree	3.35	0.49	Agree
OVERALL			3.12			3.33

The data in Table 1 are the responses from IT professionals in private and public sectors regarding their awareness of green computing. In the private sector, the mean scores for all indicators range from 2.99 to 3.20, indicating that IT professionals generally "Agree" with the statements about their awareness of green computing. The highest awareness is in recognizing that green computing should be made compulsory (X = 3.20, SD = 0.73). The standard deviations are relatively moderate, ranging from 0.60 to 0.86, suggesting some variability in responses but not extreme. In contrast, the mean scores in the public sector range from 3.21 to 3.47, showing a stronger agreement than in the private sector. This suggests that IT professionals in the public sector have a higher awareness of green computing. The highest awareness is in the recognition of the consequences without green computing practices (x = 3.47, SD = 0.51). The standard deviations are lower than those in the private sector, ranging from 0.47 to 0.70, indicating more consistent responses.

Comparatively, the overall mean score for awareness in the private sector is 3.12, while in the public sector, it is 3.33. This indicates that public-sector IT professionals are generally more aware of green computing than their private-sector

counterparts. The public sector shows less variability in responses compared to the private sector, suggesting more uniform awareness among public sector IT professionals.

IT professionals in both sectors are aware of green computing, but those in the public sector demonstrate a higher level of awareness. These findings suggest that while awareness is present in both sectors, there may be a need for additional initiatives or policies in the private sector to raise the level of awareness to match that of the public sector. This difference in awareness levels could guide targeted training and policy-making efforts to enhance green computing practices across sectors and may help to bridge the gap of higher education and action for a greener future [6].

4.2. Knowledge of I.T. Professional in Green Computing

Table 2 Knowledge of I.T. Professional in Green Computing

Indicators	**Private**			**Public**		
	M	**SD**	**M**	**SD**	**M**	**SD**
I know that green computing plays a crucial role in one's company.	3.23	0.77	Agree	3.59	0.50	Strongly Agree
I am knowledgeable about the energy efficient feature in our company.	3.26	0.74	Agree	3.32	0.64	Agree
I know the green computing practices that our company implements.	3.16	0.78	Agree	3.32	0.68	Agree
I can determine how much energy my work computing device utilizes.	3.34	0.62	Agree	3.00	0.85	Agree
Investing in green IT solutions is for long-term benefits.	3.32	0.49	Agree	3.50	0.56	Strongly Agree
I know my ability to contribute to implementing green computing initiatives within our company.	3.08	0.85	Agree	3.53	0.51	Strongly Agree
I know how critical coordinating environmentally responsible IT practices within our organization is.	3.24	0.67	Agree	3.41	0.50	Agree
I know how green computing helps a company in terms of finances.	3.24	0.72	Agree	3.56	0.50	Strongly Agree
I'm knowledgeable that promoting green computing practices should be mandatory in every company.	3.32	0.87	Agree	3.41	0.56	Agree
I can identify the possibility of not having green computing practices inside a company/organization.	3.24	0.85	Agree	3.41	0.50	Agree
OVERALL	3.24			3.41		

Most IT professionals were found to have a strong understanding of green computing. This was evident with the highest number of "Strongly Agree" responses being given for question 1 showing a high level of consciousness of how green computing plays a crucial role in one's company. In these results, we assume that these IT professionals have the advantage of being knowledgeable when it comes to green computing. With these attributes, it guarantees that successful adoption and coordination will lead to the success of green computing implementation. [24]

Specifically, the data in Table 2 responses regarding their knowledge of green computing shows that private sector, the mean scores for all indicators range from 3.08 to 3.34, indicating that IT professionals generally "Agree" with the different indicators. The highest knowledge is in determining how much energy their work computing device utilizes (M = 3.34, SD = 0.62). The standard deviations are moderate, ranging from 0.49 to 0.87, suggesting some variability in responses. However, the mean scores in the public sector range from 3.00 to 3.59, showing a higher agreement than in the private sector. This suggests that IT professionals in the public sector have a higher level of knowledge in green computing. The highest knowledge is in recognizing the crucial role of green computing within the company (M = 3.59, SD = 0.50). The standard deviations are generally lower than those in the private sector, ranging from 0.50 to 0.85, indicating more consistent responses.

Comparatively, the overall mean score for knowledge in the private sector is 3.24, while in the public sector, it is 3.41. This indicates that public-sector IT professionals are generally more knowledgeable about green computing than their private-sector counterparts. The public sector shows less variability in responses compared to the private sector, suggesting more uniform knowledge among public sector IT professionals.

Therefore, IT professionals in both sectors are knowledgeable about green computing, but those in the public sector demonstrate a higher level of knowledge. These findings suggest that while knowledge is present in both sectors, there may be a need for additional training or information dissemination in the private sector to raise the level of knowledge to match that of the public sector. This difference in knowledge levels could guide targeted educational efforts and policy-making to enhance green computing practices across sectors.

4.3. Practices of I.T. Professional towards Green Computing

Table 3 Practices of I.T. Professional towards Green Computing

Indicators	Private			Public		
	M	SD	M	SD	M	SD
I use digital for documents.	3.60	0.68	Often	3.79	0.48	Often
Our company decreases the average printing per day.	3.03	0.99	Sometimes	3.24	0.55	Sometimes
I attend green computing training and seminars.	1.84	0.85	Rarely	1.94	0.85	Often
We use solar energy in the company.	2.14	0.87	Rarely	2.11	0.74	Rarely
We use virtual networks in our company.	3.52	0.56	Often	3.65	0.54	Often
We have storage virtualization in our company.	3.22	0.84	Sometimes	3.59	0.61	Often
I use storage consolidation.	2.77	1.13	Sometimes	3.56	1.12	Often
I follow the policy on managing electronic waste.	3.32	0.79	Sometimes	3.44	0.56	Sometimes
I track and monitor energy usage/ consumption.	2.96	0.81	Sometimes	3.12	0.69	Sometimes
We upgrade and maintain existing computers rather than buying new ones.	3.37	0.75	Sometimes	3.41	0.70	Sometimes
I turn off unused peripheral devices.	3.60	0.68	Often	3.53	0.61	Often
I use desktop virtualization.	3.03	0.99	Sometimes	3.44	0.56	Sometimes
I re-use printed papers in our company.	1.84	0.85	Rarely	3.32	0.68	Sometimes
We buy or use energy-efficient gadgets or equipment.	2.14	0.87	Rarely	3.21	0.81	Sometimes
I use rewritable storage media.	3.52	0.56	Often	3.32	0.73	Sometimes
We use eco-labeled IT products (like Energy Star).	3.22	0.84	Sometimes	3.12	0.73	Sometimes
I set computers to hibernate.	2.77	1.13	Sometimes	3.26	0.67	Sometimes
We donate replaced electronic equipment.	3.32	0.79	Sometimes	2.76	0.92	Sometimes
I contribute in electronic recycling programs.	2.96	0.81	Sometimes	3.06	0.69	Sometimes
Our company recycles unwanted computing devices.	3.37	0.75	Sometimes	3.18	0.67	Sometimes
OVERALL	2.99			3.20		

While both sectors display a commendable level of green computing practices, public sector IT professionals generally exhibit a higher frequency of these practices as seen in Table 3. The mean score for green computing practices in the private sector is 2.99, while it is higher at 3.20 in the public sector. This suggests that IT professionals in the public sector engage in green computing practices more frequently than those in the private sector. The significant differences between sectors, particularly in practices such as re-using printed papers and using energy-efficient gadgets, highlight areas where private sector companies might improve to enhance their green computing efforts. These insights can guide targeted interventions and policy-making to promote sustainable IT practices across both sectors.

Specifically, the data in Table 3 revealed the frequency of various green computing practices among IT professionals in private and public sectors. In the private sector, the mean scores range from 1.84 to 3.60, with standard deviations ranging from 0.56 to 1.13. The highest mean score is for the use of digital documents (M = 3.60, SD = 0.68), indicating that IT professionals in the private sector often use digital documents. Other practices frequently undertaken include the use of virtual networks (M = 3.52, SD = 0.56) and turning off unused peripheral devices (M = 3.60, SD = 0.68). However, attending green computing training and seminars (M = 1.84, SD = 0.85) and using solar energy (M = 2.14, SD = 0.87) are practices rarely adopted. In the public sector, the mean scores range from 1.94 to 3.79, with standard deviations from 0.48 to 1.12. The highest mean score is also for the use of digital documents (M = 3.79, SD = 0.48), indicating that IT professionals in the public sector often use digital documents. Other frequent practices include using virtual networks (M = 3.65, SD = 0.54) and attending green computing training and seminars (M = 1.94, SD = 0.85). Similar to the private sector, the use of solar energy is rare (M = 2.11, SD = 0.74).

Virtual machines and networks can use prediction algorithms to boost productivity in green, which may also affect the relationship between green computing and sustainable development, emphasizing the advantages of green practices for society as a whole [25][47].

4.4. Comparative Results on Awareness

Table 4 Comparative Analysis of the Awareness of I.T. Professionals

Levene's Test For Equality Of Variances			**T-test For Equality Of Means**								**Hypothesis Checking**
	F	**Sig**	**t**		**Df**	**sig(2-tailed**	**Mean difference**	**Std. Error Difference**	**95% Confidence interval of difference**		
									Lower	**upper**	
Equal variance assumed	1.16	0.283	Priv	-1.65	130.00	0.101	-0.21	0.13	-46	0.04	H0 is accepted
Equal variance not assumed			Pub	-2.10	99.08	0.38	-0.21	0.10	-0.40	-0.01	H1 is rejected.

Private-sector professionals show less environmental concern compared to public-sector professionals in green IT adoption. [4] However, in the case of this study, the findings in Table 4 show that there is no significant difference supporting the null hypothesis based on Levene's test to assess the equality of variances between the private and public sector groups. The results showed an F value of 1.16 and a significance value of 0.283, which is greater than 0.05. This indicates that the assumption of equal variances is met, and the t-test for equality of means can be done. With equal variances assumed, the t-value was -1.65, the degrees of freedom were 130, and the significance value was 0.101, which is greater than 0.05. This suggests that we fail to reject the null hypothesis, implying that there is no statistically significant difference in the awareness of green computing between IT professionals in the private and public sectors. However, when equal variances were not assumed, the significance value was 0.038, which is less than 0.05, indicating a statistically significant difference between the two groups.

It is noteworthy to conclude that there is no significant difference in the awareness of green computing between IT professionals in the private and public sectors, thus rejecting the alternative hypothesis (H1).

4.5. Comparative Results on Knowledge

IT professionals' knowledge, social influence, and green management culture directly influence their attitudes towards green IT, with beliefs playing a mediating role in knowledge and social influence[34]. In Levene's test to assess the equality of variances of the knowledge in Green computing, the results showed an F value of 0.45 and a significance value of 0.505, which is greater than 0.05. This indicates that the assumption of equal variances is met, and a t-test for equality of means could be computed. The t-test compared the means of the two groups and determined if there was a statistically significant difference in their knowledge of green computing. With equal variances assumed, the t-value was -1.36, the degrees of freedom were 130, and the significance value was 0.176, which is greater than 0.05.

Table 5 Comparative Analysis of the Knowledge of I.T. Professionals

Levene's Test For Equality Of Variances			**T- test For Equality Of Means**								**Hypothesis Checking**
	F	**Sig**	**t**		**Df**	**sig(2-tailed)**	**Mean difference**	**Std. Error Difference**	**95% Confidence interval of difference**		
									Lower	**upper**	
Equal variance assumed	0.45	0.505	Priv	-1.36	130.00	0.176	-0.16	0.12	-0.39	0.07	H0 is accepted
Equal variance not assumed			Pub	-2.10	99.08	0.38	-0.21	0.10	-0.40	-0.01	H1 is rejected.

This suggests that there is no statistically significant difference in the knowledge of green computing between IT professionals in the private and public sectors. When equal variances were not assumed, the significance value was 0.38, which is also greater than 0.05, further supporting the conclusion that there is no significant difference between the two groups. The analysis supports the null hypothesis (H0), which states that there is no significant difference in the knowledge of green computing between IT professionals in the private and public sectors, and rejects the alternative hypothesis (H1).

4.6. Comparative Results on Practices

Table 6 Comparative Analysis of the Practices of I.T. Professionals

Levene's Test For Equality Of Variances			**T- test For Equality Of Means**								**Hypothesis Checking**
	F	**Sig**	**t**		**Df**	**sig(2-tailed)**	**Mean difference**	**Std. Error Difference**	**95%Confidence interval of difference**		
									Lower	**upper**	
Equal variance assumed	0.98	0.323	Priv	-2.56	130.00	0.011	-0.20	0.08	-0.36	-0.05	H1 is accepted
Equal variance not assumed			Pub	-2.10	99.08	0.38	-0.21	0.10	-0.40	-0.01	H0 is rejected.

In terms of green computing practices, Levene's test used to assess the equality of variances between the private and public sector groups. The results showed an F value of 0.98 and a significance value of 0.323, which is greater than 0.05. This indicates that the assumption of equal variances is met, and t-test for equality of means could be computed. The t-value was -2.56, the degrees of freedom were 130, and the significance value was 0.011, which is less than 0.05. This suggests that we reject the null hypothesis, implying that there is a statistically significant difference in the practices of

green computing between IT professionals in the private and public sectors, with private sector professionals showing higher awareness. When equal variances were not assumed, the significance value was 0.038, which is also less than 0.05, further confirming the statistically significant difference between the two groups. In conclusion, the analysis supports the alternative hypothesis (H1), which states that there is a significant difference in the practices of green computing between IT professionals in the private and public sectors, and rejects the null hypothesis (H0).

Some studies connect gender as a factor in green computing when it comes to awareness and practices of Green IT, with males showing better awareness and commitment to integrating it into organizations for environmental sustainability. [20] However, based on the results when affiliation is considered private-sector professionals show a higher awareness.

4.7. Underlying Barriers and Challenges

Table 7 The Underlying Barriers and Challenges Preventing the Widespread Adoption of Green Computing Practices Among I.T. Professionals

Themes	**Description**	**Instances**		**Example of Actual Responses**
		Private	**Public**	
Lack of awareness/knowledge	Respondents indicate a lack of familiarity with concepts like green computing, energy-efficient gadgets, and eco-labeled IT products.	1	0	"I've never heard of green computing"
Absence of company initiatives/training	Respondents mention that their company does not offer seminars, webinars, or training opportunities related to green computing.	14	10	"No seminars to attend"
Work-from-home setup	Many respondents work from home or are not based in the company's office, limiting their ability to influence or implement certain green computing practices.	15	9	"We are working from home-based"
Reliance on digital documents/cloud storage	Respondents indicate a shift towards digitization and reduced paper usage by primarily using digital documents and cloud storage.	0	0	"We use cloud storage"
Limited adoption of sustainable practices	While some practices like using cloud storage and turning off unused devices are mentioned, there seems to be limited adoption of other sustainable practices like using solar energy or donating replaced electronic equipment.	3	0	"We do not own the building" (referring to not being able to install solar panels)
Policies and decision-making factors	Certain sustainable practices are governed by company policies or management decisions, which can influence their adoption.	12	3	"Due to company policy"

IT workers are well aware of how technology affects the environment [44] and how sustainable practices/green computing are necessary. The data in Table 3 reveals several key barriers and challenges preventing the widespread adoption of green computing practices among IT professionals. These barriers can be categorized into five main themes. The first theme is the lack of awareness and knowledge among respondents. Some respondents indicated that they had never heard of the concept of green computing, suggesting a fundamental gap in their understanding of energy-efficient technologies and eco-labeled IT products. The second theme is the absence of company initiatives and training opportunities. Many respondents, particularly from the private sector, mentioned that their companies do not offer seminars, webinars, or other educational programs related to green computing. This lack of company support and investment in green computing knowledge-sharing hinders the adoption of sustainable practices.

Another significant barrier is the work-from-home setup that many respondents have adopted. With a large portion of IT professionals working remotely, their ability to influence and implement certain green computing practices within the office environment is limited. This work-from-home arrangement poses a challenge to the widespread implementation of sustainable practices. While some respondents mentioned a shift towards digitization and reduced paper usage, with increased reliance on digital documents and cloud storage, the analysis did not reveal any instances of this trend in either the private or public sectors. This suggests that the adoption of digital solutions as a sustainable practice is not yet widespread among the surveyed IT professionals.

The analysis also highlighted a limited adoption of other sustainable practices, such as the use of solar energy or the donation of replaced electronic equipment. Only a few instances from the private sector were mentioned, indicating that there is room for improvement in the implementation of a broader range of green computing initiatives. The analysis revealed that certain sustainable practices are governed by company policies or management decisions, which can either facilitate or hinder their adoption. Respondents from the private sector reported more instances of such policy-driven factors influencing their green computing practices compared to their public sector counterparts. It suggests that while there are some efforts towards green computing practices, particularly in the private sector, significant barriers such as lack of awareness, absence of company initiatives, work-from-home setups, and policy-driven factors continue to hinder the widespread adoption of sustainable practices among IT

5. Findings

- Both public and private sector IT professionals acknowledge the importance of green computing. However, public sector professionals demonstrate slightly higher overall awareness levels. This difference suggests that public sector initiatives might be more effective in disseminating information about green computing.
- IT professionals in both sectors are well-informed about their organizations' green computing policies and recognize the importance of personal initiatives. This awareness is slightly more pronounced in the public sector, indicating a stronger institutional focus on green computing.
- Public sector IT professionals display a stronger understanding of the crucial role and long-term benefits of green computing practices than those in the private sector. This indicates a deeper institutional commitment to sustainability in public organizations.
- Public sector IT professionals are more knowledgeable about their potential contributions to green computing initiatives and the importance of coordination within the organization.
- There is a stronger consensus among public sector professionals regarding the financial benefits of green computing, suggesting that public organizations may be more successful in communicating these advantages.
- Both sectors frequently employ digital documentation and virtual networks, but public sector IT professionals use these practices slightly more often. This higher usage could be attributed to better-established digital infrastructure in the public sector.
- Attendance at green computing training and seminars is low in both sectors, indicating a significant area for improvement. Increasing participation in educational programs could enhance overall effectiveness.
- Public sector IT professionals are more proactive in adopting energy-efficient gadgets and storage practices. This proactive approach is likely driven by stricter regulatory requirements and stronger institutional support for sustainability.
- Public sector professionals are more engaged in reusing printed papers and participating in electronic recycling programs. This engagement reflects a higher institutional emphasis on recycling and sustainability practices.

6. Conclusion

There are no significant differences in the awareness and knowledge of green computing between private and public sector IT professionals. IT professionals in both sectors have a comparable level of awareness regarding green computing, with public sector professionals showing slightly higher awareness overall. Both private and public sector IT professionals possess a good understanding of green computing practices, with public sector professionals demonstrating marginally higher knowledge scores on average. However, in terms of practices, the data reveals that private-sector professionals demonstrate significantly higher levels of green computing practices compared to public-sector professionals.

Recommendations

- Conduct regular training sessions, sharing of best practices, and seminars specifically tailored to improve awareness among IT professionals in both sectors. The focus should be on aspects where awareness levels were

lower, such as company policies contributing to green computing and the consequences of not implementing green practices.

- Provide continuous education opportunities for IT professionals to stay updated on energy-efficient technologies and practices within the IT sector
- Invest in energy-efficient IT solutions and technologies (e.g., virtual networks, storage virtualization, energy-efficient gadgets) to reduce environmental impact.
- Set clear and measurable sustainability goals related to green computing practices, with input from IT professionals, to drive continuous improvement and accountability
- Conduct regular audits to assess the effectiveness of green computing practices and make necessary adjustments based on audit findings.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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