



TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
PULCHOWK CAMPUS

THESIS No.: 079/MSEEB/020

**Gender Perception Differences Influencing Behavioral
Intentions toward Energy Saving: A Study of Nepalese
Workplace**

By
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A THESIS SUBMITTED TO THE DEPARTMENT OF ARCHITECTURE IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE IN ENERGY EFFICIENCY

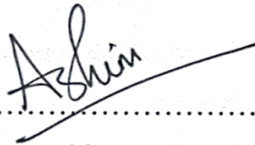
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I hereby declare that the thesis entitled “Gender Perception Differences Influencing Behavioral Intentions toward Energy Saving: A Study of Nepalese Workplace” which is being submitted to the Department of Architecture, Pulchowk Campus, Institute of engineering, Tribhuvan University in partial fulfilment of the requirements for the degree of Masters of Science in Energy Efficiency in Buildings (MSEEB) is a research work carried out by me, under the supervision of Associate Professor, Dr. Sanjay Uprety, PhD and Assistant Professor Er. Navin Kumar Jha, between start dates to completion date. I declare that the work is my own and has not been submitted for a degree of another University.



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079MSEEB020

Masters of Science in Energy efficiency in Buildings

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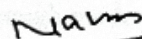
CERTIFICATE OF THESIS APPROVAL

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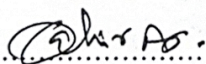


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ABSTRACT

Unlike household settings where individuals have greater autonomy over energy decisions, workplace behaviors are mainly governed by shared spaces, and established organizational norms. Nepal's workplace environment experience gradual increasing inclusion in female workforce rate at 28.7%, particularly in banking institutions, where energy consumption patterns are influenced by workplace hierarchies, departmental divisions, and standardized operating procedures. Previous studies have been carried out in household energy consumption pattern, there is limited understanding of how gender perceptions influence energy-saving behaviors in professional environments. This study aims to analyze gender differences in energy saving perceptions and examine how these perceptions influence behavioral intentions towards energy saving in workplace settings, specifically among commercial banking sector within different location of Nepal. The research employed a mixed-methods approach using the theory of planned behavior, analyzing 133 responses through moderated multiple regression analysis. Men primarily approach energy conservation through perceived control over daily habits, while women integrate multiple factors including technical knowledge and workplace culture. This study identified a technical competence paradox where technical knowledge decreases men's energy saving intentions but increases in women's perceptions. A key finding was the intention-behavior gap: intentions did not significantly predict actual energy saving behaviors for men or women challenging TPB assumption that intentions drive behavior and highlights the role of organizational barriers in shaping actions. This research gains both theoretical understanding and practical implementation of workplace sustainability initiatives by highlighting the complex relationship between gender perceptions and energy-saving behaviors in corporate settings. The insights gained provide a foundation for developing more effective, inclusive energy conservation strategies that acknowledge and accommodate the different approaches that men and women take to workplace energy management.

Keywords: Gender perception, behavioral intention, workplace energy efficiency, energy saving, Theory of Planned Behavior

ACKNOWLEDGEMENT

It would not have been possible to produce this thesis without the supports and contributions from many people and institutions. I am grateful to them, all. Particularly, I would like to make the following acknowledgements:

My heartfelt thanks and appreciation to my thesis supervisor Dr. Sanjay Uprety, PhD, who provided me with an immense inspiration to work for my thesis with his creative, and untiring comments and feedback. I am very much indebted to my co-supervisor Er. Navin Kumar Jha for providing his sincere, constructive and resourceful support that encouraged me to work hard throughout and understand the intensity of my Master's research.

My warm appreciation and thanks go to my research participants from different banking institutes around Gandaki, Bagmati and Koshi province of Nepal, who despite of their heavy corporate schedules, provided me with the time and opportunity to learn and to gather the necessary information require for my research.

My great appreciation and thanks go to my uncle and brother for helping me during survey and two of my friends for providing feedback on my statistical analysis and proofreading my thesis.

Lastly, I want to express my deepest appreciation to my family for their endless love and support, patience, understanding and commitment, without which it would not have been possible for me to undertake the challenges of this Degree

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LIST OF ABBREVIATIONS

TPB – Theory of Planned Behavior

CA- Cognitive Attitude

CA_TE – Cognitive Attitude_Technical Efficacy

CA_ER – Cognitive Attitude_ Environmental Responsibility

WC – Workplace Culture

PBC – Perceived Behavioral Control

PBC_T – Perceived behavior Control _Technical/Operational Control

PBC_D – Perceived Behavioral Control_ Day-to-day Control

BI – Behavioral Intention

ESB - Energy Saving Behavior

HVAC - Heating, Ventilation and Air Conditioning

CHAPTER 1 INTRODUCTION

1.1 Background

The global energy landscape has changed in recent decades, marked by rapid increase in electricity consumptions both in residential and workplaces settings (Peng et al., 2018). This increase has made energy consumption one of the biggest global challenges that affects environmental sustainability, economic growth and social wellbeing (B. Wang et al., 2018). With growing concerns about climate change and resources depletion stated by IPCC (2022), energy conservation has become a priority, promoting many countries to adopt strategies aiming on reducing consumption and transition towards more sustainable practices (IEA, 2023). However, Nepal, like many developing nations, faces distinct challenge in this domain due to its geographical constraints, limited infrastructure and economic considerations (Zimmerman & Reames, 2021). Thus, understanding energy consumption dynamics, particularly in workplace environment, is essential for crafting effective management strategies to address these multifaceted issues.

Electricity utilization within office buildings represents a central component of global energy consumption, accounting for approximately 30-32% of total energy utilization on an international scale (Gruske, 2020; IEA, 2021). (See **Figure 1.1**). Office buildings, as structures, characterized by high energy demands depend significantly on systems such as lighting, heating, ventilation, and air conditioning (HVAC), in conjunction with electronic office equipment, which collectively generate considerable energy requirements. Studies indicate that lighting and HVAC systems alone can account for 30–50% of energy consumption in office environments (Pérez-Lombard et al., 2008), while modern offices increasing dependence on electronic devices contributes an additional 20% (Mulville et al., 2017), that shows the increase in digitalization of workplace activities. (See **Figure 1.2**). The progressive incorporation of technology into workplace environments, the management of energy demand arising from these electronic devices has become imperative for the enhancement of energy efficiency. In response, innovations such as the Internet of Things (IoT), artificial intelligence (AI), and digital management systems are offering new solutions to optimize energy consumption, leading to significant improvements in office environments (Azua

Ramli et al., 2020). Emphasizing energy uses in offices is therefore crucial, not only to reduce operational costs but also to contribute to global sustainability goals, as these buildings continue to be major consumers of nation's energy.

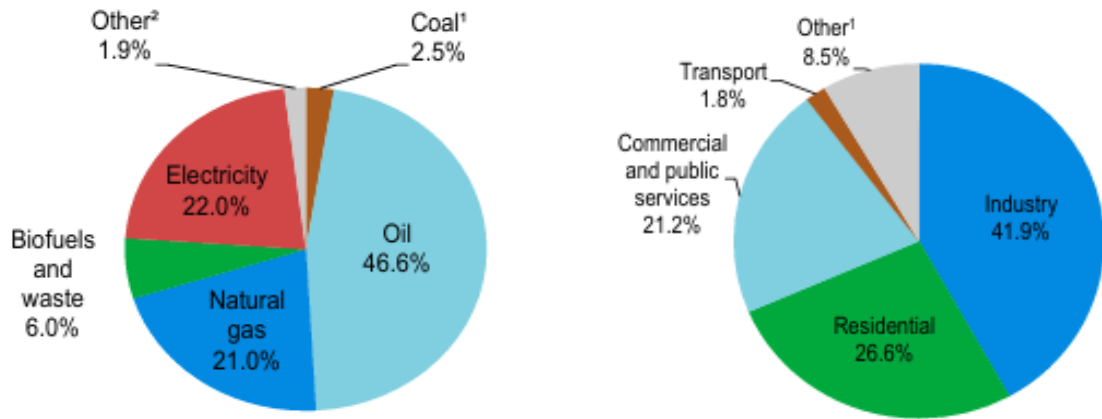


Figure 1.1: Total energy consumption worldwide 2019
Total electricity consumption, 2019 (IEA, 2021)

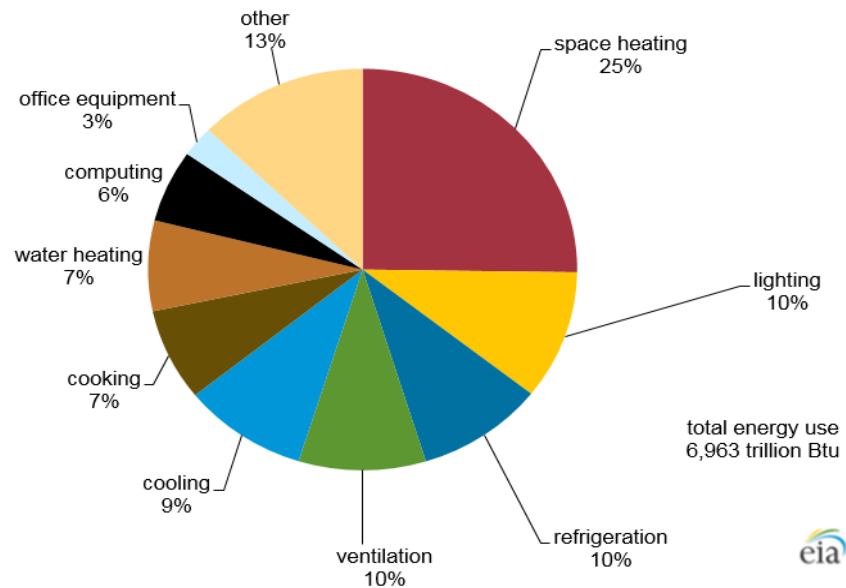


Figure 1.2: Total energy consumption in commercial Buildings
(Source: Energy information administration, commercial buildings energy consumption survey)

This comprehensive energy distribution visualization in the commercial sector accounts for over one-fifth of global energy consumption. **Figure 1.1** illustrates the worldwide energy consumption patterns in 2019, showing the distribution across major energy sources and consumption sectors. While **figure 1.2** specifically breaks down energy consumption within commercial buildings, revealing the multiple high-impact

intervention areas where space heating (25%), lighting (10%), ventilation (10%), and computing/office equipment (9%) represent significant portions that are directly affected by daily workplace practices. These figures directly connect to energy challenges experiencing in rapid growth in urbanization in Nepal.

Nepal's energy consumption has grown significantly in recent years, with total annual demand reaching 8,960 GWh in 2022/23 (NEA, 2023). As detailed in Table 1, the grid electricity for 4.96% of national energy consumption with increment of 20.45% compared to the previous years. Renewable energy sources contributes an additional 2.52% to the national energy mix leading to renewable sector. Collectively, electricity (both grid and renewable) represents 7.48% of Nepal's total energy consumption, demonstrating overall growth rate of 15.93% (WECS, 2023). Adding the projections, Water and Energy Commission Secretariat (WECS, 2019) and Ministry of Energy, Water Resources and Irrigation (2018) also states that, Nepal's electricity demand is expected to increase dramatically across all economic sectors by 2030.

Table 1.1 Electricity Consumption by Category in Nepal (FY 2078/79)

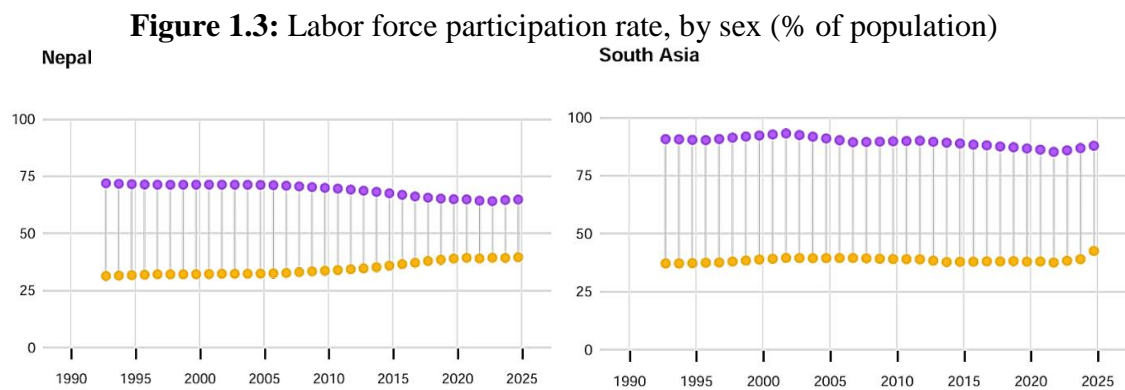
Category	Type	Energy (GJ)	TOE	GWh	% of National Total	Growth Rate (%)
Commercial	Grid Electricity	31,766.40	758.73	8,894.59	4.96%	20.45%
	All Renewable Sources					
Renewable	(Biogas, Wind, Micro/Pico Hydro, Solar)	16,113.88	384.87	4,511.89	2.52%	7.19%
Total Electricity		47,880.28	1,143.60	13,406.48	7.48%	15.93%

The growing urbanization and the expansion of commercial activities have placed office buildings as a major electricity consumers in urban centers. A report by Building Energy Efficiency in Nepal, 2024, highlights that rapid urbanization and evolving workplace dynamics have escalated energy demand in Nepal's office buildings further amplified by extended operating hours and modern appliances. Recent studies indicates that urban commercial establishments, including office spaces, account for over 50% electricity use in Nepal's urban areas (NEA, 2023). This trend parallels the country's economic growth, infrastructure development, and increasing adoption of technologies

in workplaces (ADB, 2019). The service sector, which includes office operations, is expected to drive a significant portions in this growth, highlighting the need of developing targeted approach to energy management in office environments (Shrestha et al., 2021). Therefore, improving energy efficiency in Nepalese offices is crucial for both economic, infrastructural and environmental sustainability, requiring effective management strategies and workplace policies.

Variations in office energy consumption are influenced by multiple factors, such as building design, operational hours, technology usage, and workplace energy management practices. Despite these factors in energy efficient systems, many offices continues to experience inefficiencies in how energy is being used within office environments. These inefficiencies often come from human factors (how employee behave) rather than technical limitations (Nisa et al., 2019; Stern, 2020). Employee behavior emerges as a critical determinant of energy consumption in office environments, influenced by personal comfort levels, energy-saving awareness, and workplace policies (Kotsopoulos et al., 2023), which encompass a range of action from equipment usage to temperature control preference. Among these, behavioral patterns and demographic factors, particularly gender, have been increasingly recognized as influential determinants of energy use. Research suggests that gender-specific behaviors impact energy consumption patterns, with some studies indicating that women consume more energy in office settings than men (Ponichan et al., 2023). These differences may be attributed to various factors including socialization processes (how men and women are raised differently in society), value orientations (different priorities or values that individuals hold), and risk perceptions (men and women might perceive risks differently) (Kennedy & Kmec, 2018; Mccright & Dunlap, 2011). This highlights the importance of analyzing gendered behavioral influences on energy consumption to develop effective policies and interventions aimed at promoting sustainability in office buildings. Therefore, understanding behavioral patterns, such as the influence of gender on energy consumption, is essential for designing effective policies and technologies that promote energy savings and sustainability in Nepalese workplaces. As gender significantly influences energy consumption behaviors, shaped by cultural norms, social roles, and individual preferences, the gender specific behavior and perception towards energy consumption pattern is imperative.

The exploration of gender preferences in energy consumption patterns is particularly relevant in growing participation of women in the workforce and their roles as household energy managers create unique intersections in their energy behaviors across settings (Trace, 2019). In the context of Nepal, according to gender data portal, a lower-middle-income country that has seen a gradual increase in women's participation rate in Nepal stands at 28.7% for females and 53.9% for males. While this gender gap is still present, it is relatively narrower compared to other South Asian countries, such as India (20.3% for females and 57.5% for males) and Pakistan (21.9% for females and 67.1% for males) to examine how gender-specific behaviors influence energy consumption patterns in office buildings (World Bank, 2024).



In Nepal, where gender roles and norms remain particularly strong, understanding these difference takes on added importance. The country has witnessed bigger changes in gender dynamics in professional settings, with many women joining the workforce over the last ten years (Asian Development Bank, 2015). Understanding gender-based differences in their energy use behaviors and intentions therefore represents an important part of energy saving efforts in offices of Nepal.

1.2 Problem statement

Despite that, saving energy in workplaces is important, but we don't fully understand how being a man and women might affect energy saving habits, especially in countries like Nepal. Studies have shown that men and women do use energy differently at home (Mainali & Silveira, 2013; Khatiwada et al., 2019), but little is known about how these differences translate to professional working settings like banks.

Banks in Nepal are worth studying because they rely heavily on electronic equipment, air conditioning and lighting, employ diverse workforce, and contribute positively to

the country's growing sector. However, current energy saving plans and strategies in banks treat everyone the same way. These banking institute don't really consider that men and women might think about and use energy differently (Islar et al., 2017; Nepal & Paija, 2019; B. Shrestha et al., 2021).

This research is about exploring gender based differences in energy perceptions and behavioral intentions within Nepal's banking sector. It also seeks to understand gendered patterns in how employees think about energy, how workplace environment shapes these patterns and how these factors translate into actual conservation behaviors. Thus, understanding these differences could help develop better energy saving strategies in Nepalese workplaces. By recognizing the different ways men and women perceive about and approach energy conservation, organizations can create more effective programs that engage all employees in reducing energy consumption.

1.3 Research objectives

1. To analyze gender difference in perceptions of energy use in office environment.
2. To examine how gender difference in perceptions influence behavioral intentions regarding energy saving in workplace settings.

1.4 Research questions

Women are more involved in household energy management, while men often dominate energy decisions related to infrastructure and policy (B. Shrestha et al., 2021). However, little is known about how these dynamics translate to the workplace. Based on the background, problem statement and research objectives, the research questions in the study are as follows:

1. Do men and women perceive and use energy differently in office settings?
2. How do workplace culture control influence gendered energy behavior?

1.5 Organization of the Master Thesis

To show the clarity of the thesis structure, the organization of the research thesis is listed as the following:

- a. Chapter One: Introduction – elaborates the main components including background, problem statements, objectives and research questions and lastly the limitation of the research study.
- b. Chapter two: Literature Review – presents an overview of the theoretical background and other relevant information that related with the scope of the research.
- c. Chapter three: Conceptual framework – showcases the adaption of the theoretical foundation and refined to align with the research goal with supportive validation.
- d. Chapter four: Research Methodology – describes data collection methods, justification of the area, data analyzing process and results.
- e. Chapter five: Results – presents the key findings from statistical results and patterns.
- f. Chapter Six: Discussion – interprets the findings to existing literatures and semi structure interview along with implications and recommendations.

CHAPTER 2 LITERATURE REVIEW

2.1 Gender and Energy Use

2.1.1 Gender

Gender isn't just about being male or female in a biological way, it's a social concept that are shaped by cultural expectations, behaviors, and roles assigned to men and women differently. It is something we "perform" daily through actions and interactions (West & Zimmerman, 1987). As a social construct, gender varies from society to society and can change over time. Researchers have distinguished between biological sex (physical traits) and gender (how society expects people to act based on those traits) (Butler, 1999). This distinction seems important when studying how gender influences energy use, decision making and workplace behaviors.

In an energy research, understanding gender, it requires moving beyond binary categories to examine how gender intersects with other social identities including class, ethnicity and age (Johnson et al., 2020). Their study of workplace energy consumption found that gender performances varied significantly across different organizational contexts. Similarly, other researchers add their insights stating "gender plays a big role in energy policies, yet it's often ignored (Fraune, 2016)", and "in developing countries, gender norms influence who controls energy resources and how technologies are designed (Khamati-njenga, 2002)".

Despite the progress in gender theories, studies continues to explore gender as classifying individuals strictly as either male or female in technical researches, while ignoring its social and cultural dimensions (Fathallah & Pyakurel, 2020). Methodologically, many quantitative studies depend on self-reported data, which may not reveal implicit gender biases in energy behavior (Wilhite, 2017). While qualitative approaches provide deeper insights, they typically rely on small sample sizes, limiting broader applicability. For the present study of gender perception differences in Nepalese workplaces, adopting wider understanding of gender is essential.

2.1.2 Gender perception of energy use

Gender differences in how people understand, value and interact to energy represents a growing area of research (Clancy & Roehr, 2003). Men and women often have different views on how energy is used, what it's used for, and who is responsible for saving it. These difference affect how aware they are of energy use and what they think should be prioritized. These viewpoints helps to understand the importance for creating better energy saving strategies in workplaces where gender roles and office systems influence behaviors.

Studies have consistently shown that difference in gender perception exists in valuable factors. Carlsson-Kanyama & Lindén, (2007) found that women in Sweden were more aware of daily household energy use and more concerned about its environmental impact compared to men. Similarly, Rätty & Carlsson-Kanyama, (2010) observed that women tend to have a better understanding of how energy is use in home.

In office environments, gender based variations are seen in pro-environmental attitudes, noting that women tend to express stronger concerns about energy waste in shared spaces (Matthies et al., 2011). However, they often reported feeling less capable of influencing energy efficiency at an organizational level. The study highlighted that while women were more observant of inefficiencies, they perceived lower levels of control over broader energy saving initiatives. Women's role as a caregiver and household managers further amplify their concerns about energy waste, as they seek to balance comfort and resource management. In the South Asian context, Pachauri & Rao, (2013) analyzed patterns of energy access and use in India, reveals that men and women often assign different priorities to energy services. Women were more inclined to focus on household energy needs whereas men emphasized energy use for income generating or recreational purposes. Building on this, a Nepalese researcher, Shrestha et al., (2019) found gendered perceptions of energy technologies and revealed that men often evaluated energy technologies based on their potential for income generation and productivity, such as their applicability in agriculture or business. In contrast, women emphasized the value of these technologies in easing their labor and improving efficiency in daily tasks. Women also showed a stronger preference for technologies that were reliable and consistent, likely due to their daily dependence on energy for

essential tasks. Men, however, were more tolerant of occasional system failure if economic benefits were apparent.

According to Sovacool, (2014), a comprehensive study on gendered perceptions of energy security across various Asian countries, men and women conceptualization energy security in significantly different ways, shaped by their distinct roles, responsibilities and lived experiences. Women prioritize most about reliability and affordability, focusing on uninterrupted power cuts or high costs whereas men focus on making the country energy independent, using advance technology, and reducing the need to import energy from other countries. Women focus on the present oriented perspective concerned with immediate issues and men tend to think more about the long term such as building new power plants and developing energy technology. Women usually think about energy security at community level, where they see how energy affects everyday life. Men focus on the national/international level, such as how energy affects the country's economy or global position. Women worry about things like power cuts, high energy prices and how these affect their immediate environment, in contrast men are more concerned about technical problems or rely too much on energy. Women often connect clean energy and a healthy environment similarly, men treat the environment as a separate issue focusing more on just having enough energy. These differences reflect distinct cognitive frameworks shaped by gendered experiences and social roles.

Energy perceptions vary not only by gender but also across different settings. Women perceived energy through a multidimensional lens integrating health and comfort, and men primarily focused on cost and technical performance (Clancy & Roehr, 2003; Khamati-njenga, 2002). A study by Ryan, (2014) in professional settings, documented, particularly in male dominated energy industries, 78% of male respondents conceptualized energy primarily as an optimization problem requiring technical solutions. Similarly, female professionals in the same environments were 3.2 times more likely to incorporate social context considerations into technical energy discussions. When accessing workplace energy inefficiencies, men primarily identified equipment failure (67% responses), while women more frequently noted behavioral and organizational factors (58% of responses). Also, in the same study, male employees showed a statistically significant tendency to prioritize system wide technical metrics,

while female employees integrate both technical and social metrics when evaluating energy systems.

Methodologically, researchers have employed diverse approaches to study gendered energy perceptions. Qualitative studies like those by Sunikka-Blank et al., (2019) used in-depth interviews to uncover how gender shapes energy narratives and meanings in Pakistan, revealing rich differences in how men and women conceptualize and talk about energy. Quantitative research by Elnakat & Gomez, (2015) applied statistical analysis to identify patterns in how different genders respond to questions about energy awareness, concern, and valuation in the United States.

Gender differences in energy perception are also reflected in various cognitive frameworks. Women are more likely to perceive energy use within social and collective contexts, viewing energy consumption as embedded within community responsibility. Clancy et al., (2012) found that women were more aware of how energy is used and more concerned about energy costs. They also showed a stronger understanding of how energy use affects the environments. Men, on the other hand, had more technical knowledge about how energy is produced. They were also more likely to value energy independence such as relying less on foreign energy sources. In contrast, Standal & Winther, (2016) observed in rural India, that men were much more focused on the technical details of energy systems, like how powerful or efficient they were. They aimed to maximize performance and output. In contrast, women focused on whether the technology fit into daily life. When talking about the best kind of energy systems, men mostly used technical terms, while women talked about how the system could improve life or help their surroundings.

Current studies on how gender influence energy perception have some limitations as well. First, many studies use self-reported data where people reporting their own thoughts or behaviors. But this can be unreliable because people might answer in ways they think are socially acceptable, not how they truly feel or act (Wilson et al., 2013). Second, a lot of research only looks at men and women, ignoring people with non-binary or fluid gender identities. As Johnson et al., (2020) point out, this means researchers may be missing important differences in how people of all gender identities think about use energy.

Research shows that there are still big gaps in understanding why men and women think differently about energy. While many studies point out these differences, they don't always explain where these differences come from. Some researchers suggest these views develop through life experiences, education, and social roles. For example, Cecelski, (2004) explains that women might see energy systems differently because they often have less access to technical training and information. This means the difference in how men and women understand energy may be due more to unequal opportunities than natural differences. On the other hand, Agarwal, (1997) points out that men often feel more in control of energy decisions because society and institutions support that role. This helps explain why men and women may develop different ways of thinking about energy use and control.

Therefore knowing these gender-based differences in how people think about energy is especially important in Nepal. Traditional gender roles there often shape how men and women understand and relate to energy. For instance, Mahat, (2011) found that in Nepali office settings, women often see energy-saving as a part of their social and moral responsibility, while men tend to view it more from a technical or cost-saving perspective. These different ways of thinking affect how each group forms their attitudes and behaviors toward saving energy.

Summary of Gender Perception of Energy use can be seen in **Appendix 1: Section 1**

2.1.3 Factors Influencing Gender perception of Energy use

Several key factors shape how gender influences energy perceptions, producing distinct patterns in men's and women's understanding and value energy systems:

(a) Socialization and gender role development

Early socialization significantly shapes energy perceptions. Research by Zelezny et al., (2000) found that gender-differentiated childhood responsibilities related to household management create lasting differences in energy awareness. Girls are typically socialized to manage domestic resources including energy, developing greater attention to consumption patterns. Boys are more often socialized toward technical and instrumental aspects of energy systems, shaping their perception frameworks.

(b) Division of labor and responsibilities

Traditional gender divisions of labor directly impact energy perceptions. Women's typical responsibility for household tasks leads them to perceive energy through the lens of daily practices and immediate needs (Clancy & Roehr, 2003). This creates more practice-oriented energy perceptions compared to men's more abstract conceptualizations.

(c) Education and technical knowledge access

Differential access to technical education fundamentally shapes energy perceptions. Women received significantly less technical energy education than men, with this educational disparity explaining approximately 63% of the variance in technical confidence regarding energy systems (Cecelski, 2004). When women gain equal technical training, perception gaps narrow substantially, though distinct priorities often remain.

(d) Institutional and organizational structures

Workplace hierarchies and organizational cultures mediate gendered energy perceptions. Ryan, (2014) found that in male-dominated energy sectors, institutional structures reinforced technical optimization frameworks as the dominant approach to energy. Female professionals often adopted hybrid frameworks that integrated both technical and social considerations, even though they faced challenges in recognizing these perspectives.

(e) Cultural and religious norms

Cultural contexts significantly shape gendered energy perceptions. Research by Skutsch, (2005) demonstrated how cultural norms in different societies create distinct patterns of energy responsibility, authority, and knowledge that influence perceptual frameworks. Religious teachings sometimes reinforce gendered relationships to resources, including energy, as documented by Sunikka-Blank et al., (2019) in their study of Muslim households in Pakistan.

(f) Economic and Decision making authority

Economic power significantly influences gendered energy perceptions. Women with greater economic decision-making authority demonstrated different energy perceptions

than those with limited financial control (Pachauri & Rao, 2013). Economic status intersects with gender to create distinct patterns of energy priorities and concerns.

(g) Knowledge system and information Networks

Men and women typically access different information networks regarding energy. Carlsson-Kanyama & Lindén, (2007) documented how women more often relied on social networks and practical demonstrations for energy information, while men had greater access to formal technical information channels. These different knowledge systems shaped fundamentally different perceptions of energy technologies and systems.

Summary of factors influencing gender perception of Energy use can be seen in **Appendix 1: Section 2**

2.2 Energy efficiency and Energy conservation

While the terms energy efficiency, energy conservation and energy saving are often used interchangeably, where they have distinct meanings. According to the U.S. (EIA, 2024), energy efficiency refers to the use of technology that requires less energy to perform the same function or work which include the installation of energy efficient appliances. On the other hand, energy conservation is any behavior that results in the use of less energy.

Energy conservation typically refers to the overall reduction of energy use, which involves efforts in order to preserve natural resources and minimize environmental pollution. This can be achieved often by using energy more efficiently, achieving the same results with less energy or by simply avoiding energy consuming activities (Baharuddin & Ismail, 2020). It involves behavioral changes like using appliances less, climbing stairs instead of using lifts, switching off unnecessary lights or turning off the air conditioning when it's not strictly needed. It basically focuses on using less energy sometimes by sacrificing comfort or conveniences (Constellation, 2020).

These two approaches: technological improvement (efficiency) and behavioral change (conservation) are both essential in achieving overall energy savings. The EIA emphasizes that they are complementary strategies aimed at reducing energy

consumption with conservation addressing demand side behavior and efficiency improving the supply side performance.

2.3 Energy Saving

Energy saving refers to the action taken to reduce energy consumption through improved efficiency and smarter behavioral changes while still maintaining or even improving the level of service provided (Bertoldi & Labanca, 2016). For example, installing LED bulbs to get the same lighting with less electricity, minimizing the use of regular electric bulbs by installing solar panel, replacing electronic vehicles with traditional petrol or diesel fueled vehicles etc. Energy saving can be understood in a broader way as it includes both the energy conservation and energy efficiency. The relationship between energy saving, energy efficiency and energy conservation is foundational in energy policies and researches.

$$*Energy saving = Energy efficiency + Energy conservation*$$

2.3.1 Efforts toward energy saving in Nepal

In Nepal, energy saving is not only an environmental priority but also an essential economic strategy. As a country highly exposed to the effects of climate change due to its mountainous geography, using energy more efficiently plays a vital role in Nepal's climate strategies (NCCP, 2019). Efficient energy use across households, workplaces and industries can help in relying less on expensive imported fuels, lowers operational costs for business, expand energy access and become more resilience to climate related risks (World bank, 2023). Along with the rapid growth of the service sector, minimizing energy waste in office environments is a major opportunity to achieve both economic saving and environmental progress (on that saves money while also protect the environment). That's why saving energy is a fundamental pillar in Nepal's journey towards sustainable development. With that, Nepal has gradually increased its focus on energy efficiency and conservation over the past several decades. The following represents the key efforts made towards energy saving in Nepal.

Table 2.1: Chronological Development of Energy saving initiatives in Nepal
According to the report, National Energy Efficiency Strategy, 2075. (MoEWRI, 2019)

Time Period	Key Initiatives	Implementing Agencies	Focus Areas	Outcomes/Achievements
1985-1999	<ul style="list-style-type: none"> Initial studies and analyses on energy efficiency 	<ul style="list-style-type: none"> Various government agencies 	<ul style="list-style-type: none"> Research and assessment 	<ul style="list-style-type: none"> Baseline understanding of energy efficiency potential
1999-2005	<ul style="list-style-type: none"> Industrial energy audits Energy efficiency training Public awareness campaigns Financial mechanisms for industry 	<ul style="list-style-type: none"> Ministry of Industry Donor agencies 	<ul style="list-style-type: none"> Industrial sector Capacity building 	<ul style="list-style-type: none"> Initial energy audit capacity Awareness among key industries
2009-2011	<ul style="list-style-type: none"> Demand-side management Energy audits Electricity load profiling Policy recommendations Incandescent bulb replacement 	<ul style="list-style-type: none"> Nepal Electricity Authority 	<ul style="list-style-type: none"> Electricity sector Lighting efficiency 	<ul style="list-style-type: none"> Reduced peak demand Energy-efficient lighting adoption Load management during shortages
2010-2018	<ul style="list-style-type: none"> Nepal Energy Efficiency Program (NEEP) Industrial Energy Management Project 	<ul style="list-style-type: none"> Ministry of Energy Ministry of Industry GIZ (German Development Agency) 	<ul style="list-style-type: none"> Cross-sector approach Human resource development 	<ul style="list-style-type: none"> Enhanced technical capacity Initial policy frameworks

	<ul style="list-style-type: none"> • Policy development • Training and awareness 		<ul style="list-style-type: none"> • Policy framework 	<ul style="list-style-type: none"> • Energy audit expertise
2016	Biomass Energy Strategy 2073	<ul style="list-style-type: none"> • Ministry of Energy • Alternative Energy Promotion Centre 	<ul style="list-style-type: none"> • Biomass resources • Traditional energy sector 	<ul style="list-style-type: none"> • Framework for sustainable biomass • Improved cooking technologies
2018- Present	<ul style="list-style-type: none"> • National Energy Efficiency Strategy 2075 • Action plan implementation • Standards development • Entity establishment 	<ul style="list-style-type: none"> • Ministry of Energy, Water Resources and Irrigation • Multiple agencies 	<ul style="list-style-type: none"> • Comprehensive approach • All energy sectors • Institutional framework 	<ul style="list-style-type: none"> • Goal to double efficiency improvement rate • Cross-sector coordination • Energy efficiency standard

Nepal’s energy efficiency journey spans over three decades, beginning with preliminary studies in the mid-1980s and evolving into comprehensive national strategies by 2018. The chronological progression shows a gradual shift isolated, sector specific interventions to more integrated, policy driven approaches. The initial efforts focused primarily on industrial efficiency and capacity building while later initiatives expanded to address electricity, biomass and eventually over all energy sectors. The National Energy Efficiency strategy represents a significant milestone where there is an established framework for coordinated actions with ambitious goal of doubling energy efficiency improvement rate in Nepal. Throughout this evolution, the involvement of international development partners particularly GIZ has been instrumental in providing technical expertise and resources. This systematic development of initiatives exhibits growing commitment to address energy conservation as a national priority.

Energy saving efforts in Nepal have been implemented across various sectors, each with different approaches, progress level and various challenges. These initiatives ranges from technical solutions to behavioral interventions along with difference in degrees of success. While some sectors like residential lighting have seen widespread implementation, other such as transport remains in early development stages. The following table provides a comprehensive overview of sector specific energy saving interventions in Nepal, highlighting the key initiatives, implementation status and potential impacts for each major sector of the economy.

Table 2.2: Sector specific energy saving interventions in Nepal

Sector	Key Initiatives	Implementati on Status	Challenges	Potential Impact
Industrial	<ul style="list-style-type: none"> • Energy audits • Energy management systems • Efficiency standards • Cogeneration (sugar mills) • Technical training 	<ul style="list-style-type: none"> • Partially implemented • Limited by funding and expertise 	<ul style="list-style-type: none"> • High initial costs • Technical knowledge gaps • Limited incentives 	<ul style="list-style-type: none"> • 10-30% energy savings potential • Reduced production costs • Improved competitiveness
Commercial & Public Buildings	<ul style="list-style-type: none"> • Building energy codes • Efficient lighting • HVAC optimization • Energy audits • Awareness campaigns 	<ul style="list-style-type: none"> • Initial implementation in urban areas • Limited enforcement 	<ul style="list-style-type: none"> • Low awareness • Split incentives • Limited regulation 	<ul style="list-style-type: none"> • 30-50% reduction in energy waste • Lower operational costs • Improved indoor environments

Residential	<ul style="list-style-type: none"> • Energy-efficient lighting (CFL/LED) • Appliance standards and labeling • Public awareness • Improved cooking technologies 	<ul style="list-style-type: none"> • Lighting initiatives widely implemented • Limited progress on appliance standards 	<ul style="list-style-type: none"> • Affordability concerns • Market availability • Consumer awareness 	<ul style="list-style-type: none"> • Reduced household energy costs • Lower peak electricity demand • Health benefits (cooking)
Transport	<ul style="list-style-type: none"> • Vehicle efficiency standards • Fuel-efficient practices • Electric vehicle studies • Public transportation 	<ul style="list-style-type: none"> • Limited implementation • Early stages of development 	<ul style="list-style-type: none"> • Infrastructure limitations • Fuel dependence • Regulatory frameworks 	<ul style="list-style-type: none"> • Reduced petroleum imports • Lower air pollution • Foreign exchange savings

Furthermore, Nepal has established a multi institutional framework to address energy efficiency challenges, with each organization having distinct but complementary responsibilities. While policy development and strategy planning are occurred primarily at the ministry level, implementation activities are distributed over various agencies who are specialized with the particular field of interest. This institutional layout evolve continuously with the proposed establishment of entity which will represent a future development. The framework aims to create an approach that effectively implement energy saving measures cross all sectors.

Table 2.3: Institutional framework for Energy saving in Nepal

Institution	Role in Energy Efficiency	Current Status	Future Direction
Ministry of Energy, Water Resources and Irrigation	<ul style="list-style-type: none"> • Policy development • Coordination • Strategy implementation • Monitoring and evaluation 	<ul style="list-style-type: none"> • Energy Efficiency Cell established • National Strategy approved (2018) 	<ul style="list-style-type: none"> • Strengthening coordination mechanisms • Developing comprehensive legal framework
Nepal Electricity Authority	<ul style="list-style-type: none"> • Demand-side management • Load management • Consumer awareness • Grid efficiency 	<ul style="list-style-type: none"> • Active implementation of programs • Focus on reducing losses 	<ul style="list-style-type: none"> • Smart metering • Time-of-use tariffs • Consumer feedback systems
Alternative Energy Promotion Centre	<ul style="list-style-type: none"> • Renewable energy integration • Biomass efficiency • Rural energy solutions 	<ul style="list-style-type: none"> • Primary focus on renewables • Limited energy efficiency components 	<ul style="list-style-type: none"> • Integrating efficiency with renewable promotion • Expanded rural energy efficiency programs
Nepal Bureau of Standards and Metrology	<ul style="list-style-type: none"> • Equipment standards • Testing and certification • Labeling programs 	<ul style="list-style-type: none"> • Initial development of standards • Limited enforcement capacity 	<ul style="list-style-type: none"> • Comprehensive standards framework • Testing facilities enhancement • Market surveillance

Proposed Energy Efficiency Entity	<ul style="list-style-type: none"> • Dedicated implementation • Cross-sector coordination • Technical assistance • Monitoring and verification 	<ul style="list-style-type: none"> • Proposed in National Strategy • Not yet established 	<ul style="list-style-type: none"> • Establishment as priority • Development of National Energy Efficiency Action Plan
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2.4 Energy saving Intention and behavior

Energy saving intention refers to an individual’s motivation, willingness, or plan to engage in behaviors that reduce energy consumption. It represents the degree to which a person is willing to try or how much effort they are planning to exert in order to perform energy saving behaviors. This psychological construct reflects the cognitive and motivational foundation that leads to actual energy saving behavior.

Energy saving behaviors refers to the everyday actions which people take to use less energy and reduce environmental harm associated with energy usage and production (Sony & Mekoth, 2018). These actions show how people manifest their intentions to save energy into real behavior. They are shaped by personal habits, social influences and the surrounding environment. So, by knowing what encourages people to save energy, helps us to design more effective strategies and allow us to identify the key factors that influences behavior.

Energy saving behaviors can be categorized into four distinct approaches that collectively contribute with each offering a different pathways to the central goal of energy saving. Efficiency behaviors involve one time investments in energy efficient technologies. Examples include replacing traditional light bulbs with LED alternatives, installing better insulation, or upgrading to energy efficient appliances (Trotta, 2018). Although these actions require an initial financial outlay, they typically demand little ongoing effort. Once they are adopted, such measures continue to save energy passively over time, making them as essential component of long term energy reduction

strategies. This strategy is highly effective as a research found that switching to energy efficient technology can significantly reduce energy usage (Steg et al., 2015).

In contrast, curtailment behavior refers to the everyday actions that help lower energy use through repeated effort. These include simple routines such as turning off lights when leaving a room, unplugging unused electronics or adjusting thermostats. While these behaviors do not require significant spending, they rely on consistent personal commitment. Their impact accumulates over time and can be substantial when widely practiced. As Trotta, (2018) points out, these require continuous behavioral commitment but collectively can have substantial impact.

Avoidance behaviors involves more significant lifestyle adjustments where individuals choose to forget energy intensive activities altogether which entails avoiding energy intensive practices, such as using paper works instead of digitalization approach which involve printing and physical storage (Huber, 2000). These behaviors often reflect deeper personal values or commitments to sustainability and while they are more challenging to adopt yet leads to meaningful reductions in energy consumption.

Moreover, Maintenance behaviors focus on keeping the existing energy technologies and systems to function efficiently through regular care and attention. This includes tasks like cleaning air filters, servicing heating or cooling systems or ensuring windows and doors are properly sealed. Such activities help to extend the life of equipment and maintain optimal performance which are indirectly contributing to reduced energy utilizations.

Although each of these actions help save energy, they have different levels of impact, and no single approach is sufficient on its own. Moreover, Zografakis et al., (2008) point out that reducing electricity consumption in a meaningful way requires long term lifestyle changes, not just one time efforts. What's interesting is how these different strategies work together: technology improves efficiency, while changes in behaviors ensures those efficiency gains leads to the actual savings rather than increased energy use. Furthermore, the contrast between curtailment behaviors and avoidance behaviors illustrate the difference in level of efforts involved, ranging from simple adjustments to more significant lifestyles transformation. That can also be said that people can start

with simple steps like switching off unnecessary lights before gradually moving towards bigger commitments, such as upgrading to energy efficient appliances.

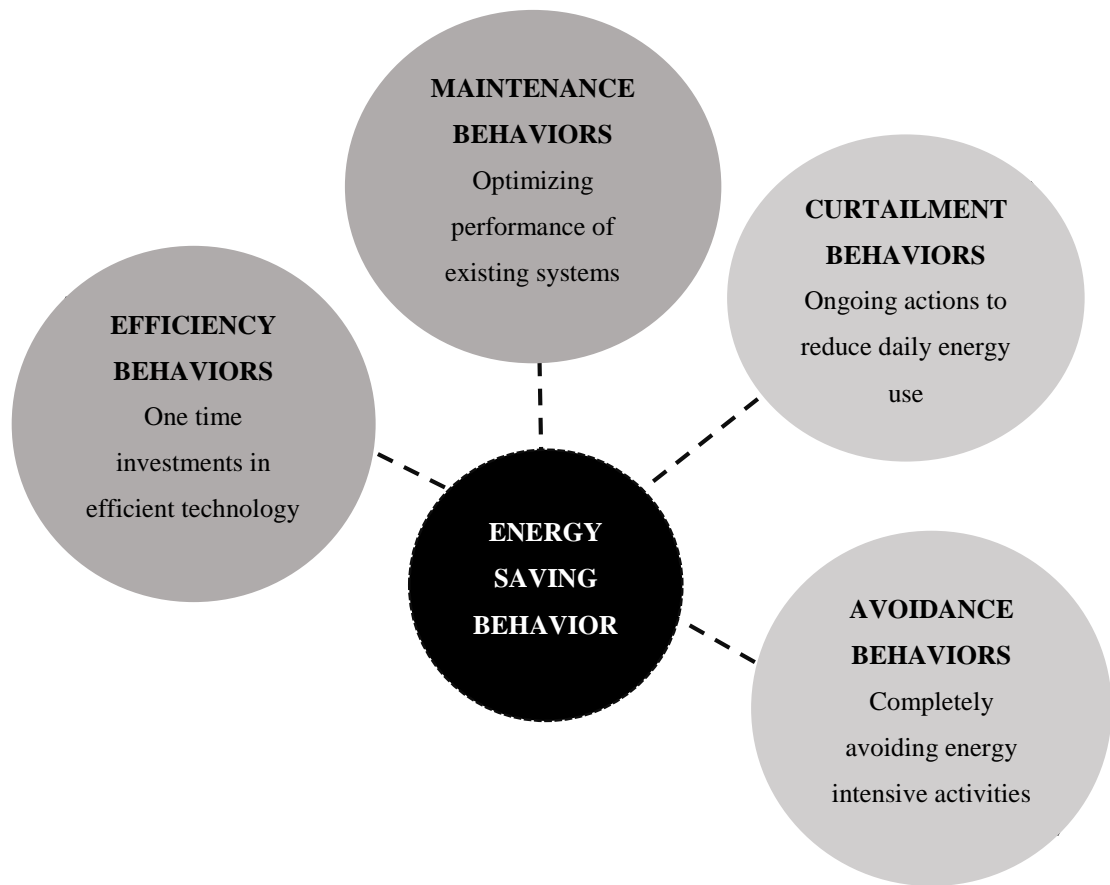


Figure 2.1: Graphical Representation of types of energy saving behavior

2.5 Gendered Behavioral intentions and actions

Gender significantly influences how individuals interact with energy systems, perceive energy conservation and engage in energy saving behaviors. These differences in gendered behavioral patterns are influenced by a complex interplay of socialization, organizational roles and cultural expectations that shape how men and women approach energy use differently in workplace settings.

(a) Environmental Benefits (Women)

A female office manager regularly reminds her team to switch off computers and lights before leaving the office, emphasizing the long-term environmental benefits and aligning these actions with the company's sustainability goals. Women are more likely to connect routine behaviors, such as turning off unused devices, with broader

ecological responsibilities due to their heightened environmental concern (Zelezny et al., 2000)

(b) Financial Benefits (Men)

Men often view energy-saving actions as practical and logical strategies to minimize expenses, prioritizing financial efficiency over environmental or moral reasoning (Räty & Carlsson-Kanyama, 2010). Example: A male team leader reviews the monthly energy expenses and suggests replacing outdated air conditioners with energy-efficient models, framing the decision as a financial benefit for the company in terms of lower utility bills. Men may champion investment in energy-efficient office equipment, such as LED lighting or Energy Star-rated appliances, to enhance resource efficiency and reduce operational costs.

(c) Social Expectations on Women

Women are more likely to be expected to foster eco-friendly behaviors in communal settings, often fulfilling roles that encourage collective energy-saving practices (Carlsson-Kanyama & Lindén, 2007). They are often seen in their office environment as advocates for sustainability, fulfilling societal expectations that position them as promoters of cooperation and environmental responsibility. Example: A female employee in a mid-level management role may organize awareness sessions on reducing energy consumption or suggest policies such as turning off lights during lunch hours. This behavior aligns with societal perceptions of women being natural custodians of sustainability within both domestic and professional spaces.

(d) Social Expectations on Men

Men are often perceived as more competent in technical tasks, reinforcing their societal role as problem-solvers in large-scale, energy-related initiatives (Buckingham & Kulcur, 2009). In the workplace, they are often expected to address technical and systemic aspects of energy management, reflecting societal norms that associate men with technical expertise and leadership in operational efficiency. Example: A male IT manager might be tasked with evaluating and implementing energy-efficient server systems or conducting an energy audit for the office. Colleagues may look to him for solutions involving technical installations, such as integrating smart energy meters or optimizing HVAC systems.

(e) Women and Perceived Barriers

(Mahapatra & Gustavsson, 2008) highlights that women often face challenges in adopting innovative energy systems, largely due to the lack of technical training and barriers to their involvement in technical decision-making roles. This could stem from limited exposure to technical training or workplace biases that restrict their involvement in energy-related decision-making. For instance, a female employee may feel hesitant to propose changes to the building's energy management system due to a lack of perceived authority or technical expertise.

(f) Men and Perceived Control

A study by Agarwal, (1997) examines that men's perception of control is often reinforced by both societal expectations and institutional support. In office settings, men may be more inclined to propose large-scale energy solutions, such as installing solar panels or advocating for energy-efficient building systems, due to their perceived higher competence and authority in technical matters. For example, a male employee might lead efforts to integrate solar panels or energy-efficient lighting into the office infrastructure, leveraging greater access to technical knowledge and managerial roles.

Summary of patterns of gender perspective towards energy use can be seen in **Appendix 1: Section 3**.

2.6 Nexus of Gender perception, behavioral intention and actual behavior

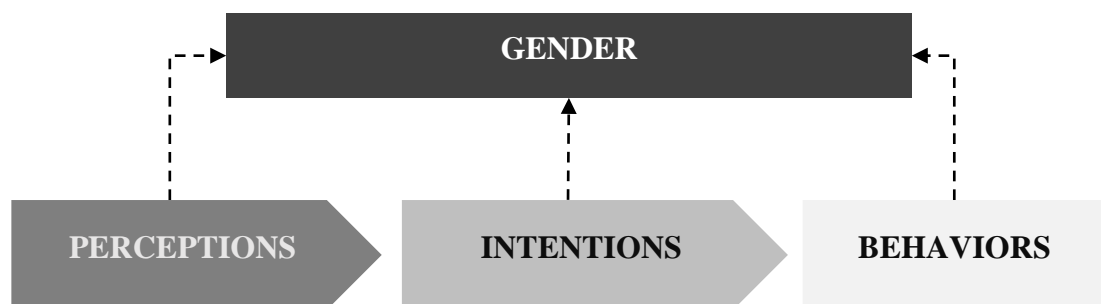


Figure 2.2: Nexus of Gender perception, behavioral intention and actual behavior

The relationship between how we think about energy, our plans to conserve it and our actual energy saving actions are deeply tied to psychology. The gender plays a key role

in shaping this process. Many researches have said men and women approach energy use differently and several psychological factors helps to explain these distinct patterns. The manifestation of energy saving intentions into actual behavior showcase various difference in gendered patterns:

- Women intentions more frequently translate into curtailment behaviors such as turning off lights and equipment, consistent with their more practice-oriented energy perceptions (Trotta, 2018)
- Women shows higher behavioral consistency between intentions and small daily actions, while men show stronger alignment between intentions and larger one-time efficiency investments (Zografakis et al., 2008)
- Men often manifest their intention in efficiency behaviors involving technological solutions and system-wide approaches, reflecting their more technical and instrumental energy perceptions (Huber, 2000)

2.6.1 Cognitive processing difference

a) Elaboration Likelihood Model

According to Petty & Cacioppo (1986), Elaboration Likelihood Model, attitudes can form through either central (deliberative) or peripheral (heuristic) processing. Gender differences appear in how energy information is processed. Men tend to engage more with central route processing for technical energy information, evaluating efficiency claims systematically whereas, women often employ more integrative processing that combines both central and peripheral routes, considering both technical parameters and contextual factors (Darley & Smith, 1995). This may explain why men's intentions focus more on technical efficiency metrics while women consider broader implications of energy behaviors.

b) Construal Level Theory

Trope & Liberman, (2010) Construal Level Theory suggests that psychological distance influences how abstractly or concretely we think about actions. A research found that women tend to process energy conservation at lower construal levels (more concrete, immediate, and practical) and men often employ higher construal levels (more abstract, distant, and principle-based) (Pahl & Bauer, 2013). These differences in construal level help explain why women focus on immediate, concrete actions (turning

off lights) while men gravitate toward abstract system improvements (upgrading efficiency).

c) Socialization and Role Expectations

Beyond cognitive factors, gender-specific intention-behavior patterns reflect broader socialization processes. Traditional gender socialization often positions women as custodians of daily household management, including resource conservation (Carlsson-Kanyama & Lindén, 2007). Men are typically socialized to focus on technological solutions and infrastructure decisions (Räty & Carlsson-Kanyama, 2010). These socialized roles create cognitive schemas that influence how energy perceptions are processed, which intentions are formed, and ultimately which behaviors are enacted.

d) The Intention-Behavior Gap

An important psychological phenomenon in this nexus is the "intention-behavior gap" - the discrepancy between what people intend to do and what they actually do. Research by Kollmuss & Agyeman, (2002) found that this gap manifests differently by gender. Women experience smaller intention-behavior gaps for routine, habitual conservation behaviors, whereas men show smaller gaps for planned, investment-oriented efficiency behaviors. These differences likely reflect varying obstacles each gender faces in translating intentions to actions. Women often have more direct control over daily household operations but less decision-making authority for major investments, while men face the reverse situation.

2.7 Theory of Planned Behavior (TPB)

In Psychology and particularly in social cognition, many theories had been developed over time to explain what influences human behavior. The Theory of Planned behavior model have been applied in various real world situations. Whether it is used for understanding why people make certain health choices, how they decide to help the environment, or what influences their travel habits, this frameworks try to explain human behavior in a way that applies to many different situations.

The Theory of Planned Behavior (TPB), developed by (Ajzen, 2005), is a psychological framework that explains how individual behavior is guided by their intentions. It was created to address the limitations of its predecessor, the Theory of Reasoned Action, particularly in predicting behaviors over which individuals have incomplete control

over their willingness. Both models explain that an individual’s decision to engage in a certain behavior is based on logical and reasoned thought processes. The TPB emphasizes understanding and predicting human behavior in specific contexts by considering both motivational and non-motivational factors. The TPB suggests that behavior is primarily determined by an individual’s intention to act, which is influenced by three main components:

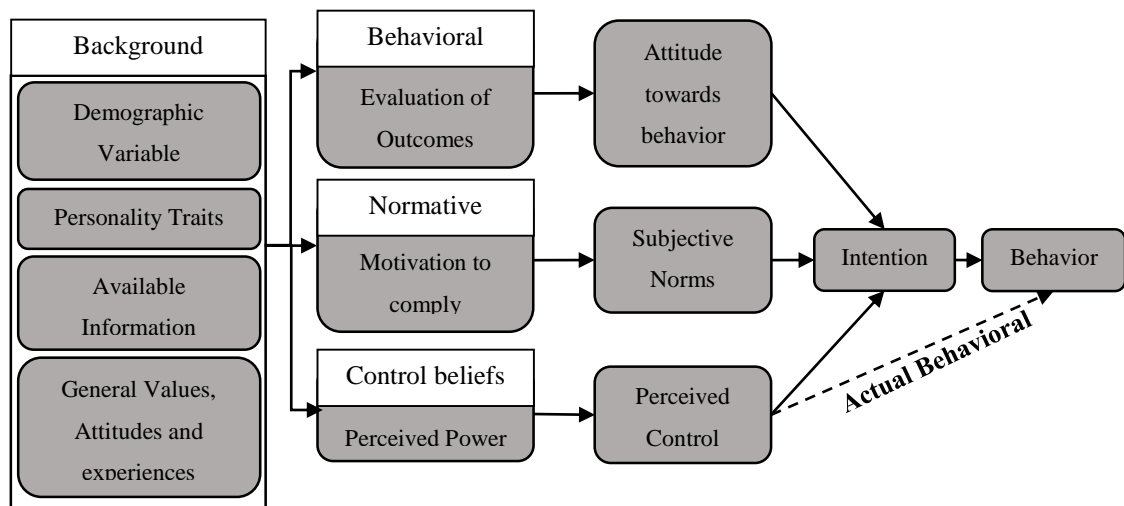


Figure 2.3: Theory of Planned Behavior Framework
Organizational Behavior and Human Decision Process

Attitude towards energy efficiency reflects how positively or negatively an individual view the potential outcomes of performing the behavior. Subjective norms are the perceived expectations or opinions of important people in the individual’s life regarding the behavior. Perceived behavior control pertains to the individual’s belief in their ability to carry out the behavior, considering any obstacles or resources available.

Background factors in the Theory of Planned Behavior (TPB) include various elements that indirectly influence attitudes, subjective norms, and perceived behavioral control, ultimately shaping intentions and behavior. These factors encompass demographic variables like gender, age, and socioeconomic status, which play a significant role in defining individual energy-related behaviors. For instance, societal roles and expectations often lead to gendered differences in energy using/saving practices. Personality traits, such as openness to new experiences or conscientiousness, can influence individuals’ motivation to adopt energy behaviors differently for men and women. Additionally, access to information about energy usage practices affects perceptions of control and the likelihood of engaging in such behaviors. Individual

values, attitudes, and past experiences are also critical, as they form the foundation of energy-saving tendencies and the confidence to implement them. These background factors indirectly shape the behavioral, normative, and control beliefs that are central to the TPB framework.

Behavioral beliefs are perceptions about the outcomes of engaging in energy-saving behaviors (in simple terms, what individual think might happen if they save energy – could be benefits or expenses) which are influenced by gender-specific priorities and roles, even in professional environments.

Normative beliefs reflect gendered societal expectations and pressures within workplace dynamics that shape energy-related behaviors. (How individual believe other expect them to behave regarding energy use)

Control beliefs are perceptions of one's ability to perform energy-saving behaviors, often shaped by gender-specific roles, technical knowledge, and access to resources in professional environments.

Looking at the construct of the framework and reviewing findings from previous literatures it can be access the reliability of its key components. The following points provide an explanation of how well each construct describe their reliability, consistency and relevance within the study.

2.7.1 Cognitive Attitudes

Attitudes towards energy conservation refers to an individual's evaluation of energy-saving behaviors; it can be positive or negative. Several previous studies have found that attitude plays a significant role in determining energy-saving behaviors(Zhao et al., 2019). Report that attitude is the most influential factor impacting an individual's intention to purchase energy-saving appliances. Attitude had a greater impact than social norms, perceived behavioral control, or moral norms (S. Wang et al., 2018). Report that intentions to save electricity were positively impacted by attitudes. Some studies have reported that attitude strongly predicts intention to purchase energy-efficient devices (Tan et al., 2017, (Bhutto et al., 2019). (Olawale, 2020) also report that staff members' intentions to perform energy-saving behaviors in a hotel are significantly impacted by attitude. Attitudes towards a behavior have also been reported

to predict energy-saving behaviors in various countries (Hien & Chi, 2020, Fornara et al., 2016). Therefore, it may be assumed that attitude significantly impacts behavioral intention to perform energy-saving behaviors.

In the context of office energy-saving behaviors, if employees perceive such actions as beneficial, important, and effective, they are more likely to intend to perform them. Gender differences in environmental attitudes have been observed, with studies indicating that women often exhibit higher levels of pro-environmental attitudes and behaviors compared to men (Lee et al., 2013)

2.7.2 Subjective Norms

Subjective norms refer to the perceived social pressures to perform or not perform a behavior. In an office setting, if employees believe that their colleagues, supervisors, or organization expect them to engage in energy-saving behaviors, they are more likely to form intentions to do so. Gender can influence these perceptions, as societal expectations and norms around energy use and conservation may differ for men and women. For instance, a research in office settings showed that workers were more likely to save energy when they felt their colleagues expected them, proving how workplace culture shapes people's actions.(Canova & Manganelli, 2020).

Workplace culture, characterized by shared norms, values, and practices, significantly shapes employees' pro-environmental behaviors, including energy-saving practices. One research show that employees are more inclined to engage in sustainable actions (adopt eco-friendly habits) in organizations that actively promote and support these behaviors (Lo et al., 2012). Similarly, another study. emphasize that organizational policies, leadership support, and peer behaviors collectively establish a normative environment that strongly influences employees' actions, often surpassing the traditional predictive role of subjective norms (Norton et al., 2015). Such an environment provides shared accountability and motivation that aligns individual behavior with organizational sustainability goals. Consequently, the integration of workplace culture as a normative factor provides a stronger framework for understanding energy-saving behavior in office settings.

2.7.3 Perceived Behavioral control

Perceived Behavioral Control (PBC) refers to an individual's belief about how easy or difficult it is to perform a specific behavior, based on both internal factors (e.g., knowledge, skills) and external factors (e.g., availability of resources or opportunities). It is generated from an individual's belief that they have sufficient resources, capability, and opportunities to perform a given behavior. A higher level of perceived control is theoretically associated with an increased likelihood of performing a particular behavior. Studies have supported this in contexts such as recycling and composting (Library, n.d.), choosing eco-friendly beverage packaging (van Birgelen et al., 2009), bringing reusable shopping bags (Lam & Chen, 2006), and reducing car usage (Oreg & Katz-Gerro, 2006). A study examined how environmental concern, attitudes toward frugality, and the perceived ease of implementation influenced intentions to reduce electricity and gas consumption, minimize waste, and lower car usage (Fujii, 2006). Respondents were more inclined to adopt these behaviors when they perceived them as easier to execute.

Perceived behavioral control and intentions then determine behavior. Previous studies have used TPB to explain an individual's participation in a variety of behaviors, including health behaviors (Moan & Ruse, 2005), resource conservation (Gibson et al., 2021), and safe environmental practices (Schaffner et al., 2017).

Direct Link to Behavior: PBC has been shown to have a direct effect on behavior, in addition to its indirect effect through intentions. This means that even if someone has positive attitudes and feels social pressure to save energy, they are unlikely to do so if they don't believe they can effectively perform the necessary actions.

2.8 Reviewed Articles

2.8.1 Article A

Title: The article is titled "Swedish private forest owners' perceptions and intentions with respect to adopting exotic tree species," authored by Kerstin Hemström, Krushna Mahapatra, and Leif Gustavsson. It was published in the European Journal of Forest Research in 2013.

Research objective/Aims: The primary aim of this study was to empirically investigate Swedish private forest owners' perceptions and intentions regarding

increasing forest growth through the adoption of exotic tree species. The researchers wanted to understand:

- Assess how attitudes, knowledge, and perceived behavioral control influence their decision-making.
- And identify what are the possible barriers that could obstruct their intention to adopt exotic tree species

Methodology: The study employed a quantitative survey-based approach, with key methodological components including:

Theoretical Framework: This article follows the theory of planned behavior (Ajzen, 2005), which stand to be true that behavioral intentions are influenced by three key determinants:

- a. Cognitive attitude (evaluation of outcomes)
- b. Subjective norm (perceived social pressure)
- c. Perceived behavioral control (sense of ability to perform the behavior)

The study primarily focused on cognitive attitudes and perceived behavioral control, while excluding subjective norm since it typically explains less variance in behavioral intentions.

Survey Design and Data Collection

The study employed a mail-in questionnaire administered by Statistics Sweden, targeting physical persons with Swedish personal identity numbers and addresses who owned at least 10 hectares of forest. A stratified simple random sample of 3,000 individuals was extracted nationally, with an additional 500 from northern Sweden to address regional interests. The sampling was proportionally stratified based on forest estate size and geographical region to ensure representativeness. The questionnaire, divided into seven parts, primarily used five-point Likert-type scales to gather responses. Despite the structured approach, the response rate was 43%, yielding 1,465 respondents. This methodology aimed to provide a comprehensive understanding of forest owners' perspectives while accounting for regional and size-based variations in the sample.

Measurements of Variables

- a. Dependent Variable: Behavioral Intention (BI)

Calculated as: **BI_s = (Interest in species s) + (Openness to new methods)**

BI = Behavioral intention = willingness of forest owners to adopt exotic tree species.

s = Number on items

Interest in cultivating exotics (1 = Not interested at all, 5 = Very interested).

Openness to new methods (1 = completely disagree, 5 = completely agree)

b. Independent Variable: Cognitive Attitude (*A_s*)

For the calculations here they used the multi-attribute Fishbein model (Eq. 1–3 in the paper).

Calculated as: $A_{s_consq.} = \sum(Ic_{_consq} \times Pcs_{_consq})$

A = Cognitive Attitude

s = no. of items

consq. = Economic (ECO), Environmental (ENV), and Recreational (REC).

Factor Analysis was used which categorized 19 forest management consequences into three groups: Economic (ECO), Environmental (ENV), and Recreational (REC). For example, the ECO factor included aspects such as timber supply, growth rate, and profitability. Respondents provided two types of ratings on a five-point scale: Importance Rating (*I_c*), which measured how important each consequence was, and Performance Rating (*P_{cs}*), which assessed how well exotic species performed for each consequence. The scores for each factor were then summed across all relevant items.

c. Independent Variable: Perceived Behavioral Control (PBC):

Measurements was done in single survey item which was rated in the scale: 1 (Strongly disagree) to 5 (Strongly agree).

d. Independent Variable: Knowledge (*K_s*):

It was a self-rated understanding of forestry and exotic species which combined two items: General forestry knowledge (1–5 scale) and Knowledge of each exotic species (1–5 scale).

Calculated as: $K_s = (\text{General knowledge}) + (\text{Species-specific knowledge})$

K = Cognitive Attitude

s = no. of items

e. Independent Variable: Socio-Demographic controls:

Age, size of forest estate, geographical region, and educational level

Statistical analysis: Separate analysis was done for each exotic species using Multiple Regression Models. Calculated as:

$$BI = \beta_0 + \beta_1 A_{s_ECO} + \beta_2 A_{s_ENV} + \beta_3 A_{s_REC} + \beta_4 K_s + \beta_5 PBC + \beta_1 control + \epsilon$$

Adjusted R² measured how well predictors explained intention variance.

Key findings:

The research shows that forest owners have been slow to plant exotic tree species, despite their desire for better forest growth. When asked about specific exotic species, only about one in five owners expressed interest in larch, which was the most popular choice among the options. Lodgepole pine, on the other hand, was the least appealing to forest owners. Money matters turned out to be the biggest factor in whether owners would consider planting exotic trees. Those who believed these trees could be profitable for timber were much more likely to consider them. Another important factor was how confident owners felt about their ability to succeed with new species. Those who believed they could learn the necessary skills to increase forest growth were more open to trying exotic trees. A significant roadblock to adoption was simply lack of knowledge. Forest owners who rated themselves as having better forestry knowledge showed more willingness to plant exotic species. Interestingly, concerns about environmental impact or recreational use of forests didn't seem to play a major role in their decision-making process.

The study also found some patterns based on the forest owners themselves. Younger owners and those who had gone to university showed more interest in planting exotic tree species. However, the size of the forest and where it was located didn't make much difference in owners' willingness to try new species.

Conclusion: The study highlights disconnect between forest owners' growth aspirations and their willingness to adopt exotic species, primarily due to knowledge gaps and economic risk perceptions.

2.8.2 Article B

Title: The article is titled as “The Role of the Theory of Planned Behavior in Explaining the Energy-Saving Behaviors of High School Students with Physical Impairments” authored by Sirinakorn Suntornsan, Surapong Chudech, and Piyapong Janmaimool, and was published in the Behavioral Sciences in 2022.

Objectives/Aims: The study aimed to examine how TPB constructs influence energy-saving behaviors among high school students with physical impairments in Thailand. It specifically investigated:

- How attitudes, subjective norms, and perceived behavioral control affect intentions to perform energy-saving behaviors
- How intentions and perceived behavioral control affect actual energy-saving behaviors
- The mediating effect of intentions between perceived behavioral control and behaviors

Methodology: The study employed a quantitative survey-based approach. The researchers applied the Theory of Planned Behavior (TPB) as their primary theoretical framework with its skeleton variables: Attitudes toward the behavior, Subjective norms, perceived behavioral control. Additionally, it also tries to check whether perceived behavioral control can directly influence behavior. The study was analyzed with 330 high school students with physical impairments from 6 Thai schools. Participants were selected using simple random sampling and had 54.2% female, 45.8% male. Majority (82.12%) were junior high school students. Self-reported questionnaire were prepared with 7 point Likert scales that measured the TPB constructs:

- Attitudes toward energy-saving behaviors (10 items)
- Subjective norms (11 items)
- Perceived behavioral control (8 items)
- Behavioral intention (4 items)
- Energy-saving behaviors (6 items)

Data Analysis Techniques:

- Confirmatory Factor Analysis (CFA) to validate study variables
- Structural Equation Modeling (SEM) to test causal relationships among variables
- Bootstrapping technique to test mediation effects

Model Fit Assessment

The researchers evaluated model fit using multiple indices:

- Chi-square (χ^2)
- Ratio of chi-square to degrees of freedom (χ^2/df)

- Goodness-of-fit index (GFI)
- Root mean square error of approximation (RMSEA)
- Comparative fit index (CFI)
- Incremental fit index (IFI)
- Normed fit index (NFI)
- **Tucker-Lewis index (TLI)**

Key findings:

- The Theory of Planned Behavior (TPB) constructs (attitudes, subjective norms, perceived behavioral control) collectively explained a substantial portion (54%) of the variance in energy-saving behaviors.
- Subjective norms (social pressure) had the strongest influence on behavioral intention.
- Perceived behavioral control (belief in one's ability to act) was the second strongest predictor.
- Attitudes (personal evaluation of the behavior) had a weaker but still significant effect.
- Behavioral intention was the strongest direct predictor of energy-saving behaviors.
- Perceived behavioral control had no direct effect on behaviors but indirectly influenced them through behavioral intention (full mediation).

Conclusion:

The findings validated the TPB framework while highlighting the context-dependent hierarchy of predictors, particularly subjective norms (social influences) plays a particularly strong role in energy conservation. It also offers practical recommendations for behavioral interventions and underscores the need for multi-faceted approaches rather than a one-size-fits-all strategies to encourage sustainable energy use.

CHAPTER 3 CONCEPTUAL FRAMEWORK

3.1 Adaptation of TPB Framework

This research adopts the Theory of planned Behavior (TPB) (Ajzen, 2005, 2012; Ajzen & Fishbein, 2010) as a theoretical foundation which provides a broader understanding of how individual intentions are translated into actions. Firstly, the TPB is particularly valuable for workplace energy saving because it helps to explain how people behave in situations when they have limited control over their behaviors as they might at home. Second, it offers a psychological framework that connects attitudes, social influences and perceived control to behavioral intentions and actual behaviors providing multiple interventions for promoting energy conservations (Abrahamse & Steg, 2013) and lastly, it also demonstrates strong predictive validity over diverse pro-environmental behaviors, with experimental analysis showing that the constructs can explain 39-64% of variance in environmental intentions (Klößner, 2019).

3.2 Framework Modifications

As illustrated in figure below, the conceptual framework is designed to support the aim to understand gendered perception difference that influences the behavioral intention towards energy saving in Nepalese workplace. The modifications represents a gender responsive adaption of traditional TPB model which was necessary to enhance the theory's applicability to workplace energy saving through a gender lens.

3.2.1 Central Determinant

As Gender has the key role in shaping all psychological constructs within the model, which aligns with the strong evidence of gender differences in attitudes and behaviors (Zelezny et al., 2000). By placing gender at the core, the framework enables a systematic analysis of how masculine and feminine perspectives influence distinct pathways towards energy saving intentions which directly supports the aim of this research to understand gendered perception difference that influences the behavioral intention towards energy saving in Nepalese workplace.

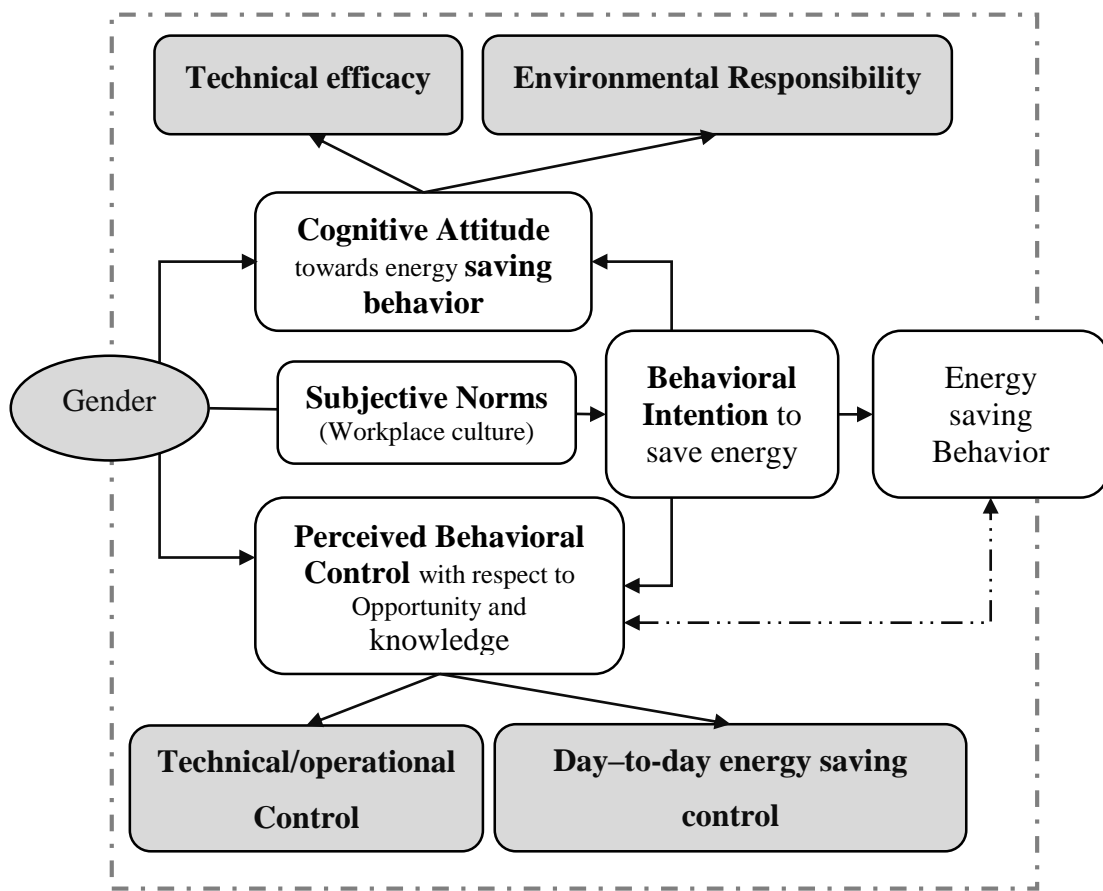


Figure 3.1: Conceptual framework
(Overview of Theory of Planned Behavior, Organizational Behavior and Human Decision Process)

3.2.2 Differentiated Cognitive Attitudes

The model had been split the cognitive attitude towards energy saving behavior into two gendered typical orientations.

Technical Attitude : This orientation more commonly observed in male employees which evaluates energy saving through technical efficacy, system optimization and operational efficiency frameworks (Reegård & Drøivoldsmo, 2020). Previous research has shown that men typically demonstrated greater interest in technical aspects of environmental solutions, focusing on quantifiable metrics and efficiency parameters (Ishak et al., 2018).

Environmental Attitude : This attitude is more frequently exhibited by female employees, evaluating the energy saving through environmental responsibility,

collective impact and sustainability frames (Lee et al., 2013). Studies consistently show that women expresses stronger environmental concerns and greater willingness to prioritize collective environmental benefits over individual convenience (C. Xiao & McCright, 2015).

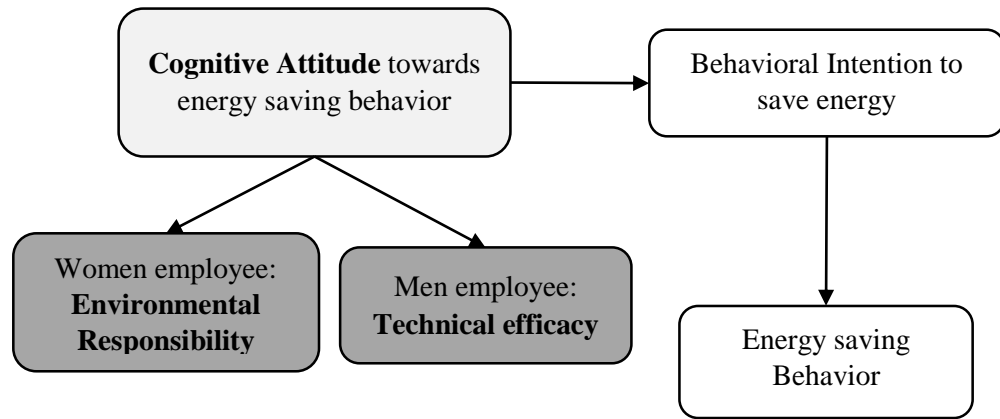


Figure 3.2: Sub division of Cognitive Attitudes

The diagram illustrates how cognitive attitudes toward energy-saving behavior differ between men and women employees, and how these attitudes influence behavioral intention to save energy, which ultimately leads to actual energy-saving behavior.

3.2.3 Adaptation of Subjective Norms

Subjective norms has been revised and conceptualized as “Workplace Culture”. This replacement acknowledge that organizational contexts create distinct normative environments that often overshadow broader societal influences. This adaptation is informed by research in workforce behavior, which focus the strong impact of workplace norms on employees environmental actions (Norton et al., 2015). Supporting this, another study found that workplace-specific norms were more influential in predicting office energy conservation than general environmental values (Lo et al., 2012).

3.2.4 Differentiated Perceived Behavioral Control

This framework again subdivides perceived behavioral control into two pathways that reflects documented gender differences in control perceptions:

Technical/Operational Control: This dimension captures male employee’s typical confidence in managing technical systems and applying technological solutions for energy efficiency (Asian Development Bank, 2015). Another study again found that men generally exhibit greater confidence in utilizing energy management technologies and assessing technical efficiency measures (Strengers, 2014).

Day-to-Day Energy saving Control: This represents female employee are more strongly confidence in adopting routine conservation behaviors and coordinating collective energy saving efforts (Hunter et al., 2004). Kennedy & Kmec, (2018) found that women are generally more confident in organizing and sustaining daily environmental practices.

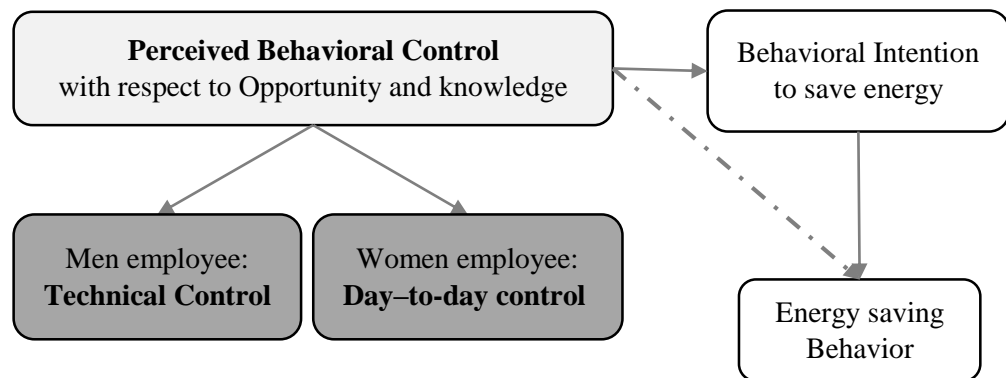


Figure 3.3: Subdivision of Perceived Behavioral Control

3.3 Modification Validity

This modification again is built on successful research precedents. Many research have modified the TPB framework which suit their specific research objectives and contexts. For instance. in healthcare, (Adolph, 2016) extended TPB by incorporating personal moral norms to better predict COVID-19 preventive behaviors such as mask-wearing and social distancing. In educational settings, TPB is modified by adding technology self-efficacy and facilitating conditions to examine teachers' intentions to adopt mobile learning technologies in (Cheon et al., 2012). In financial behavior research, (J. J. Xiao & Wu, 2008) adapted TPB by including financial knowledge and financial satisfaction to predict credit card debt payment behaviors. Exploring entrepreneurship, Kautonen et al., (2015) extended TPB with demographic variables and entrepreneurial experience

to investigate business start-up intentions across different age groups. Additionally, in the field of nutrition, original framework is modified by incorporating habit strength and anticipated emotions to better predict healthy eating behaviors (McDermott et al., 2015).

Furthermore, Han et al., (2010) extended TPB by incorporating environmentally conscious behaviors to investigate hotel customers' intentions to stay at green hotels. Similarly, (Ghazali et al., 2019) modified TPB by including environmental concern and environmental knowledge as additional predictors of intention to purchase energy-efficient vehicles. (Chen & Tung, 2014) adapted the TPB framework by adding environmental concern and perceived moral obligation to study consumers' intentions to visit green hotels. In the workplace context, (Greaves & Zibarras, 2013) extended TPB by incorporating environmental attitudes and organizational identification to examine employees' intentions to engage in energy-saving behaviors at work. Likewise, Zhao et al., (2019) modified TPB by integrating perceived organizational support and environmental concern to investigate employees' pro-environmental behaviors in the hospitality industry.

Thus, by differentiating between technical and environmental attitudes, replacing subjective norms with workplace culture, and distinguishing between technical/operational and day-to-day control perceptions, the framework provides a comprehensive structure for understanding how gender shapes energy conservation behaviors. This gender-responsive approach, supported by empirical research across multiple contexts, enables the development of more inclusive energy conservation strategies that effectively engage the distinct motivational drivers of both male and female employees, ultimately leading to more effective and equitable workplace sustainability initiatives in the Nepalese context.

CHAPTER 4 RESEARCH METHODOLOGY

This chapter outlines the methodological framework which represents how this research is shaped (See Figure 4.1), done to investigate gender differences in perception and behaviors in Nepalese Workplaces. This research follow a structured, four phase approach that systematically progresses from theoretical foundation to data analysis and interpretation. Each phase is designed to capture specific aspects of energy conservation behaviors in gendered perceptions. This research employs a mixed method study with Quantitative methods (survey and statistical analysis) and Qualitative (semi structured interviews and site observations). The findings from quantitative analysis were validated though qualitative insights from interviews and site visits, alongside evidences from previous researches. This triangulated approach ensured a broader understanding of workplace energy conservation pattern ultimately leading to well supported conclusions.

This research is performed in four sequential phases:

- (1) Problem Conceptualization which establishes the theoretical foundation through literature review,
- (2) Framework development which adapts the TPB to incorporate gender specific constructs
- (3) Study design and measurement which details participant selection and the development of gender differentiated measurement instruments and
- (4) Data analysis strategies which outlines the analytical approaches used to examine variations in energy saving perceptions and behaviors.

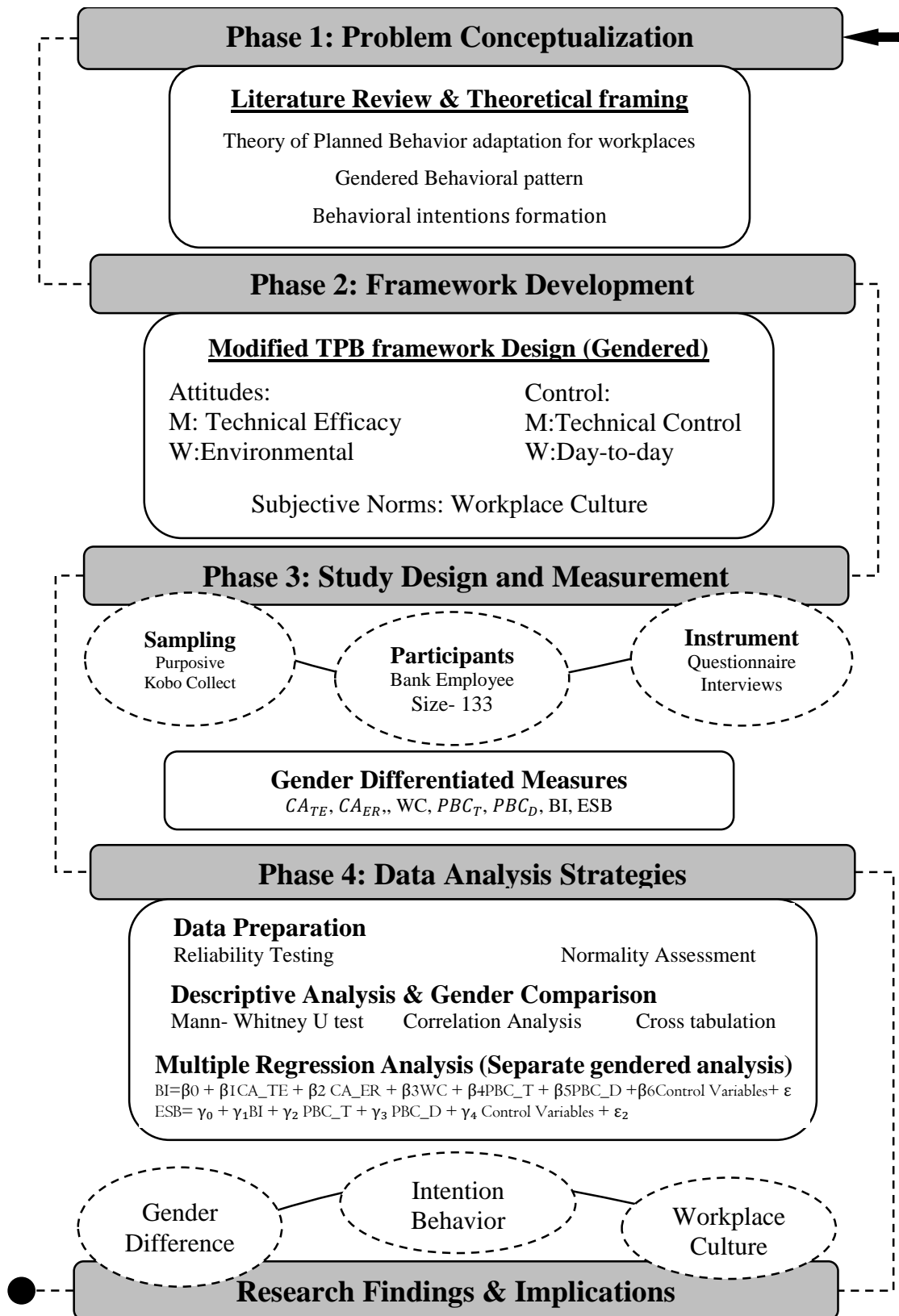


Figure 4.1: Flowchart showing Research Methodological Framework

4.1 Data collection and Analysis

4.1.1 Justification of Research Area

The selection of Nepalese Banking sector as the research due to its high energy consumption, gender diversity and structured workplace environment, making it an ideal setting to examine gender perception difference in energy saving behaviors. Banking institutions in Nepal rely heavily on electronic equipment, lighting systems, and temperature control mechanisms, making them adequate contributors to commercial energy consumption. They have standardized operational procedures which creates a controlled setting for analyzing office environmental practices. Additionally, these institutions has a gendered composition (28.7% female workforce participation) allows us a meaningful access for comparison study of male and female energy saving perceptions that affect their behavior within same organizational environment.

There's seen a clear stratified occupational patterns that make the banks are suitable for examining how professional roles interact with gender to shape energy saving behaviors. A research also have identified that organizational hierarchies significantly influences how gender roles manifests in workplace behaviors (Tabassum & Nayak, 2021). Another reasons for selecting these sector for observation and study was their uniform corporate policies across diverse region allow for organizational consistency while still capturing regional variations in energy behaviors. Thus, the selection of the Nepalese banking sector as the research area, this study responds to calls from Norton et al., (2015) for more contextually-specific research on workplace energy conservation that accounts for organizational culture, gender dynamics, and occupational structures.

4.1.2 Sample selection method

A sample defines as a group with a relatively smaller number of people selected from a population for investigation purposes. The members of the sample are called as participants or respondents. A sample represents a subset of a population selected for study, with participants providing insights about the broader group (Greaves & Zibarras, 2013). Sampling is the process of drawing sample from whole population size, from which required data can be collected.

The study employed a purposive sampling technique to select participants from various commercial banks and finance-related workspaces across different provinces of Nepal. It allows for the deliberate selection of bank employees who directly engage with energy consumption in workplace settings, enabling focused examination of gender based perceptions and behaviors. As participants are selected according to the needs of the study, hence the alternate name of purposive sampling is called deliberate sampling. Purposive sampling is known as judgmental sampling, a non-probability sampling technique where researchers rely on their judgment when selecting members of the population to participate in their study (Nyimbili & Nyimbili, 2024).

The sampling was ideal for this research due to:

- a. It ensured participants had direct experience with workplace energy system, which are essential for examining gender differences in conservation behaviors (Tongco, 2007).
 - b. The clear organizational hierarchy allowed targeted selection across roles (administrative, managerial, technical), aligning with recommendation for context specific sampling. (Bernard, 2012).
- (d) The sample adequacy depends on saturation and analytical needs. For quantitative studies with multiple variables, 100-150 participants are typically sufficient (Hair et al., 2010).

4.1.3. Survey questionnaire

Section A: Demographic Survey

The demographic section of the questionnaire was methodologically designed to collect essential participant characteristics that would serve as variables in the analysis. Questions were carefully selected based on their relevance to energy conservation behaviors in workplace settings (Hunter et al., 2004; Zelezny et al., 2000). This section was strategically placed at the beginning of the questionnaire to established baseline participant characteristics before proceeding to another section.

The relationship between demographic variables and energy behavior in banking environments is examined through several key dimensions. The collection approach is the most necessary to gain essential variables for both control purposes in the regression analyses and for the cross-tabulation analyses central to the research's gender comparative objectives.

Section B: Variables of TPB framework

Items were developed based on TPB framework. 12 items were used to measure cognitive attitudes towards energy saving behavior, 10 items to measure the perceived behavioral control, 6 for workplace culture and 5 items for behavioral intention which concludes the actual Energy saving behavior having 9 items. Self-reports were used to measure the participants' energy saving behaviors (Gatersleben et al., 2002). First, Energy saving behavior section (ESB) assessed routine workplace behaviors such as “switching off lights when not in use”, “enabling power saving modes on office equipment”, and “managing temperature control preferences”. The responses used a 5-point Likert scale, ranging from “Never” (1) to “Regularly” (5) (Vagias, 2006). The measures were selected based on their relevance to daily office operation and potential impact on energy consumption. Second, the cognitive attitude (CA) section evaluate gender-specific attitudes towards energy saving practices. The focus was on constructs – A. [Technical Efficacy (CA_TE) for men participants], measuring their confidence and effectiveness in handling energy related technical aspects, whereas B. [Environmental Responsibility (CA_ER) for women], judging their concern and contribution towards conservation of energy. To determine which attributes of attitude towards energy saving behaviors that employees prioritize, the respondents were asked to rate the importance (1= Not important at all, 5=Very important) of effective use of Technical Efficacy (e.g. How important do you think technical solutions are for achieving energy conservation?). Then, the respondents rated the belief (1=strongly disagree, 5= strongly Agree) of attribute (e.g. My colleagues rely on me for advice and help with minor technical issues in the office.) which revealed the reliance on their technical confidence.

In the third section, Perceived Behavioral control (PBC), evaluated gender specific measures to reflect different aspects of control in the workplace. For men, Technical/operational control (PBC_T) to evaluate their perceived ability on managing technical system, such as “adjusting thermostat settings and optimizing energy-efficient technologies” and for women, Day-to-day Energy Saving Control (PBC_D) to evaluate perceived control over managing immediate workspace devices and routine energy saving actions. Likertz scale measuring was used in the item (1=strongly disagree and 5=strongly agree) addressing both internal factors (knowledge, skills) and external factors (resources, opportunities). Fourth, the Workplace Culture (WC) evaluated

institutional initiatives such as “energy efficiency training sessions”, “coworker support for energy saving behavior (e.g., reminders about computer sleep mode settings)” and “supervisory guidance (e.g., promotion of natural ventilation practices)” in energy saving actions. Lastly, Behavioral Intention examined the willingness and readiness to engage and perform actions towards energy saving.

The complete survey questions are in **Appendix 2**. This was the main tool for collecting data and analyzing results.

4.1.4. Data collection method

Data collecting method followed a systematic three step process as shown in the flow chart below:

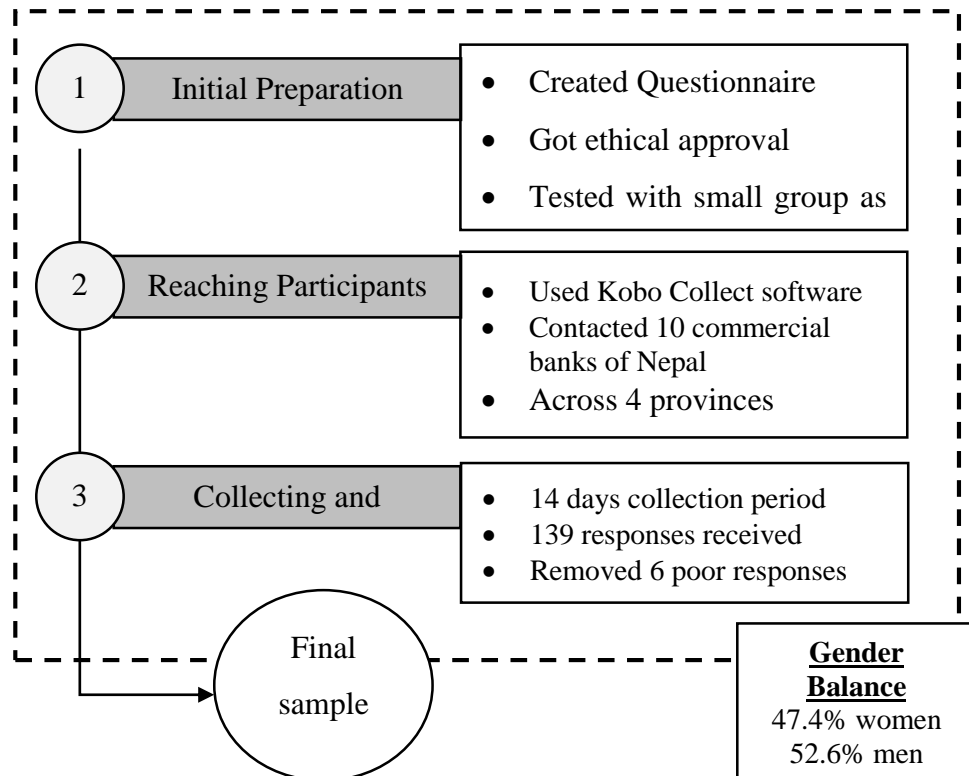


Figure 4.2: Flowchart describing the data collection method

It began with creating questionnaire in a Kobo collect software as the primary data collection tool, which is an online tool similar to Google form, that helps researchers gather and manage survey data. This digital approach was an effective for survey administration. This platform allowed to efficiently distribute the questionnaires to employee across 10 commercial banking institute and 2 insurance forms spanning over three province of Nepal (Bagmati, Gandaki and Koshi). These banking employee were contacted through social media and email which was adopted easily by the participants.

Before full scale deployment, ethical approval was obtained and conducted a pilot study with 28 participants from similar corporate office environment other than banks. This testing helped to refine the questions which was again consulted with supervisors and revision were made resulting to the clear and well-structured questionnaire. The data collection period lasted 14 days, resulting in 139 total responses with nearly balanced gender distribution which was ideal for the comparative analysis of gender differences.

4.1.5. Data Analysis Method

The collected sample number of 133 participants satisfied the requirements of purposive sampling (Shively, 2011), (Nyimbili & Nyimbili, 2024). A research has supported the number of sample gained by stating that “for quantitative studies with multiple variables, 100-150 participants are typically sufficient (Hair et al., 2010).”

To analyze all the information collected through Kobo Collect, this thesis used two main analyzing software program. Initially all the raw information were exported to Excel 2013 directly from Kobo which was used for organizing the information which include identifying blank/missing entries and fixing obvious typos. Simple transformation was also done before analyzing which includes creating categorical codes then basic calculation was performed like calculating sums or average. After this process, now the organized data were imported in IBM SPSS 26.0 to perform the core analysis through which the objectives of the thesis would conclude. This software is generally used for statistical calculation and the use of it was followed from the instructions (IBM, 2018).

An unspecified survey was conducted to collect data to test the proposed model and examine potential gender differences in energy saving perceptions. The estimated number of participants was around 300 to 400 bank employee including insurance company staffs and personnel from technically affiliated bank offices. A total of 139 sample were received. Out of it, 133 samples were clearly answered while the rest 6 responses were excluded due to missing values and invalid entries e.g., failing to tick the ethical agreement, providing identical answers across Likert-scale questions.

The survey contained many questions from demographic content and all other variables of TPB framework but all of them were not used on the analysis because that would have made the results less reliable. Instead each question were tested to see how well it measured what was intended to know. Consistency test of each questions (items) were

checked using Cronbach's alpha value. It is described and can be seen in Chapter 5 Analysis and Findings.

4.2 Relevance of the Research

4.2.1 Methodological Validity

The mixed-methods approach employed in this study provides strong methodological validity through triangulation of quantitative surveys and qualitative interviews. By integrating these two approaches, the research not only identifies statistical patterns but also gains a deeper understanding of the underlying factors influencing behavior. This dual perspective ensures that the results are both measurable and contextually meaningful.

The study includes 133 participants from the banking sector, with a nearly equal representation of men and women, providing sufficient statistical power for the regression analyses used (Hair et al., 2019). This sample size is consistent with previous research examining gender differences in workplace behaviors, reinforcing the reliability of the findings. For instance, Kennedy & Kmec, (2018) used a sample of 142 participants to identify significant gender differences in sustainability behaviors, while Karatepe et al., (2019) studied 141 banking employees to assess service quality perceptions. Similarly, Nguyen et al., (2022) analyzed responses from 135 financial sector workers in their study of organizational culture, demonstrating that samples of this size are well suited for such investigations. These precedents support the strength of the methodological choices of current study.

To better understand gender based differences in behavior, the study adapts the Theory of Planned Behavior (TPB) by incorporating gender specific constructs (which has been already mentioned previously and explanation can be seen in above chapters). This modification follows established research practices, as demonstrated by Abrahamse & Steg, (2011) who successfully applied an adjusted TPB framework to study energy conservation behaviors. Their findings validate the approach taken in this study, confirming that tailored theoretical models can more accurately capture behavioral differences between men and women.

The research further strengthens its analysis by comparing gender-specific responses rather than treating them as a single group. This approach aligns with previous study, Xiao & Hong, (2018) who used comparative regression analyses to uncover distinct behavioral pathways between men and women. Their work confirmed that separate gender analyses reveal critical differences that might otherwise remain hidden in combined datasets. By adopting a similar method, this study ensures that subtle yet meaningful variations in behavior are properly identified and interpreted.

Finally, the combination of quantitative measurements using Likert scales and qualitative insights from interviews represents a best practice approach in energy behavior research. Sovacool et al., (2018) strongly advocate for this mixed-methods design when studying gendered dimensions of energy use, emphasizing that "quantitative measurements alone often fail to capture the nuanced ways gender influences energy behaviors." By supplementing statistical data with in-depth interviews, this study captures a more complete picture of how gender shapes workplace sustainability actions, ensuring that both measurable trends and personal experiences are taken into account. This comprehensive methodology enhances the study's credibility and depth, making its findings more reliable and insightful.

4.2.2 Contextual Relevance

This research addresses a critical gap in understanding energy conservation behaviors within Nepal's rapidly expanding commercial sector. The urgency of this issue is underscored by recent data from the (NEA, 2023), which reports a striking 20.45% increase in commercial electricity consumption compared to previous years. As businesses consume more energy, effective workplace energy management becomes increasingly necessary for sustainability.

Focusing specifically on banking institutions offers unique advantages for this study. Banks represent high-energy-consuming workplaces with standardized operations across different regions, providing a consistent setting to examine energy use patterns. This consistency allows for clearer insights into how organizational and individual factors influence energy saving behaviors.

Moreover, the banking sector serves as an ideal environment for investigating gender differences in energy perceptions. Unlike many other industries in Nepal where workforce participation remains heavily ascending in banking institution where there

seems a relatively balanced gender representation. According to Nepal Rastra Bank (2022), women comprise approximately 31% of the sector's workforce nationally, a significantly higher proportion than in most other formal employment sectors in the country. This gender diversity enables meaningful comparisons between men and women within similar organizational structures and job roles, strengthening the validity of the study's findings on how gender shapes energy-related attitudes and behaviors.

CHAPTER 5 ANALYSIS AND FINDINGS

5.1 Demographic observation

The demographic profile of the research participants (N=133) provides rich foundation for understanding energy saving behaviors within Nepal's banking institute. The data reveals the mix of balanced representation across some variables and distinct patterns that reflect wider organizational trends in the industry.

A. Gender of Participants

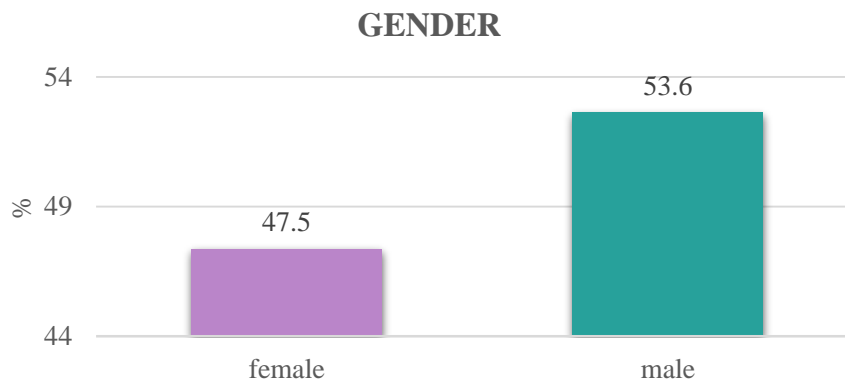


Figure 3: Bar representing gender distribution

Table 5.1: Gender distribution

	Frequency	Percent
Female	63	47.4
Male	70	52.6
Total	133	100.0

The gender distribution shows a nearly equal, with 47.4% women (63 participants) and 52.6% men (70 participants). This gender balance is particularly essential for this research as it aims to examine gender specific perception difference influencing behavioral intentions towards energy saving. However, when examined closely through cross-tabulation analysis, important gender differences emerged across office roles and structures.

B. Age distribution

For the professional banking settings, the age distribution follows an expected curve, with the majority of participants falling within the 30-39 age bracket (48.1%, 64 participants), followed by younger professionals aged 20-29 (25.6%, 34 participants). The curve gradually falls in older age category with 16.5% (22 participants) in the 40-49 range and 9.8% (13 participants) in the 50-59 range. The age profile is consistent with typical banking workforce compositions which primarily include early to mid-career professionals.

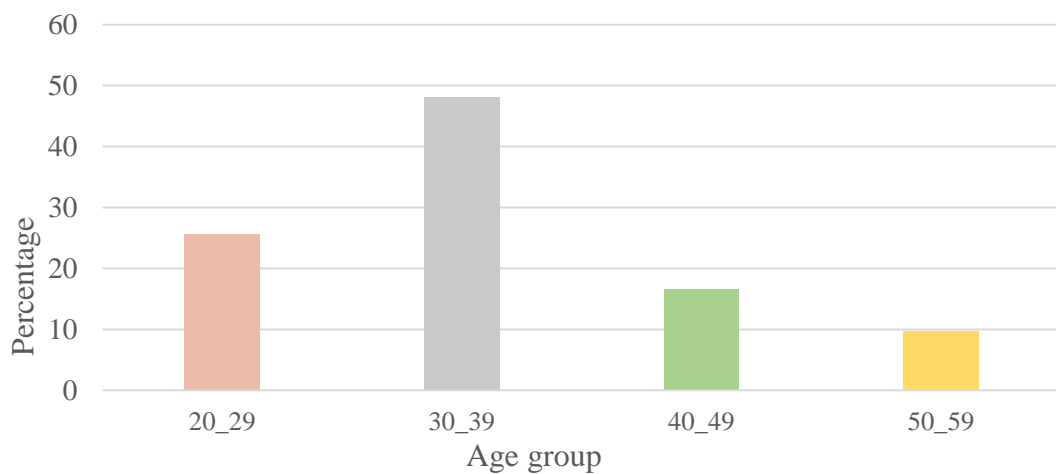


Figure 5.4: Bar chart representing age group distribution among participants

As shown in the graph shown below, male participants as a blue line exceeds females in red line at the 30-39 age group, peaking at around 32 years of age. However, in the younger (20-29) and older (40 and above), the gender distribution is more balanced. The declining trend in the frequency for both male and female beyond the late 30s suggests fewer older employees in the baking workforce.

Table 5.2: Gender distribution across Age group

Gender vs. Age group	20_29	30_39	40_49	50_59	Total
Female	17	27	12	7	63
Male	17	37	10	6	70
Total	34	64	22	13	133
Percentage	25.6%	48.1%	16.5%	9.8%	100%

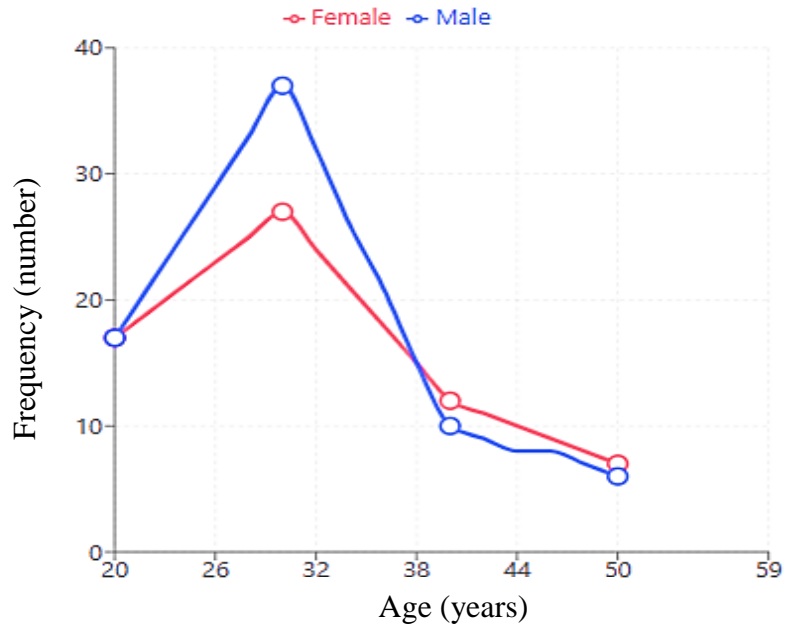


Figure 5.5: Graphical representation of gender distribution across Age

C. Job Position

The job position analysis reveals both overall diversity and gender specific patterns. While managerial positions represent the largest segment overall (33.1%, 44 participants), gender cross-tabulation exposes significant disparities. Women are heavily concentrated in administrative/clerical roles (41.3% of women versus 21.4% of men), while men dominate technical/IT/engineering positions (30.0% of men versus 15.9% of women) and hold a greater share of managerial positions (38.6% of men versus 27.0% of women). This pattern reflects traditional gender segregation within organizational hierarchies, with women more frequently occupying support roles and men more commonly holding technical and leadership positions.

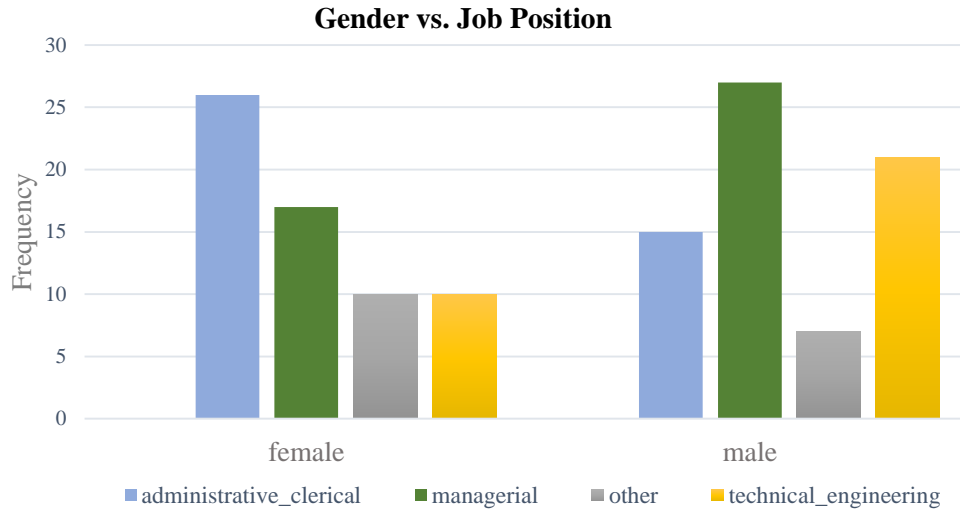


Figure 5.6: Bar chart representing job position among genders

The distribution of jobs differs meaningfully between males (Men) and females (Women) thus, the potential gender segregation in different job categories, with women more represented in administrative roles and men more represented in managerial and technical positions.

Table 5.3: Gender distribution across Job Position

Gender Vs. Job Position	Administrative/clerical	Managerial	Other ¹	Technical/IT/engineering	Total
Female	26	17	10	10	63
Male	15	27	7	21	70
Total	41	44	17	31	133
Percentage	30.8	33.1	12.8	23.3	100

Note: ¹ Others: Senior/Junior Assistant, Operational In charge, Branch Operation

D. Education Background

A highly educated population is reflected in the sample’s educational profile, with master’s degree accounting for majority (60.2%, 80 participants) followed by bachelor’s degrees (33.8%, 45 participants). Just 3.8 % of the sample (5 participants) have a doctorate, compared to 1.5% who have only completed high school and 2.5% having professional certification (including Chartered Accountancy, Technical Training, and A-level banking courses). With almost all participant have at least

undergraduate degree, this shows a professional workforce with a significant academic credentials.

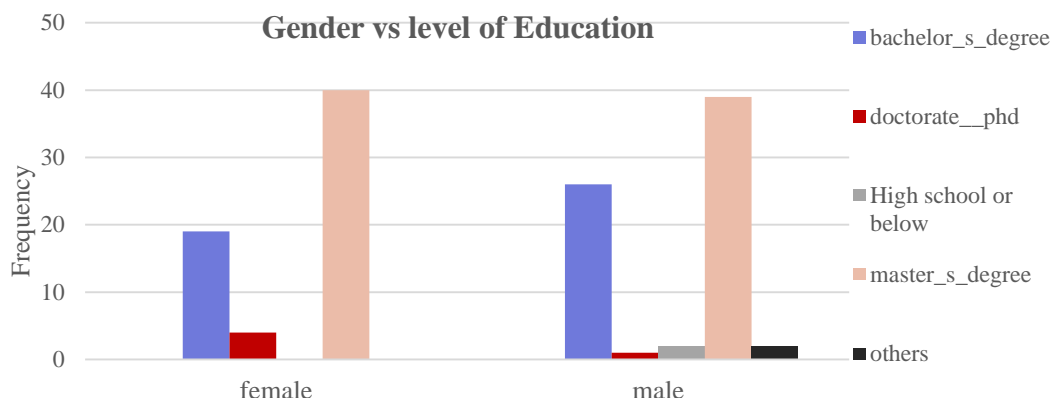


Figure 5.7: Bar chart representing education background among genders.

Looking further to gender division data, there are notable trends that demand considerations. Women (Female) demonstrate a tendency towards higher academic achievements within traditional degree structures, with a greater percentage holding master’s degrees (63.5% of women versus 55.7% of men) and a significantly higher representation at the doctoral level (6.3% of women compared to 1.4% of men). On the other hand, men have a wider range being the only ones in both the high school category and professional certifications. There are moderate inequalities in the bachelor’s degree with 30.2% of women and 37.1% of males possessing this qualification. These pattern in educational paths displays men somewhat more diverse paths and women concentrating more on advanced academic degrees.

Table 5.4: Gender distribution across level of Education

Gender vs. level of education	High	Bachelor's Degree	Master's Degree	Doctorate/PhD	Others ²	Total
	School or Below					
Female	0	19	40	4	0	63
Male	2	26	39	1	2	70
Total	2	45	79	5	2	133
Percentage	1.5	33.8	59.4	3.8	1.5	100

Note: ²Others = Professional certification levels - Chartered Accountancy, Technical Training and A-level banking courses

E. Tenure Period

Furthermore, Tenure patterns further illuminate gender differences in career trajectories. Both genders show highest concentration in the 1-5 years category, though women demonstrate significantly higher representation (54.0% of women versus 41.9% of men). Men show substantially greater representation in long-term employment categories (11-15 years: 7.1% of men versus 3.2% of women; ≥ 15 years: 15.7% of men versus 7.9% of women). These tenure disparities may reflect various factors including career interruptions, work-life balance challenges, or relatively recent increases in women's participation in the banking sector.

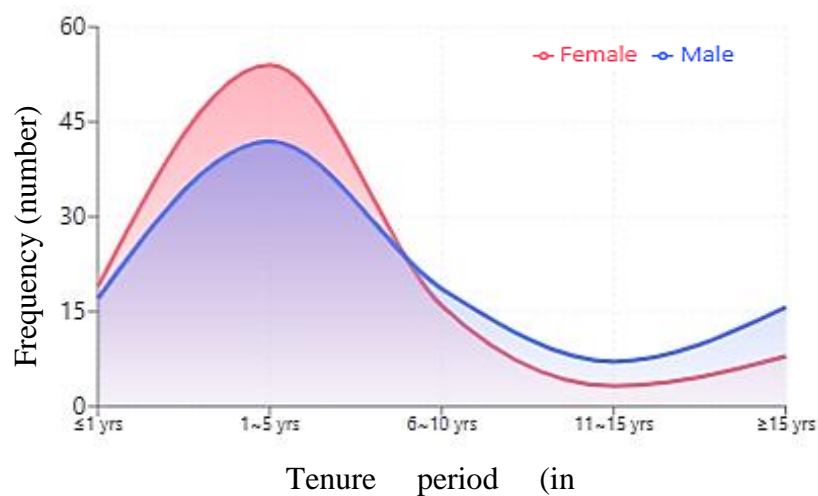


Figure 5.8: Graphical representation of gender distribution across tenure period

Collectively, these demographic details reveals a sample that is educationally advanced, professionally diverse, and gendered balance in aggregate numbers, but exhibits notable gender based patterns in organizational positioning. The purposive sampling approach successfully captured participants from a variety of backgrounds, increasing the representativeness of the sample within the banking sector. These patterns particularly the gender differences in job position, education background, and tenure may significantly influence energy consumption behaviors through differences in work routines, authority levels, and involvement in decision-making, and institutional knowledge. Recognizing these variations provides necessary context for interpreting energy behavior findings that account for the complex organizational dynamics exists within Nepalese banking environments.

5.2 Consistency test of items

To ensure the reliability of measurement scales, this research conducted a consistency test using Cronbach's alpha. Cronbach's alpha (α) is a widely used measure of internal consistency reliability that indicates how closely related a set of items are as a group. It helps to determine if the survey questions consistently measure the same underlying constructs or not. A high alpha value indicates good internal consistency that means the participants responded to related questions in a similar way. This step is important because reliable measurement is essential for performing analysis of behavioral intention which further adopts energy saving behavior.

The table of results below shows that all scales are acceptable to good reliability, with α -values ranging from 0.71 to 0.77. These value exceeds the commonly accepted threshold of 0.70 (Cronbach, 1951) suggested by indicating that the items within each scale are measuring the same underlying construct consistently.

Table 5.5: Result of consistency test

Variables	Items	Avg. Mean	Avg. SD	Avg. (α)
ESB	9	3.40	1.16	0.71
CA	9	3.85	1.32	0.76
	Items (A5, A10,A12) were excluded (being $\alpha < 0.55$)			
PBC	10	3.48	0.99	0.74
WC	6	3.59	0.98	0.75
BI	4	3.97	0.85	0.77
	Item (IN3) was excluded (being $\alpha < 0.6$)			

Note: (α)-Cronbach's alpha; SD-Standard Deviation

For the ESB scale, the 9 items showed an average mean score of 3.40 with a standard deviation of 1.16 and an alpha value of 0.71. This shows that participants reported moderate levels of energy saving behaviors with considerable variation among respondents. The reliability coefficient indicates acceptable internal consistency, meaning the items are coherently measuring the same construct.

CA towards energy saving behavior scale, after removing three problematic items, contained 9 items with an average mean of 3.85, a standard deviation of 1.32, and an alpha value of 0.76. The higher mean score says that participants generally held positive cognitive attitudes toward energy conservation. The relatively high standard deviation indicates substantial variability in these attitudes across participants. The alpha value of 0.76 demonstrates good reliability of this scale.

For PBC, the 10 items showed an average mean of 3.48, a standard deviation of 0.99, and an alpha value of 0.74. This indicates that participants perceived moderate levels of control over their energy-saving behaviors, with somewhat less variation compared to the CA scale. The reliability coefficient demonstrates good internal consistency among the PBC items.

The WC scale consisting of 6 items yielded an average mean of 3.59, an average standard deviation of 0.98, and an average alpha value of 0.75. The participants generally perceived a positive workplace culture regarding energy conservation, with moderate variation across the sample. The reliability coefficient indicates good internal consistency.

Lastly, BI scale, after removing one problematic item, it contained 4 items with an average mean of 3.97, an average standard deviation of 0.85, and an alpha value of 0.77. The relatively high mean score has a strong intention to engage in energy saving behaviors among participants, with less variation compared to other constructs. This scale demonstrated the highest reliability among all the measures used.

Three items from the Cognitive Attitude scale and one item from the Behavioral Intention scale were excluded due to low reliability ($\alpha < 0.6$). As items that reduce a scale's reliability may introduce measurement error and potentially distort findings.

Several statistical methods were performed to understand the data, including descriptive statistics (like averages). The Mann-Whitney U test to compare the differences between men and women and regression analysis to understand how different factors influenced energy saving intentions and behaviors for each gender group. The outcomes of the analysis are placed in the immediate chapter number five: Analysis and Findings.

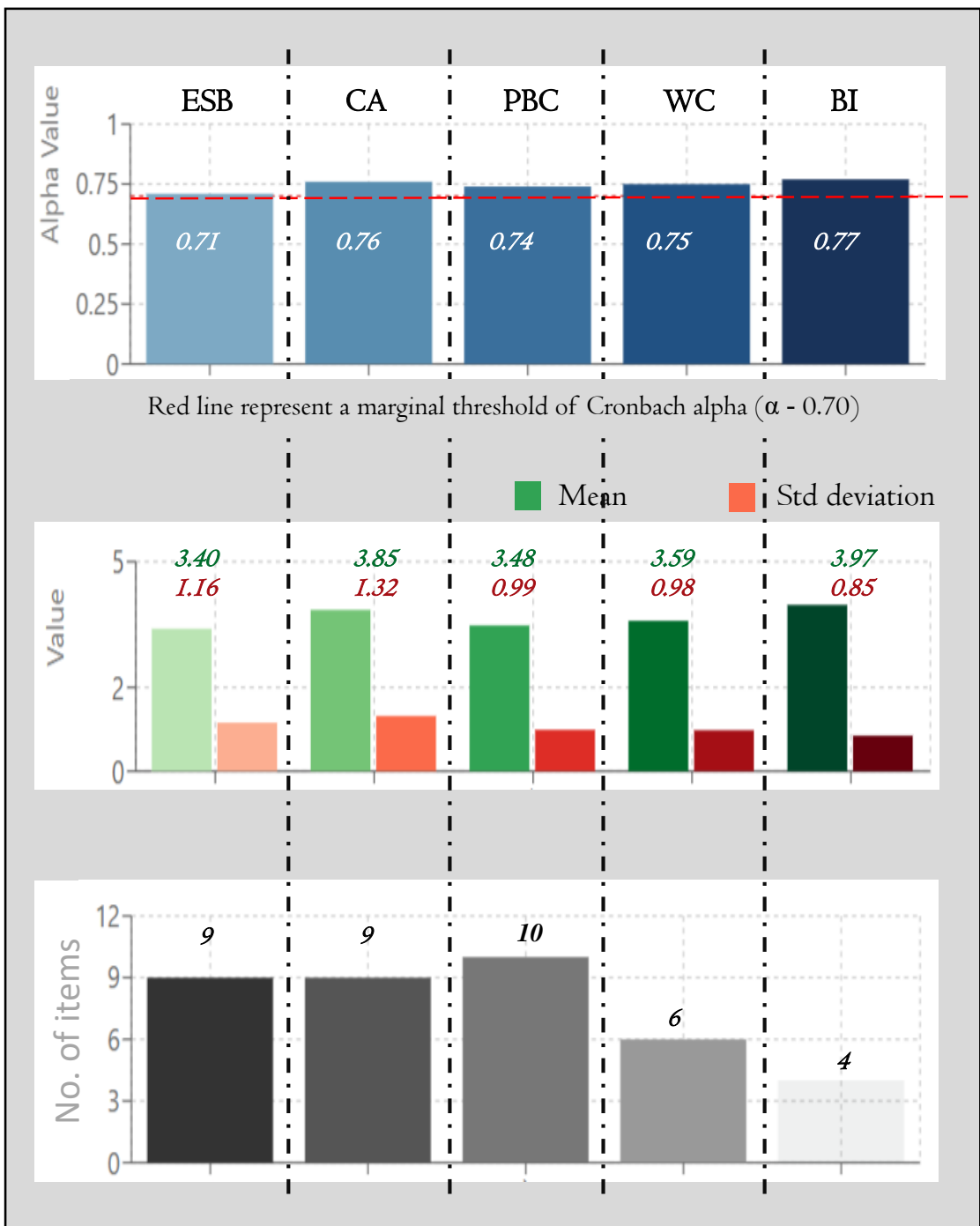


Figure 5.9: Bar charts representing Cronbach's alpha value, mean and standard deviation and frequency of sample question according to the variables respectively

5.3 Mann-Whitney U Test

Definition: Mann-Whitney U test is a non-parametric statistical test used to determine whether there is a significant difference between two independent groups on a continuous or ordinal variable.

This research further used the Mann-Whitney U test to compare how men and women differ in their energy saving perceptions and behaviors. Sometimes it's called the Wilcoxon rank-sum test which is helpful when comparing two groups without assuming the data follows a normal distribution, making it suitable for the survey of the research.

Table 5.6: Results of Mann-Whitney U test for gender differences across constructs of variables

Construct	Women Mean rank	Men Mean rank	U score	p-value
BI	70.26	64.06	1999.5	0.348
PBC_T	69.88	64.41	2023.5	0.404
PBC_D	58.70	74.47	1682	0.033*
WC	60.85	72.54	1817.5	0.046*
CA_TE	61.48	71.52	1723.5	0.025*
CA_ER	67.63	66.41	2101.0	0.404
ESB	61.85	71.64	1880.5	0.142
Age group	68.19	65.93	2130	0.717
Job position	59.45	73.79	1729.5	0.025*

The U test analysis results in several gender differences of ESB. Men showed up significantly higher scores in PBC_D (U = 1682, Z = -2.130, p = 0.033), it means that they perceive fewer obstacles when performing energy conservation actions compared to women. Similarly, men reported more positive perceptions of WC supporting energy conservation (U = 1817.5, Z = -1.762, p = 0.046) and held more favorable CA_TE (U = 1723.5, Z = -2.234, p = 0.025). Men also typically occupied higher Job Positions (U = 1729.5, Z = -2.234, p = 0.025), which may explain some of these differences, as higher positions often provide greater access to resources and decision making opportunities related to energy management.

Despite these differences, the analysis showed no significant gender variation, including Behavioral Intention, Perceived Behavioral Control related to Technical control, Cognitive Attitudes toward environmental responsibility, and actual Energy Saving Behaviors.

5.4 Normality Assessment

A normality test is a statistical procedure used to determine whether a dataset follows a normal distribution (also called a Gaussian distribution or “bell curve”). This assessment is necessary for evaluating whether the data follows a normal distribution, which is a key assumption for many statistical analyses, especially Regression (Jarque & Bera, 1980; Schmidt & Finan, 2018). Regression assumes that variables have normal distributions whereas non-normally distributed variables can distort relationships and significance tests (Osborne & Waters, 2003).

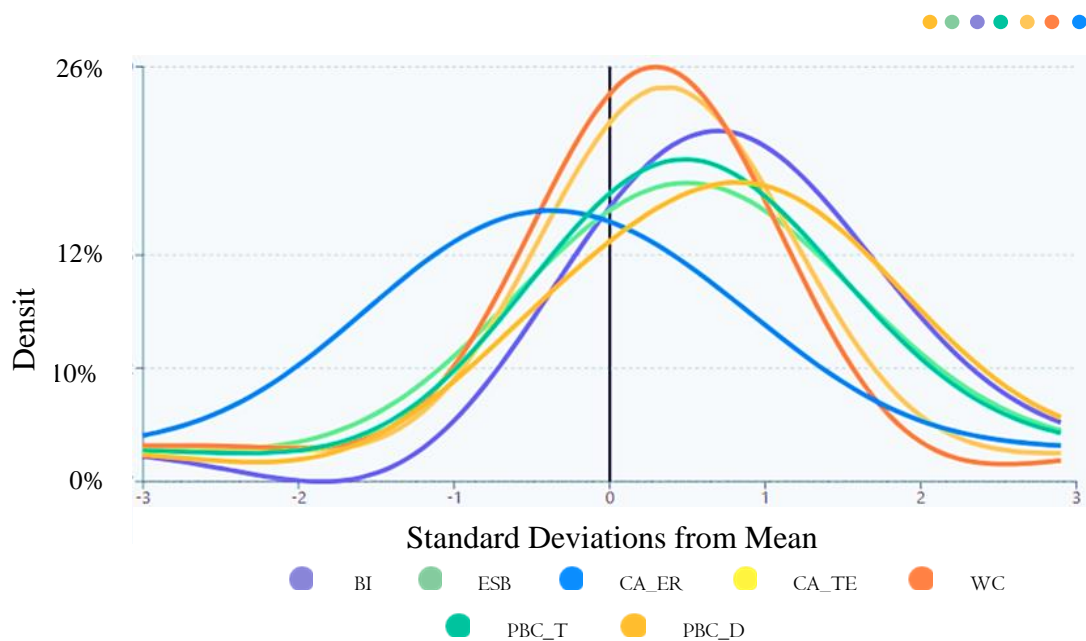


Figure 5.10: Graph representing Normality analysis (bell shaped curve) of all the variable of the framework

The above graph shows normality assessment curve (probability density functions) for all the variables of the TPB framework in the research (meaning it followed a bell-shaped pattern) before running the main analysis. The data were analyzed in two different ways: a. visually by creating graphs to see the shape of the data and b.

mathematically by calculating specific values that tells about unusual patterns or extreme responses.

Looking at the graph most variable shows reasonable symmetrical bell-shaped curves, indicating approximately normal distribution. The blue curve (CA_ER) appears to be the most widely spread, that means greater variability is in participants' environmental responsibility attitudes. It also peaks slightly to the left of the center line, indicating a slight negative skew. The orange curve (WC) and yellow curve (PBC_D) display the narrowest and highest peaks, means less variability in workplace culture perceptions and perceived control over daily habits. These variables also show slight positive skews, with their peaks positioned just to the right of the center line. The purple curve (BI) and green curve (ESB) show moderate spreads with peaks slightly towards the right from center, indicating that behavioral intentions and actual energy-saving behaviors are reasonably normally distributed with positive skews.

All variables mathematically also resulted acceptable normality as evidenced by skewness and kurtosis values falling within the conventional threshold of ± 1.0 . See Table below.

Table 5.7: Mean, Skewness, and Kurtosis of key variables

Variable	Mean	Skewness ¹	Kurtosis ²
BI	15.92	-0.834	0.320
ESB	29.44	-0.441	0.353
WC	20.33	-0.582	-0.570
CA_T	11.81	-0.501	-0.875
CA_E	14.74	0.254	0.473
PBC_T	3.94	-0.529	0.175
PBC_D	11.46	-0.594	0.680

Note: ¹ Skewness threshold: -1 and +1 is considered acceptable (George & Mallery, 2010).

² Kurtosis threshold: -1 and +1 is considered acceptable (Byrne, 2016)

The table 12 presents descriptive statistics for the key variables in the study about gender differences in energy-saving perceptions and behaviors in Nepalese workplaces. For each variable, three statistics are reported. The average score for each variable across all participants. For example, the Behavioral Intention (BI) variable has a mean of 15.92, while Energy Saving Behavior (ESB) has a mean of 29.44. The skewness measures the asymmetry of the distribution. Most variables show negative skewness (values between -0.441 and -0.834), meaning the distribution has a slight tail toward lower values with more data clustered at higher values. The exception is CA_E (Cognitive Attitude - Environmental Responsibility), which shows a mild positive skewness (0.254), suggesting slightly more data points at lower values. And, the kurtosis measures the "peakedness" or "tailedness" of the distribution. All variables show acceptable kurtosis values (between -1 and +1). Variables with positive kurtosis (BI, ESB, CA_E, PBC_T, PBC_D) have slightly more peaked distributions than a normal curve, while those with negative kurtosis (WC, CA_T) have slightly flatter distributions.

The table confirms that all values fall within acceptable thresholds according to established statistical guidelines (Byrne, 2016; George & Mallery, 2010), indicating that the data were suitable for parametric statistical analyses. The normal distribution of variables strengthens the reliability of regression analyses and other statistical tests. Visual inspection of normal Q-Q plots and detrended Q-Q plots further confirmed that the data met the normality assumptions required for the regression analyses employed. This assessment of distributional properties enhances the validity and reliability of the findings regarding energy saving behaviors in banking institutes, ensuring that the statistical relationships identified are not the indicators of distribution irregularities but reflect genuine associations among the variables of interest.

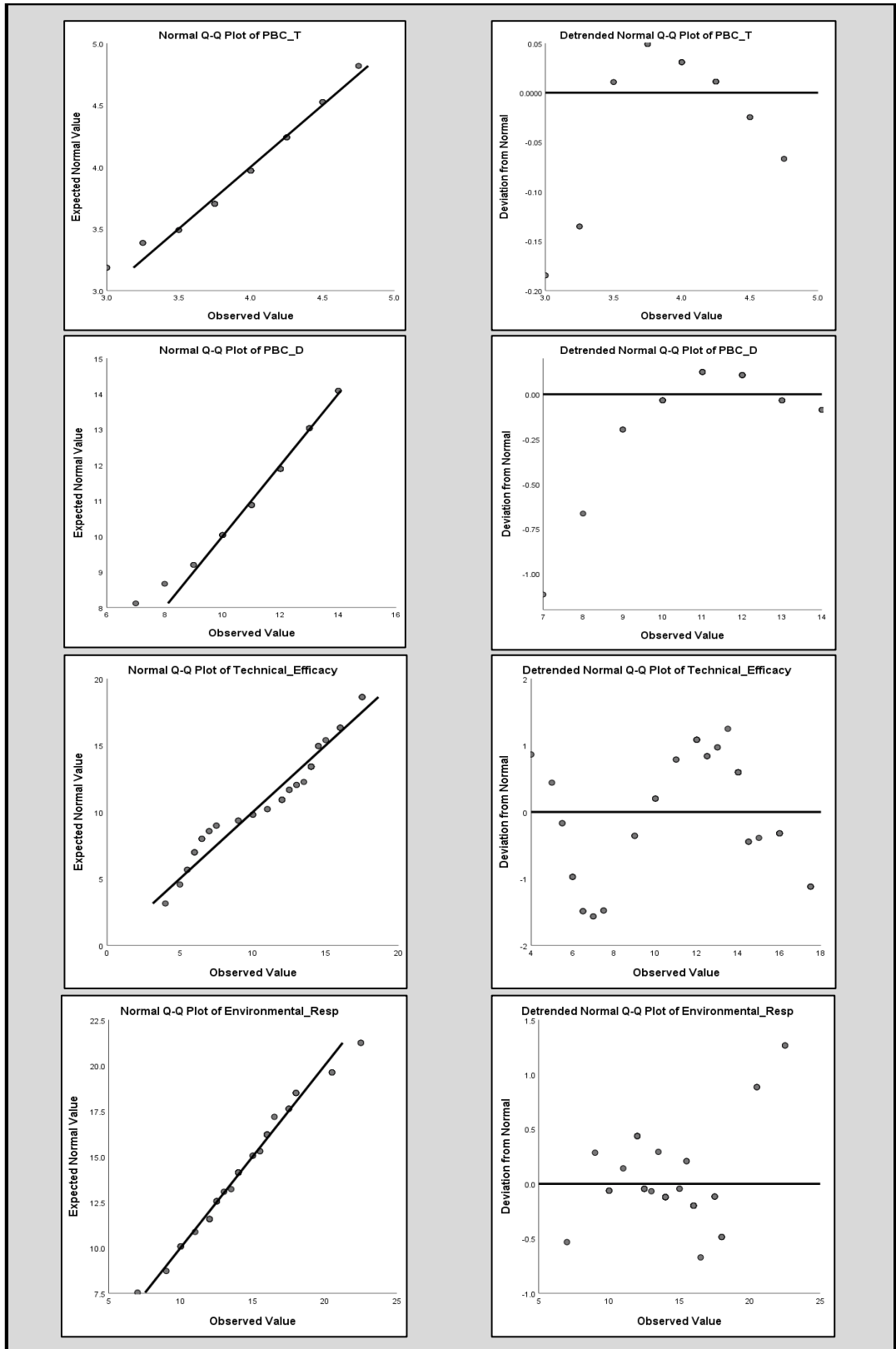


Figure 5.11: Q-Q plot for normality test of Perceived Behavioral Control's construct and Cognitive Attitude's construct

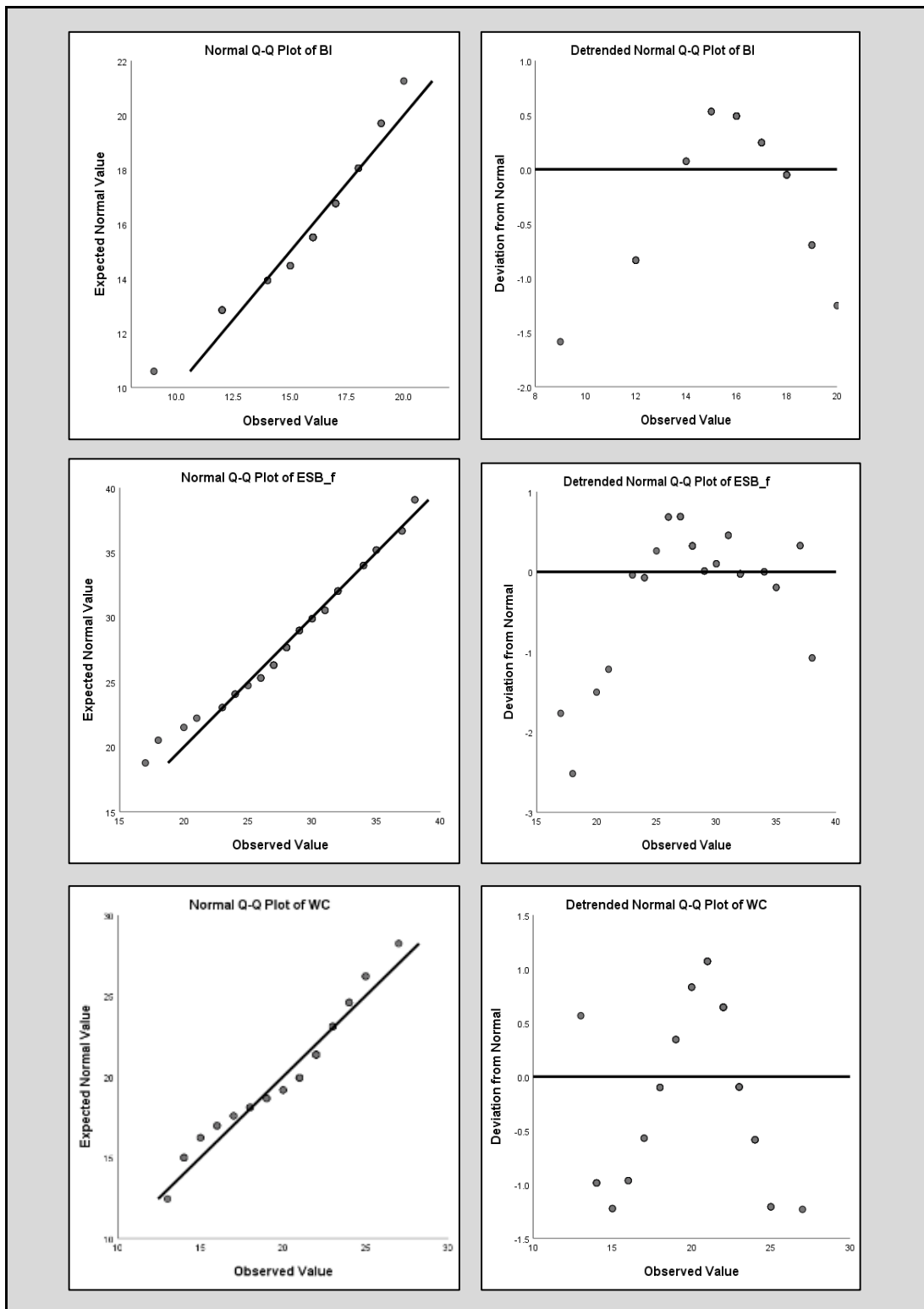


Figure 5.12: Q-Q plot for normality test of Behavioral intention, Energy saving behavior and Workplace context

a. Behavioral Intention

Visual inspection of normal Q-Q plots and detrended Q-Q plots, combined with acceptable skewness (-0.834) and kurtosis (0.320) values, confirmed that the Behavioral Intention variable met normality assumptions required for subsequent analyses. The mean score for this construct was 15.92 (SE = 0.29), indicating generally positive intentions toward energy-saving behaviors among banking professionals.

b. Energy Saving Behavior

The Energy Saving Behavior variable demonstrated an approximately normal distribution, with skewness (-0.441) and kurtosis (0.353) values well within acceptable ranges (± 1.0). The mean score of 29.44 (SE = 0.58) suggests moderate-to-high engagement in energy conservation practices among participants.

c. Workplace Culture

Assessment of the Workplace Culture variable revealed acceptable normality characteristics, with skewness (-0.582) indicating a slight negative skew and kurtosis (-0.570) suggesting a somewhat flatter distribution than the normal curve. However, both values remained within acceptable thresholds for parametric analyses. The mean score of 20.33 (SE = 0.43) indicates generally positive perceptions of workplace culture supporting energy conservation.

d. Perceived Behavioral Control Components

The Perceived Behavioral Control related to Time (PBC_T) variable demonstrated appropriate normality with skewness (-0.529) and kurtosis (0.175) values within acceptable ranges. The mean score of 3.94 (SE = 0.05) suggests participants perceive moderate control over time-related aspects of energy conservation.

Similarly, the Perceived Behavioral Control related to Difficulty (PBC_D) variable exhibited adequate normality characteristics with skewness (-0.594) and kurtosis (0.680) values within acceptable parameters. The mean score of 11.46 (SE = 0.18) indicates that participants generally perceive moderate control over difficulty-related aspects of energy-saving behaviors.

e. Cognitive Attitude Components

The Technical Efficacy component of Cognitive Attitude (CA_T) demonstrated acceptable normality with skewness (-0.501) and kurtosis (-0.875) values within acceptable ranges, though the negative kurtosis indicates a somewhat flatter distribution. The mean score of 11.81 (SE = 0.47) suggests moderately positive attitudes toward the technical aspects of energy conservation.

The Environmental Responsibility component (CA_E) exhibited a slight positive skew (0.254) and moderate kurtosis (0.473), both within acceptable parameters for assuming normality. The mean score of 14.74 (SE = 0.39) indicates relatively high levels of perceived environmental responsibility among banking professionals.

5.5 Regression Analysis

Multiple regression analysis is a statistical technique used to examine the relationship between multiple independent variables (predictors) and a single dependent variable. Unlike simple linear regression which involves only one predictor, multiple regression allows researchers to simultaneously assess how several factors influence an outcome, while controlling for the effects of other variables in the model (Cohen et al., 2003). This approach provides a more comprehensive understanding of complex phenomena by accounting for multiple influences and their relative importance.

5.5.1 Predictors of Behavioral Intention

To explore how men and women differ in their motivations for energy conservation, we conducted separate regression analyses for each gender (Table 12). This approach has allowed us to identify the distinct psychological pathways through which men and women develop intentions to save energy in the workplace.

(a) Female Participants (N=63)

For women, perceived behavioral control related to daily habits emerged as the strongest significant predictor of energy-saving intentions ($\beta = 0.290$, $p = 0.021$). Women also showed a marginally significant positive relationship between perceived technical control and behavioral intention ($\beta = 0.239$, $p = 0.071$), indicating that technical confidence somewhat enhances their motivation for energy conservation.

Additional factors showing marginal influence on women's intentions included workplace culture ($\beta = 0.157$, $p = 0.070$) and cognitive attitudes toward technical efficiency ($\beta = 0.194$, $p = 0.098$). Interestingly, cognitive attitudes toward environmental responsibility demonstrated a negative, though non-significant, relationship with intention ($\beta = -0.196$, $p = 0.108$). Among the control variables, age group showed a substantial though marginally significant effect ($\beta = 0.502$, $p = 0.071$), suggesting that older women may have stronger energy saving intentions than their younger counterparts. Educational level and job position did not significantly predict women's intentions. The model explained 27.6% of the variance in women's behavioral intentions (Adjusted $R^2 = 0.276$), with the overall model being statistically significant ($F = 3.387$, $p = 0.003$).

(b) Male Participants (N=70)

For men, perceived behavioral control related to daily habits resulted as a strongly dominant predictor of energy-saving intentions ($\beta = 0.622$, $p < 0.001$), with an effect size more than twice that observed for women. Men also showed a significant negative relationship between perceived technical control and behavioral intention ($\beta = -0.278$, $p = 0.036$), indicating that as men's perception of their technical competence increases, their intention to engage in energy-saving behaviors actually decreases. Men again demonstrated a small but significant positive relationship between cognitive attitudes toward environmental responsibility and behavioral intention ($\beta = 0.135$, $p = 0.014$), while workplace culture showed a marginally significant influence ($\beta = 0.144$, $p = 0.067$).

Similar to women, age group showed a substantial though marginally significant effect for men ($\beta = 0.510$, $p = 0.070$), while educational level and job position did not significantly predict intentions. The model explained 34.6% of the variance in men's behavioral intentions (Adjusted $R^2 = 0.346$), with the overall model being highly statistically significant ($F = 5.574$, $p < 0.001$).

Table 5.8: Results of the regression equations of Behavioral intention [see Eq.6], the influence of all the constructs of modified TPB framework [see Figure 4.1] on Behavioral intention to adopt energy saving behavior, expressed in Beta values (coefficient of variables)

Predictors	Female (N=63)		Male (N=70)	
	β	p-value	β	p-value
Constant	1.502	0.012*	2.772	0.000***
CA_TE	0.194	0.098†	0.017	0.320
CA_ER	-0.196	0.108	0.135	0.014*
PBC_T	0.239	0.071†	-0.278	0.036*
PBC_D	0.290	0.021*	0.622	0.000***
WC	0.157	0.070†	0.144	0.067†
Control variables				
<i>Education</i>	-0.073	0.720	0.122	0.378
<i>Age group</i>	0.502	0.071†	0.510	0.070†
<i>Job Position</i>	-0.143	0.530	-0.169	0.484
<i>Adjusted R²</i>	0.276		0.346	
<i>F</i>	3.387; 0.003**		5.574; 0.00***	

Note: † $p \leq 0.10$, * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

- β represents standardized coefficients
- R^2 , the squared multiple correlation, is the proportion of variation in the behavioral intention predictable from the best linear combination of the predictors. Adjusted R^2 considers the magnitude of chance fluctuations as a result of the sample size (Tabachnick & Fidell, 2007).
- F , ratio of explained variance to unexplained variance, determines the regression model significantly predicts the dependent variable better than the mean alone.

5.5.2 Predictors of Actual Energy-Saving Behavior

Following (Ajzen & Fishbein, 2010) framework which states that both behavioral intention and perceived behavioral control influence actual behavior, this research conducted further regression analyses to examine factors predicting energy-saving behaviors for both genders (See Table 13 below).

The results revealed a striking gap between intentions and behaviors. The models explained only minimal variance in actual energy-saving behaviors for both women (Adjusted R² = 0.030) and men (Adjusted R² = 0.047), with neither model reaching statistical significance (women: F = 1.478, p = 0.221; men: F = 1.856, p = 0.129).

For women, none of the predictors significantly influenced actual energy-saving behavior. Perceived control over daily habits showed a small positive effect ($\gamma = 0.100$, p = 0.501), while technical control showed an even smaller influence ($\gamma = 0.046$, p = 0.661). Most notably, behavioral intention had virtually no relationship with actual behavior ($\gamma = -0.016$, p = 0.915).

Similarly for men, none of the predictors significantly influenced actual energy-saving behavior, though behavioral intention showed a somewhat stronger, albeit still non-significant, relationship with behavior ($\gamma = 0.200$, p = 0.167) compared to women. Perceived control over daily habits ($\gamma = 0.083$, p = 0.614) and technical control ($\gamma = 0.050$, p = 0.735) showed minimal influence.

Table 5.9: Results of the regression equations of actual Energy saving behavior Performed to analyze the influence of behavioral intention and PBC on actual Energy saving behavior

Predictors	Female (N=63)		Male (N=70)	
	γ	p-value	γ	p-value
Constant	2.778	0.000***	3.545	0.001**
PBC_T	0.046	0.661	0.050	0.735
PBC_D	0.100	0.501	0.083	0.614
BI	-0.016	0.915	0.200	0.167
Adjusted R ²	0.030		0.047	
F	1.478; 0.221		1.856; 0.129	

Note: † $p \leq 0.10$, * $p \leq 0.05$, ** $p \leq 0.01$;

γ represents standardized coefficients

CHAPTER 6 DISCUSSION

This research explored gender perception differences that influence behavioral intentions toward energy saving in Nepalese Workplaces, particularly within the banking sector. The analysis throughout, examines the Theory of Planned Behavior component across genders - how men and women perceive energy use differently in the workplace and how these perceptions shape their intention to adopt energy saving behavior shows comparable overall behavioral intentions. This findings suggests that while the destination may be similar, the pathways taken by each gender are markedly different. Summary of the research findings, evidences and implications are listed in the table which are further explained below.

Table 6.1: Summary of research Findings and Evidence

Key Findings	Theoretical Linkage	Reasons
<i>Objective 1: To analyze gender differences in perceptions of energy use in office environment.</i>		
<i>Question 1: Do men and women perceive and use energy differently in office settings?</i>		
Men demonstrate significantly higher perceived control over daily energy-saving actions	Men's behaviors more strongly predicted by self-efficacy and control <i>(Zelezny et al., 2000)</i>	Organizational hierarchy: Men occupy more managerial (38.6% vs 27.0%) and
Women integrate multiple factors in their approach to energy conservation	"Rebound effect" explains why technical expertise can reduce behavior change <i>(Kollmuss & Agyeman, 2002)</i>	technical positions (30.0% vs 15.9%)

Technical knowledge decreases men's conservation intentions but increases women's ("technical competence paradox")	"Resource Man" concept shows men prioritize technical and conceptualize as energy problems over behavioral solutions (<i>Strengers, 2014</i>) Men view energy technologies as objects of mastery; women as practical tools (<i>Offenberger & Nentwich, 2009</i>) Men more likely to trust technological solutions, less focused on personal responsibility (<i>Macgregor, 2010</i>)	Mann-Whitney U test confirms men have higher perceived control Regression shows technical control negative for men but positive for women
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Objective 2: How perceptions influence intentions.

Men's intentions predominantly shaped by perceived control over daily habits	Men's environmental actions strongly dependent on organizational position (<i>Sparkman et al., 2021</i>)	Models explained minimal variance in actual behavior (women: 3.0%, men: 4.7%)
Women show balanced influence from multiple factors: daily control technical control workplace culture	Men influenced by control; women by multiple social factors (<i>Kennedy & Kmec, 2018</i>) Intentions account for only 28% of variance in behavior on average (<i>Sheeran & Webb, 2016</i>)	Men find energy-saving habits more boring than women Workplace structures often limit all employees' ability to act on energy-saving intentions
Both genders show substantial intention-behavior gap	Organizational barriers weaken intention-action link (<i>Lo et al., 2012; Ruepert et al., 2017</i>)	

Question 2: How does workplace culture influence gendered energy behavior?

<p>Men perceive workplace culture more positively</p>	<p>Banking environments prioritize standardized procedures</p>
<p>Similar influence of workplace culture on intentions for both genders</p>	<p>Gendered power dynamics shape perception of workplace initiatives <i>(M. K. Ryan & Haslam, 2007)</i></p> <p>Diverse participation improves policies and engagement <i>(Goulden & Spence, 2015)</i></p> <p>Organizational structure and job performance metrics prioritize customer service over energy conservation</p>
<p>Limited participation opportunities contribute to intention-behavior gap</p>	<p>Contextual factors overshadow psychological variables in offices <i>(Klöckner & Blöbaum, 2010)</i></p> <p>Men's greater representation in policy-making positions</p>

Overall finding addressing both objectives and questions

<p>Despite different perceptual pathways, both genders show similar levels of actual energy-saving behaviors</p>	<p>Centralized building systems remove individual control <i>(Stephenson et al., 2010)</i></p> <p>ABC theory also shows contextual forces can override attitudes <i>(Stern, 2000)</i></p>	<p>Both men and women face the same barriers, so they end up saving energy similarly despite different motivations.</p> <p>Office environments limit</p>
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Structural workplace barriers prevent both genders from translating intentions into actions	Approaches addressing only motivational factors produce disappointing results (<i>Karlin et al., 2015</i>)	individual control, good intentions rarely lead to action unless the organization itself makes energy-saving automatic or mandatory. Gender doesn't matter as much as the workplace's structure in determining actual energy-saving behavior.
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6.1 Gender difference in perception to energy saving

Addressing our first research objectives, significant difference was seen in gendered perceiveness towards energy use in office environment. The findings suggest that men and women may take different mental paths to save energy at work, but they reach the same behavioral outcomes saving the same amount. Even though they perceive their abilities and environment differently, these differences don't change how much energy they actually save. The fact that actual energy-saving behaviors showed no significant difference despite variations in underlying psychological constructs. Suggests that different pathways may lead to similar behavioral outcomes for different genders in organizational settings.

For men, the strongest predicting factor influencing their intention to save energy emerged as their sense of control over daily habits likely because of greater authority and confidence in handling energy system. In contrast, women's intentions are influenced by a mix of factors, including technical knowledge, social norms, and workplace culture ($\beta = 0.290$, $p = 0.021$), reflecting their broader socialization towards

care and collaborations. This finding is consistent with several established research streams. A research by Zelezny et al., (2000), conducted a meta-analysis of gender differences in environmental behaviors and found that men's behaviors are more strongly predicted by self- efficacy and perceived control factors. Further validation comes from Kennedy & Kmec, (2018), who found that men's behaviors in workplace settings were more strongly influenced by perceived ease of action and personal control compared to women, whose behaviors were more influenced by a complex interplay of social and normative factors. The significant U-test results ($U = 1682, p = 0.033$) indicates that men's higher perceived control aligns with these established patterns. This pattern appears strong, across both Western and Asian context, suggesting a cross-cultural element to this gendered psychological mechanism.

The direct explanation lies in the gender division in job positions with men holding more managerial (38.6%) and technical roles (30.0%) whereas women occupying 27.0% and 15.9% to managerial and technical roles respectively, marking the major occupancy of 41.3% in administrative roles. This gives a clear conclusion that men inherently have greater decision-making authority and technical control in the workplace. This explanation was supported in this research context by an anonymous Bank branch manager of NIC Asia –

“As a manger, I have direct control over many energy-related decisions in the office, from setting air conditioning policies to approving equipment purchase. My female colleagues in administrative roles simply don't have the same authority or input into these decisions, which naturally affects how much control they feel they have.”

There's this assumption that men will know how to fix technical problems, which reinforces the idea that these systems are their domain. In focus group conducted with female employees from one of a Bank office, one participant expressed:

“When there's a bigger problem with the computer or air conditioning system, we report it to the maintenance

department (in house electrical engineer Er. Shubarna Kathayat) and whenever smaller issues occurs either Hemant dai, or Susham dai (our colleagues) helps us to solve the issues.”

However, our results differ from a research (Ponichan et al., 2023), done in Malaysian office, who found women in managerial positions reported similar levels of perceived control as male counterparts. This discrepancy likely stems from Nepal's unique cultural context, where gender roles in professional settings remain more rigidly defined than in Malaysia creating stronger effects on perceived control regardless of position. Thus, this gap shows the need for organizations to promote inclusive participation, such as cross-hierarchical green teams (Bennett et al., 2021).

Interestingly, the research also found that men showed a significant negative relationship between technical control (PBC_T) and behavioral intention ($\beta=-0.278$, $p=0.036$), suggesting that as men's perceived technical control increases, their intention to engage in energy-saving behaviors decreases. This surprising result explained by (Kollmuss & Agyeman, 2002) called the “rebound effect,” where greater technical expertise can lead to overconfidence in technology, making people less likely to change their behavior. Supporting this idea, the analysis showed that men find energy saving habits more boring than women, even though they are more often asked for technical advice. This suggest that men may rely too much on technical solutions, seeing routine energy-saving as less important or engaging. One research found contradictory evidence in Western contexts, where women sometimes report more positive perceptions of organizational environmental efforts than men. This difference likely results from the banking sector's hierarchical structure in Nepal, where traditional gender roles may reinforce men's greater sense of institutional belonging, unlike in the more egalitarian workplace cultures (Lo et al., 2012).

For women, the factors influencing their intention to save energy were more varied and balanced. While control over daily habits remained significant ($\beta=0.290$, $p=0.021$), technical control showed a slightly positive relationship ($\beta=0.239$, $p=0.071$) which was the opposite of men's negative trend. Additionally, attitudes towards technical solutions and workplace culture also had a positive influence on women's intentions. This

suggests that women consider a wider range of factors, including social and organizational aspects, when deciding to save energy. This aligns with research showing that women's environmental actions are often shaped by collaborative and community-focused motivations.

Here at first glance, it might seem contradictory that, men, who have more technical control, are less motivated to save energy and women, who have less technical control, are more motivated when they gain technical knowledge. This shapes a paradox explained by gendered roles and socialization. For men, technical expertise leads to overconfidence in technology, reducing their motivation for behavioral change. They see energy saving behaviors as boring a trivial compared to technical solutions. For women, Technical knowledge empowers them to take actions, as they view it as a tool to enable energy saving behavior rather than a replacement for them.

6.2 Workplace Culture

The marginally significant influence of workplace culture on behavioral intentions for both women and men suggest that organizational norms may serve as an equalizing force. While men and women differ in how technological and control factors influence their intentions, they respond similarly to workplace cultural cues. While men perceive workplace culture more positively (mean rank=72.54) compared to women (mean rank=60.85), with this difference being statistically significant, the influence of workplace culture on intentions is similar for both gender. The moderate score for "My workplace offers me very few opportunities to participate in energy related programs" (mean= 3.33) highlights that limited participation opportunities may contribute to the intention-behavior gap. This suggest that organizational norms shape intentions similarly, even though men, who hold more managerial roles, feel more supported by the culture. However, the substantial intention-behavior gap indicates that workplace systems and constraints may override individual intentions, as organizational control over energy use limits personal influence.

6.3 The technical competence paradox

Another interesting finding to be discussed of this study is the technical competence contradiction, where technical knowledge in shaping energy saving intentions differs

between genders. For men, greater technical control significantly reduces their motivation to save energy, likely because they saw routine energy saving actions as boring and preferred technological solutions like air conditioning over simpler measures. This reflects the “technosalvation” barrier termed by Gifford, (2011), where men may believe technology alone can solve energy saving problems without behavioral changes. This psychological mechanism helps explain the negative relationship between technical control and behavioral intentions among men (Gifford, 2014). But in contrast, for women, technical knowledge slightly increased their energy saving intentions. Women were more open to technical training and saw technical skills as a way to enable, rather than replace, behavioral change. However, they were less likely to be asked for technical advice, highlighting a gender gap in technical roles.

A study expanded this idea stating - the more confident one is in technological solutions, the less necessary personal behavior change seems (Maniates, 2016). This suggests that technological optimization often acts as a way to avoid feelings of personal responsibility. This effect may be particularly stronger in men due to their socialization toward relying on technology. Macgregor, (2010) found that men are more likely to trust and express confidence in technological solutions to save energy and less likely to focus on personal responsibility, supporting the idea that technical knowledge can replace rather than encourage behavior change.

Further, a research on gendered technology use in energy usage, which found that men often view energy technologies as objects of master and control, while women tend to see them as a practical tools for achieving specific goals (Offenberger & Nentwich, 2009). Their study of household energy decisions showed that technically skilled men often focused on optimizing technology rather than changing their behavior, which supports the idea that technical knowledge has different effects on men and women.

Another research supports the finding with a concept of “Resource Man”, which is an idealized energy consumer who are envisioned by smart energy advocates (Strengers, 2014). Resource Man is portrayed as technologically skilled, eager for technical information, and focused on achieving efficiency through technology rather than changing behavior. Their study observed that this archetype reflects masculine approaches to sustainability that prioritize technological solutions over lifestyle adjustments. This aligns with the research’s findings that technical knowledge reduces

energy saving intentions among men, as they tend to rely on technology rather than adopting behavioral changes.

Reasoning broadly, when men gain technical knowledge about energy systems, they often adopt a “tech-first” mindset. They see technology as an ultimate solution making daily actions feel unnecessary. They might think like – Why bother turning off lights? We’ll just install motion sensor next year”. And women might think like – Now that I understand how much power AC uses, I’ll adjust settings daily.” Women’s approach transforms their knowledge into immediate behavioral improvements. But, Our results contradict a study done in Chinese University students, which found positive correlations between technical knowledge and energy behaviors for both genders (Du & Pan, 2022). This difference might from contextual differences between university settings and workplace environments, where organizational hierarchies introduce power dynamics absent in educational settings. Thus, this paradox suggests training programs should be conducted differently which may help men see technology as complementing rather than replacing behavioral change, while giving women greater access to technical decision-making roles and real-time feedback systems to reinforce their action-oriented approach (Sheeran & Webb, 2016).

6.4 The intention-behavior gap

The substantial intention-behavior gap was observed in this research where the model explained 27-30% of variance in intentions but less than 2% of actual behavior that strongly aligns with a body of established research on environmental behaviors. This finding is powerfully validated by a research where analysis of the intention-behavior gap across 94 studies, which found that intentions account for only 28% of variance in actual behavior on average, with particularly low correlations in workplace settings where contextual constraints are stronger (Sheeran & Webb, 2016). This research observed a gap which is even more pronounced, suggesting workplace environments may present especially significant barriers to translating energy saving intentions into action. Similarly, validation comes from research that found that organizational barriers, such as centralizes systems and workplace norms, weakens the link between intentions and actions (Lo et al., 2012; Ruepert et al., 2017). Their analysis revealed that even highly motivated employees often found their conservation efforts prevent by workplace constraints.

Several complementary factors might explain the gap seen in the research of banking environments. As they typically have strict, uniform procedures, shared equipment and centralized control systems that limits employees' ability to make independent decisions. Even if an employee wants to save energy, the system restricts most individual actions. Stephenson et al., (2010) documented in their study of energy use in commercial buildings, that centralized buildings management system often remove individual control over key energy consuming systems like lighting and HVAC, creating a structural barriers between intention and action.

A front desk employee of Nabil Bank, in an interview states that -

“Our office has a centralized management systems, so we have very limited control over lighting, air conditioning or even when computers can be turned off because of automated security updates and backups”

Bank workplace's energy saving are often takes backseat to primary job responsibilities and performance goals. Due to strict systems and rules it is hard for employees to take individual energy saving actions. Job tasks and performance goals usually comes first. Thus, workplace culture discourages personal efforts to save energy, but this factor alone aren't enough to overcome workplace barriers. This finding can clearly be supported by the statement of an employee from teller section of Rastra Banijya Bank, it says that –

“I am conscious about the environment and always aim to save energy whenever I can. But when I have a line of customers waiting, I don't have time to shut down my computer between transactions. My performance here in my office is evaluated by how efficiently and effectively customers are being served by me, not by how much energy I save.”

Our findings contrast with a more recent research, which found stronger intention-behavior correlations in workplace settings (Kotsopoulos et al., 2023). That could be

due to the differences in organizational support for energy conservation in Western organizations with established sustainability programs, while Nepalese banking institutions may offer fewer structural supports for translating intentions into action. The profound intention-behavior gap can carry several critical implications for energy management:

- a. Efforts focused solely on changing attitudes and intentions may have minimal impact on actual behavior. As (Karlin et al., 2015) demonstrated in their review of energy feedback interventions, approaches that address only motivational factors without changing contextual factors typically produce disappointing behavioral results.
- b. Structural and organizational changes may be more effective than psychological interventions. This aligns with the ABC theory (Attitude, behavior, context), which proposes that when contextual forces are strong in workplace settings, the relationship between attitude/intentions and behavior is weakened (Stern, 2000).
- c. Interventions should focus on reducing the barriers between intentions and behavior rather than simply increasing intentions. A research demonstrated that “behavioral scaffolding” provides supporting structures that make it easier to translate intentions into action is particularly effective in office settings where individuals face significant constraints (Mosler & Tobias, 2007).

In conclusion, despite men and women having different psychological approaches to energy saving, men focus on control and women considering broader social factors. Both genders end up behaving similarly due to rigid workplace systems that override individual intentions. Ultimately, organizational structures, not gender differences, determine actual energy saving behaviors in Nepal’s banking sector.

CHAPTER 7 CONCLUSION

The research explored gender differences in energy saving perceptions and behaviors within Nepal's banking sector. While both men and women demonstrated similar level of environmental concern, their paths to forming energy saving intentions differed significantly. Men's intentions were primarily driven by their sense of control over workplace systems, reflecting their greater representation in decision making roles, On the other hand, women took a more balanced approach, considering multiple factors including technical knowledge, daily habits and workplace culture when making decisions regarding energy conservation.

A particularly interesting finding was the "technical competence paradox" where increased technical knowledge actually reduced men's motivation to save energy while increasing women's. That because men over rely on technological solutions, whereas women view technical skills as tools to enable behavioral change. Despite these difference in mental pathways, both genders faced the same fundamental challenge: workplace structures and priorities often limit them from acting on their energy saving intentions.

The research's most significant revelation was that organizational barriers, particularly centralizes systems and customer service focused performance metrics created an intention-behavior gap that affected all employees equally. This says that while gender sensitive awareness campaigns may help the actual progress needs systematic changes in workplace policies and infrastructure.

7.1 Practical Implication

1. Energy-saving programs should consider the different ways men and women engage with conservation. Men tend to prefer approaches that highlight independence and personal choice, while women respond better when technical information is paired with social and environmental benefits. Instead of using the same approach for everyone, organizations should offer tailored strategies to motivate different employees effectively.
2. For men, combine skills training with clear goals and tracking to avoid the risk of learning technical details without taking action. For women, offer more

training opportunities while also recognizing their current knowledge to boost their confidence and encourage action.

3. The big difference between what people plan to do and what they actually do shows that workplace systems play a bigger role than motivation. Instead of just asking employees to save energy, companies should automate, like using motion-sensor lights and preset computer sleep modes. Making saving energy the easiest choice, so people don't have to go out of their way to do it.
4. Since both men and women feel they lack opportunities to engage in energy-saving efforts, companies should create inclusive energy committees with equal gender representation. This ensures diverse viewpoints are considered. Additionally, organizations should actively involve women in administrative roles in energy-related decisions, even if workplace hierarchies typically limit their influence. This way, all employees, regardless of position or gender, can contribute meaningfully to conservation efforts.
5. To bridge the gap between employees' willingness to save energy and their actual actions, organizations should proactively identify and remove workplace barriers. This could involve changing policies that force computers to run unnecessarily, adjusting shift schedules to enable proper equipment shutdowns, or redesigning workspaces to make energy-saving behaviors more practical. By fixing these structural issues, companies can make it easier for staff to turn their conservation intentions into daily actions.
6. Energy-saving approaches should be customized to fit different job roles, since each position faces unique challenges and opportunities. For admin staff, use easy fixes like automatic printer shut-offs. Tech teams can optimize systems like servers. Managers may need cost-saving data to drive changes. This way, every employee can contribute in ways that fit their role.

7.2 Limitation of the Research

1. The study exclusively sampled participants from the banking sector, which limits the generalizability of findings to other workplace environments.
2. Data collection was limited to three provinces (Bagmati, Gandaki, and Koshi), which may not represent the full diversity of workplace environments across Nepal. Regional variations in organizational culture, infrastructure development, and gender norms could influence energy behaviors differently in

other provinces, particularly in more remote areas with different energy access challenges.

3. The data collection period of 14 days provided only a snapshot of perceptions and behaviors. This brief timeframe didn't allow for capturing seasonal variations in energy use or tracking how interventions might change behaviors over time. A longitudinal approach would have provided more robust insights into how stable these gender differences are across different periods.
4. The reliance on digital data collection methods inadvertently created participation barriers for employees in lower-level positions who may have limited digital access or literacy. Additionally, survey fatigue was observed among some participants, potentially affecting response quality. These factors may have introduced selection bias toward more tech-savvy respondents and those with greater interest in energy conservation.
5. The study relied on self-reported energy behaviors and attitudes, which may be subject to social desirability bias (people reporting what they think they should do rather than what they actually do).
6. The research conceptualized gender as a binary (male/female) construct, which doesn't account for non-binary gender identities or more nuanced gender expressions. This limitation prevents understanding how gender diversity beyond the binary might influence energy perceptions and behaviors in workplace settings.
7. Different bank branches have varying physical infrastructures, building ages, and energy management systems. These differences could significantly influence employee energy behaviors independently of psychological factors, creating an uncontrolled variable that may have affected the findings.
8. While the study identified a significant gap between energy-saving intentions and actual behaviors, it provided limited investigation into the specific organizational, structural, and procedural barriers that prevent intentions from becoming actions. A more detailed analysis of these barriers would strengthen the practical applications of the research for developing effective interventions.

7.3 Future direction

The relevant future research direction could-

1. Investigate how factors like job level, and branch location interact with gender to shape energy behaviors this shall reveal why some women in senior roles still report low perceived control, despite their authority.
2. Tracking whether increase of females' representation in decision-making groups actually improves energy-saving outcomes using this study's results as a reference.
3. Experiment whether gender specific trainings like
 - combining technical knowledge (how systems work) with behavioral strategies (actionable habits) – could counteract their tendency to focus only on tech solutions rather than changing habits
 - Focusing on practical ways to apply technical knowledge ("here's exactly how to use this tool") - could develop more effective workplace training programs that account for these gender differences in learning and motivation.

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APPENDICES

Appendix 1: Summary from Literature.

Section 1: Gender Differences in perception of Energy Use

This section contains the summary of the Gender Differences in perception of Energy Use from the Literature Review (Chapter 2) which is presented in Tabular Form.

Summary of Gender Differences in perception of Energy Use

Aspect	Female Perception	Male Perception	Source
Energy Awareness	Higher awareness of daily energy consumption patterns	Lower awareness of daily consumption details	(Carlsson-Kanyama
Environmental Concern	Stronger connection between energy use and environmental impact	Less emphasis on environmental connections	& Lindén, 2007)
Workplace Focus	Greater concerns about energy waste in shared spaces	Less attention to shared space energy waste	(Matthies
Perceived Control	Feel less capable of influencing organizational energy efficiency	Greater perceived control over energy systems	et al., 2011)
Energy Service Priorities	Focus on household and immediate needs	Emphasis on productive and recreational uses	(Pachauri & Rao, 2013)
Technology Evaluation	Value technologies that ease labor and improve efficiency in daily tasks	Evaluate technologies based on income generation potential	(Shrestha et al., 2019)

		More tolerant of occasional system failures if economically beneficial	
Reliability Preference	Stronger preference for reliable and consistent energy systems		
Energy Security Concerns	Prioritize reliability and affordability	Focus on energy independence and technological advancement	
Temporal Perspective	Present-oriented, concerned with immediate issues	Future-oriented, focused on long-term infrastructure	(Sovacool, 2014)
Spatial Scale	Focus on household and community-level impacts	Focus on national and international implications	
Problem Identification	More likely to identify behavioral and organizational factors (58%)	More likely to identify equipment failures (67%)	
System Evaluation	Integrate both technical and social metrics	Prioritize system-wide technical metrics	(Ryan, 2014)
Social Context	More likely to incorporate social considerations into technical discussions	Less likely to incorporate social context (3.2 times difference)	
Energy Conceptualization	Multidimensional lens integrating health and comfort	Primary focus on cost and technical performance	(Clancy & Roehr, 2003)
Community Perspective	View energy consumption as embedded in	View energy systems as technical challenges to optimize	(Clancy et al., 2012)

	community responsibility		
Technical Knowledge	Less technical knowledge about energy production	More technical knowledge about energy production	
System Integration	Focus on whether technology fits into daily life	Focus on maximizing performance and output	(Standal &
Communication Style	Discuss energy in terms of life improvement and surroundings	Use primarily technical terminology when discussing energy	Winther, 2016)
Nepalese Context	View energy-saving as part of social and moral responsibility	View energy-saving from technical or cost-saving perspective	(Mahat, 2011)

Section 2: Factors Influencing Gender Differences in perception of Energy use

This section contains the summary of the factors that influence gender Differences in perception of Energy Use from the Literature Review (Chapter 2) which is presented in Tabular Form. The table below outlines seven major factors that shape how men and women differently perceive and engage with energy systems. From early socialization processes to gaps in technical knowledge, these factors collectively create gender-specific frameworks for perceiving energy utilization.

Summary of factors Influencing Gender Differences in perception of Energy use

Factor	Influence on Female Perception	Influence on Male Perception	Source
Socialization and Gender Role Development	Girls socialized to manage domestic resources including energy, developing greater attention to consumption patterns	Boys socialized toward technical and instrumental aspects of energy systems	(Zelezny et al., 2000)
Division of Labor and Responsibilities	Household responsibilities lead to perceiving energy through daily practices and immediate needs	Less involvement in household management leads to more abstract energy conceptualization	(Clancy & Roehr, 2003)
Education and Technical Knowledge Access	Receive significantly less technical energy education, explaining 63% of variance in technical confidence	Greater access to technical education creates confidence with energy systems	(Cecelski, 2004)
Institutional and Organizational Structures	Often adopt hybrid frameworks integrating technical and social considerations, but face challenges having these recognized	In male-dominated sectors, institutional structures reinforce technical optimization as the dominant approach	(Ryan, 2014)
Cultural and Religious Norms	Cultural norms create distinct patterns of energy responsibility and authority	Cultural expectations reinforce men's perceived authority in energy decision-making	(Skutsch, 2005)

Economic and Decision-making Authority	Women with greater economic decision-making authority demonstrate different energy perceptions than those with limited financial control	Greater economic power shapes distinct energy priorities and concerns	(Pachauri & Rao, 2013)
Knowledge Systems and Information Networks	Rely more on social networks and practical demonstrations for energy information	Greater access to formal technical information channels	(Carlsson-Kanyama & Lindén, 2007)

Section 3: Gendered patterns in energy saving

Summary of Gendered patterns in energy saving

Aspect	Women	Men
Intention vs Action	Higher intention to save energy but actions limited by workplace constraints,	Intentions are linked to practical and financial efficiency, often supported by technical roles
Main motivation	Care for environment and future generations “women connect daily actions with broader environmental concern”	Saving money and being efficient “Men focus on practical financial benefits”
Main Challenges	Less access to technical training and decision making “women often lack sustainability campaigns”	Fewer barriers due to position and perceived expertise “Men typically have more authority in these decisions”
What others expects	To encourage group efforts and create awareness “women	To solve technical problems and implement systems

Typical actions	often lead sustainability campaigns”	“Men expected to handle technical energy solutions”
	Organizing awareness sessions, promoting routine conservation practices like turning off devices	Leading technical initiatives proposing energy efficient infrastructure improvements.

Appendix 2: Survey Questionnaire

This section contains the full questionnaire used in the survey, which served as the foundation for the study's analysis. This section provides the exact questions and structure that helped gather the data, ensuring transparency and allowing readers to understand how key insights were derived.

Section 1: Demographic Information

Variables	Structure	Scale
Demographic section	D1: Name of the organization	Text.....
	D2: Gender	Choose one
	D3: Age group	Numeric interval
	D4: Department	Choose one
	D5: Years of Experience in the organization	No. of years
	D6: Average Daily Hours Spent in Office	Hour interval

Section 2: Measures of TPB variables.

Variables	Items	Mean	SD
Energy saving behavior	E1 I switch off lights in my office when they are not in use.	4.07	1.280
	E2 Even if I didn't switch on the lights/electrical appliances, I always remember to turn them off when they are not in use.	3.92	1.185
	E3 I normally keep my office computer in sleep mode if I will not be using it for at least fifteen minutes	3.47	1.118

E4	I always enable power saving mode in my computer/ laptop while working.	3.53	1.191	
E5	I prefer using personal heaters or fans even when there is central heating or cooling.	2.35	1.194	
E6	When the weather is good, I always open windows for ventilation instead of using ac or fans.	3.98	1.059	
E7	I am comfortable in relying in ac or fans instead of opening windows.	2.07	1.149	
E8	I often forget to switch off the lights when I leave my office's restroom.	3.33	1.391	
E9	I generally reuse materials in my office.	3.95	.890	
<hr/>				
A1	It's important that making technical decisions about energy systems requires specialized knowledge.	4.04	1.003	
A2	I believe my technical input on energy efficiency is respected by my colleagues.	3.62	.975	
A3	Managing technical tasks for energy saving is important in my job role.	3.91	.917	
Cognitive attitude	A4	Collaboration is important to create awareness about energy saving.	4.15	.812
	A6	Technical solutions are important aspect for achieving energy productivity.	3.30	1.148
	A7	I believe my colleagues consider me knowledgeable when they seek my advice on technical issues.	3.35	1.048
	A8	I believe regular energy audits in our office effectively identify ways to save energy	4.15	.702

	A9	I believe that monitoring my electricity use during work hours effectively reduces energy demand.	3.80	1.013
	A11	Using natural lights instead of artificial lights in workplace is important for staff's comfort.	4.26	4.26
Perceived Behavioral Control	P1	I know how to adjust and optimize ac temperature in my work area.	3.83	.933
	P2	I know how to use advanced energy-saving settings on office devices according to my need.	3.88	.826
	P3	If any technical issues occur with office equipment, i am confident in figuring them out.	3.60	.887
	P4	I feel lack of confidence in sharing ideas in maintaining energy-saving equipment when asked for help	3.26	1.152
	P5	I can actively participate in energy-saving daily habits in my office.	3.93	.771
	P6	I encourage my colleagues to switch off lights, equipment, and appliances when not in use.	4.21	.616
	P7	I generally don't show interest in participating in technical training if offered.	3.05	1.361
	P8	Despite my work culture, i am able to practice paperless workflows and reduce printing.	3.60	.977
	P9	I feel more comfortable in administration/managerial work, while technical position does not suit me.	3.38	1.266

	P10	Following energy saving habits in daily work routine is very boring.	2.14	1.140
Workplace culture	W1	Conduct training session to educate the use of advanced energy-saving software/equipment in the workplace.	3.36	.987
	W2	Offers me very few opportunities to participate in energy-related programs.	3.33	1.070
	W3	(My coworker reminds) Keep my computer or laptop in sleep mode when I leave for lunch/snacks.	3.62	.990
	W4	(My coworker reminds) Turn off lights, computers, or other devices when not in use at work.	3.82	.999
	W5	(My supervisor) Follow paperless works to save energy.	3.61	.952
	W6	(My supervisor) Open windows for ventilation instead of using air conditioners or fans.	3.85	.909
Behavioral intention	IN1	I intend to reduce my energy consumption at work during the next month.	4.05	.815
	IN2	I plan to actively look for new ways to save energy in my workplace.	4.05	.742
	IN4	I will make a conscious effort to minimize energy waste in my daily work routine.	3.85	.957
	IN5	I expect to participate in energy conservation activities at my workplace when opportunities arise.	3.96	.864

Appendix 3: Semi Structured Interviews

Based on the analysis and obtained findings, casual conversations with different employees from different banks were held, in order to hear their unfiltered perspectives. Their exact responses was then quoted directly in the discussion section which supports to conclude the survey results, particularly around gender differences in energy attitudes and why people’s intentions don’t always translate into action. Though the conversations were informal, they were probably guided by some prepared questions to keep the focus on important themes.

Scenario 1: Interview with Bank Manager (NIC Asia)

Could you describe how do things actually work here when it comes to managing energy? Who decides when the AC runs or when systems get upgraded?

Bank Manager:	“As a manger, I have direct control over many energy-related decisions in the office, from setting air conditioning policies to approving equipment purchase. My female colleagues in administrative roles simply don’t have the same authority or input into these decisions, which naturally affects how much control they feel they have.”
---------------	---

Scenario 2: Interview with Female Bank Employee

“How do you handle situations when something goes wrong or when technical issues occurs with your computer and the office equipment?”

Female Bank Employee: (anonymous)	Oh, we have a system for that. When there's a bigger problem, we report it to the maintenance department through a formal ticket. But honestly, whenever smaller issues occur, either Hemant dai or Susham dai helps us.
--------------------------------------	--

“Do you feel confident managing the technical aspects of energy use in your workspace?”

Sometimes... for simple things like changing settings. But I don't want to make something worse by trying to fix it myself. Plus, the IT guys are really helpful, so why not ask them? They explain things nicely but I don't think they expect us to remember all the technical details.

Scenario 3: Interview with Nabil Bank IT Officer

“What factors limit your ability to implement your behavior that saves energy in your daily work?”

IT Officer:	Look at our setup. Our office has a centralized management system, so we have very limited control over lighting, air conditioning, or even when computers can be turned off because of automated security updates and backups. [points to the monitor] See this dashboard? Everything runs on schedules we program once, but changing those schedules requires approval from three different departments.
-------------	--

“So even though you know how to save energy, you can't always do it?”

Exactly. I've suggested motion sensors for lighting and scheduled shutdowns for non-essential systems many times. I have all these ideas, but implementation is another story. Security protocols come first, then customer service needs, and somewhere way down the list is energy efficiency.

Scenario 4: Interview with Rastra Banijya Bank Teller

“How do you manage to balance serving customers and trying to save energy during your shift?”

Teller: [Quick chat during a slower period at her counter]

I am conscious about the environment and always try to do my part. But when I have a line of customers waiting, I don't have time to shut down my computer between transactions. It's just not practical. Sometimes I feel bad about it, but what can I do?

“What would help you save more energy during your workday?”

Let's be honest - my performance is evaluated by how efficiently customers are served, not by how much energy I save. If they included energy saving in our performance metrics or gave us automatic sleep settings that wouldn't interrupt our work, maybe things would be different. But right now, customer satisfaction comes first, and everything else is secondary.

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Date: April 21, 2025

To Whom It May Concern:

This is to certify that the paper titled “**Gender Perception Differences Influencing Behavioral Intentions toward Energy Saving: A Study of Nepalese Workplaces.**” (Submission# 478) submitted by **Sushrusha Koirala** as the first author, which had been accepted for presentation after the peer-review process, has successfully been presented at the 16th IOE Graduate Conference held during April 18 - 20, 2025. Kindly note that the final revision of the papers and publication process of the conference proceedings is still underway and hence inclusion of the accepted manuscript in the conference proceedings is contingent upon timely response to further edits during the publication process.



Dr. Raj Kumar Chaulagain,
Convener,
16th IOE Graduate Conference



Appendix 6: Graduate conference paper

Gender Perception Differences Influencing Behavioral Intentions toward Energy Saving: A Study of Nepalese Workplaces.

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Abstract:

Unlike household settings where individuals have greater autonomy over energy decisions, workplace behaviors are mainly governed by shared spaces, and established organizational norms. Nepal's workplace environment experience gradual increasing inclusion in female workforce rate at 28.7%, particularly in banking institutions, where energy consumption patterns are influenced by workplace hierarchies, departmental divisions, and standardized operating procedures. Previous studies have been carried out in household energy consumption pattern, there is limited understanding of how gender perceptions influence energy-saving behaviors in professional environments. This study aims to analyze gender differences in energy saving perceptions and examine how these perceptions influence behavioral intentions towards energy saving in workplace settings, specifically among commercial banking sector within different location of Nepal. The research employed a mixed-methods approach using the theory of planned behavior, analyzing 133 responses through moderated multiple regression analysis. Men primarily approach energy conservation through perceived control over daily habits, while women integrate multiple factors including technical knowledge and workplace culture. This study identified a technical competence paradox where technical knowledge decreases men's energy saving intentions but increases in women's perceptions. A key finding was the intention-behavior gap: intentions did not significantly predict actual energy-saving behaviors for men or women challenging TPB assumption that intentions drive behavior and highlights the role of organizational barriers in shaping actions. This research gains both theoretical understanding and practical implementation of workplace sustainability initiatives by highlighting the complex relationship between gender perceptions and energy-saving behaviors in corporate settings. The insights gained provide a foundation for developing more effective, inclusive energy conservation strategies that acknowledge and accommodate the different approaches that men and women take to workplace energy management.

Keywords: Gender perception, behavioral intention, workplace energy efficiency, energy saving, Theory of Planned Behavior

1 Introduction

Nepal's energy consumption has seen a significant rise, with total annual demand increasing by 9.67% compared to the previous year (NEA, 2023). Urban commercial areas, particularly office spaces, consume over 50% of electricity, where a trend is driven by workplace expansion and growing reliance on technology. According to the Building Energy Efficiency in Nepal (2024) report, rapid urbanization and changing workplace dynamics have significantly increased energy demand in Nepal's office buildings. Being a major contributor to energy consumption, representing approximately 30-32% of total energy use [3], these commercial structures depends highly on systems such as lighting, heating, ventilation, and air conditioning (HVAC), in conjunction with electronic office equipment. Studies indicate that lighting and HVAC systems alone can account for 30-50% of energy consumption in office environments [4], while modern offices increasing dependence on electronic

devices contributes an additional 20% [5]. The progressive incorporation of technology into workplace environments, the management of energy demand arising from these electronic devices has become imperative for the enhancement of energy efficiency. While technological advancements are important, occupant behavior is a key to energy use in offices [6]. Individual behavioral action such as adjusting thermostats, managing lighting, and utilizing energy-saving features on equipment can substantially impact overall energy use [7]. Among the factors influencing these behaviors, gender has increasingly been recognized as a significant determinant, with research suggesting distinct patterns of energy consumption between men and women [8]. The exploration of gender preferences in energy consumption in Nepalese context, where women's workforce participation rate stands at 28.7% compared to 53.9% for men [9]. As gender significantly influences energy consumption behaviors, shaped by cultural norms, social roles, and individual preferences, the gender specific

behavior and perception towards energy consumption pattern is imperative.

Traditional gender roles continue to influence occupational distribution, with women more frequently occupying administrative positions that involve regular use of office equipment, while men often hold roles requiring different patterns of energy engagement [10],[11],[12],[13]. Employee behavior in office environments influenced by personal comfort levels, energy-saving awareness, and workplace policies emerges as a critical determinant of energy usage [14]. Therefore, understanding employee behavioral patterns, such as the influence of gender on energy consumption, is essential for designing effective policies and technologies that promote energy savings and sustainability in Nepalese workplaces. There remains a limited understanding of how gender dynamics influence energy use within office buildings, where shared responsibilities and organizational norms constitute key contextual factors. Studies have acknowledged gender influences on energy-related behaviors, most focus on residential settings, leaving workplace dynamics largely unexplored [15], [16]. Additionally, research gaps persist in areas such as organizational pro-environmental behavior, gender differences in thermal comfort, air quality perception, and socio-economic disparities in energy transition, all of which could inform workplace energy efficiency strategies [17], [18], [19], [20]. To bridge this gap, there is a need to explore how gender perceptions shape energy-saving intentions in workplace settings, especially in developing nations like Nepal, where gender roles and workplace norms are rapidly evolving. By understanding these gender-specific pathways, organizations can design more targeted and effective strategies that recognize the distinct ways men and women perceive and engage with energy conservation in professional environments.

This study aims to explore how men and women perceive and approach energy-saving behaviors differently in workplace settings, with a particular focus on commercial banking institute of Nepal. By examining these gender differences, the research seeks to uncover how perceptions of energy use influence intentions to save energy in professional environments. The study addresses two key objectives: first, to identify gender differences in how energy use is perceived in office settings, and second, to understand how these perceptions shape intentions to save energy in the workplace. The findings aim to provide insights that can help organizations develop more effective and inclusive strategies for promoting sustainable energy practices. By addressing these research

objectives, this study aims to fill critical gaps in our understanding of gender dynamics in workplace energy conservation, ultimately contributing to more effective, inclusive energy efficiency strategies in Nepalese workplaces and similar contexts in developing economies.

2 Theoretical framework

2.1 *The theory of planned behavior*

This study adopt the Theory of Planned Behavior (TPB) [21],[22] as a theoretical foundation which provides a comprehensive understanding of how individual intentions are translated into action, particularly in situations when they have limited control over their behaviors. Additionally, background factors in TPB [23], include demographic variables such as gender, age, and other socioeconomic status that significantly contribute to defining individual energy-related behaviors. According to this framework, a behavior is directly determined by an individual's intention to engage in it, and intention is influenced by the way that one perceives the value of the behavior (attitude towards the behavior) [24], how significant others in their life, view or think about the behavior (subjective norms), and the perception that the certain behavior is within the their control (perceived behavioral control) [25]. Several previous studies have employed the TPB and related variables to investigate energy saving behaviors, but no previous study had used the TPB to explore energy saving behaviors in Nepalese workplace through gendered perspective. Thus, in the current study, three variables interact with gender are assumed to examine gender differences in perception that significantly impact behavioral intention to perform Energy-saving behaviors within workplace settings [26].By considering the readjustments (see Figure 1), the study aims to fulfil its objectives and answer its research questions. Cognitive attitude towards energy saving behavior may exhibit noticeable difference in genders within workspace environment. For example, technical efficacy in men employees represents their evaluative perspective, focusing on technical competence and system efficient in energy management [27]. This orientation reflect men's tendency to approach energy conservation through technical solutions and operational optimization [28]. In contrast, women employees attitudes are characterized by environmental responsibility, foreground collective environmental impact and sustainable practices [29]. This differences in cognitive attitudes helps to analyze gender difference in perception influencing behavioral intention at workplace energy saving [30]. The

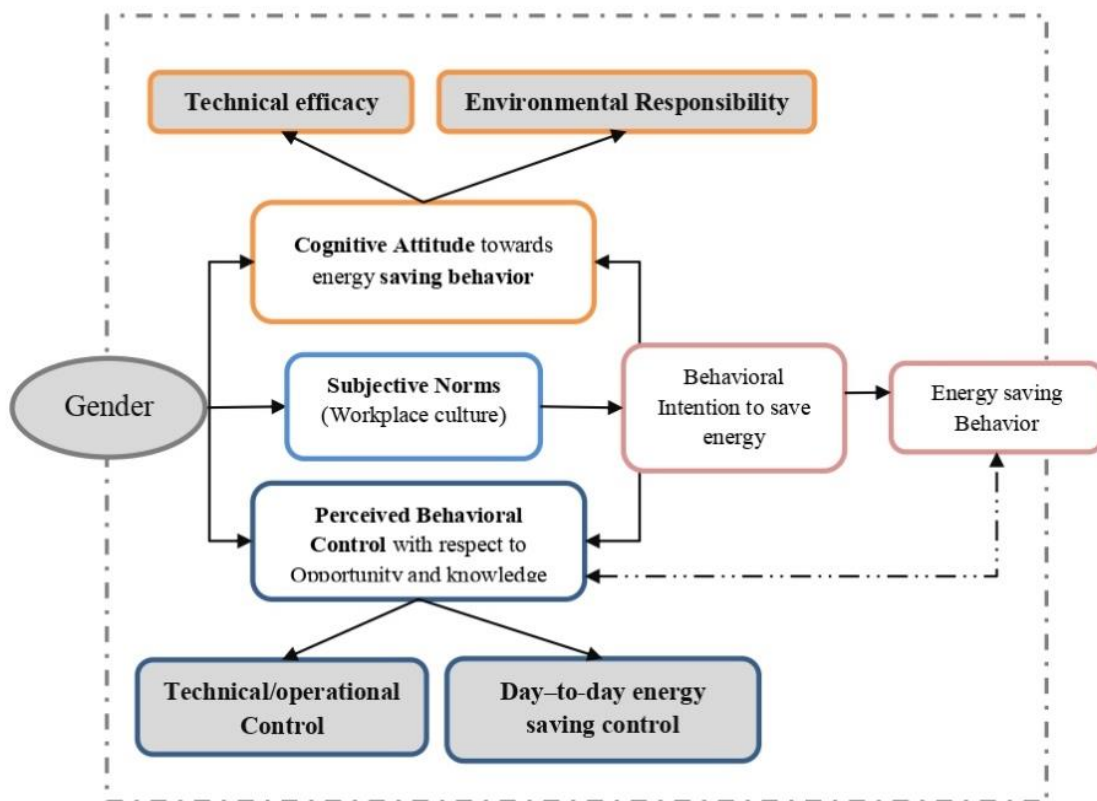


Figure: Overview of Theory of Planned Behavior *Organizational Behavior and Human Decision Process*

traditional subjective norms is replaced with Workplace Culture as it reflects research showing that organizational culture replaces individual social pressures in workplace settings. This modification better captures the institutional context within which energy-saving behavior occurs similarly, the framework subdivides Perceived Behavioral Control into Technical/Operational Control characterizes male employees' perceived ability to manage and optimize technical aspects of energy systems [31]. This control perception encompasses confidence in handling energy-efficient technologies and implementing technical solutions. Day-to-Day Energy Saving Control represents female employees' perceived control over routine energy conservation practices, reflecting their confidence in managing immediate workspace energy consumption and daily conservation routines [32]. These adapted constructs converge to influence Behavioral Intention, which ultimately leads to Actual Energy-Saving Behavior.

3 Research Methods

3.1 Participants of survey

An unspecified survey was conducted to collect data to test the proposed model and examine potential gender

differences in energy saving perceptions. The estimated number of participants was around 300 to 400 bank employee including insurance company staffs and personnel from technically affiliated bank offices. The survey questions were prepared and distributed in Kobo collect software which was adopted easily by the participants. A total of 139 sample were received. Out of it, 133 samples were clearly answered while the rest 6 responses were excluded due to missing values and invalid entries e.g., failing to tick the ethical agreement, providing indential answers across likert-scale questions. The final sample size satisfied the requirements of purposive sampling [33], [34].

3.2 Survey Questionnaire

This study used a structured questionnaire for data collection with distinct sections, each designed to capture frequency with which they engage in energy saving behavior. The prepared questionnaire consisted of basic demographic information of the participant, working context, behaviors, and measure variables in sequential order. Items were developed based on TPB framework. 12 items were used to measure cognitive attitudes towards energy saving behavior, 10 items to measure the perceived

behavioral control, 6 for workplace culture and 5 items for behavioral intention which concludes the actual Energy saving behavior having 9 items. Self reports were used to measure the participants's energy saving behaviors [35]. First, Energy saving behavior section (ESB) assessed routine workplace behaviors such as "switching off lights when not in use", "enabling power saving modes on office equipment", and "managing temperature control preferences". The responses used a 5-point Likert scale, ranging from "Never" (1) to "Regularly" (5) [36]. The measures were selected based on their relevance to daily office operation and potential impact on energy consumption. Second, the cognitive attitude (CA) section evaluates gender-specific attitudes towards energy saving practices. The focus was on constructs – A. [Technical Efficacy (CA_TE) for men participants], measuring their confidence and effectiveness in handling energy related technical aspects, whereas B. [Environmental Responsibility (CA_ER) for women], judging their concern and contribution towards conservation of energy. To determine which attributes of attitude towards energy saving behaviors that employees prioritize, the respondents were asked to rate the importance (1= Not important at all, 5=Very important) of effective use of Technical Efficacy (e.g. How important do you think technical solutions are for achieving energy conservation?). Then, the respondents rated the belief (1=Strongly disagree, 5= strongly Agree) of attribute (e.g. My colleagues rely on me for advice and help with minor technical issues in the office.) which revealed the reliance on their technical confidence. See Table 1.

In the third section, Perceived Behavioral control (PBC), evaluated gender specific measures to reflect different aspects of control in the workplace. For men,

Table 1: Construct for Cognitive Attitude towards energy saving behavior with some survey questions between men and women.

Construct	Attributes (c)	Imp (I)	Belief (P)	Score (I*P)
(CA_TE)	Confidence	A1 (M=4.04)	A2 (M=3.62)	14.62
	Effective use	A6 (M=3.30)	A7 (M=3.35)	11.06
(CA_ER)	Concern	A4 (M=4.15)	A5 (M=3.59)	14.90
	Contribution	A8 (M=4.15)	P5 (M=3.93)	16.31

Technical/operational control (PBC_T) to evaluate their perceived ability on managing technical system, such as "adjusting thermostat settings and optimizing energy-efficient technologies" and for women, Day-to-day Energy Saving Control (PBC_D) to evaluate perceived control over managing immediate workspace devices and routine energy saving actions. Likert scale measuring was used in the item (1=Strongly disagree and 5=Strongly agree) addressing both internal factors (knowledge, skills) and external factors (resources, opportunities). Fourth, the Workplace Culture (WC) evaluated institutional initiatives such as "energy efficiency training sessions", "coworker support for energy saving behavior (e.g., reminders about computer sleep mode settings)" and "supervisory guidance (e.g., promotion of natural ventilation practices)" in energy saving actions. Lastly, Behavioral Intention examined the willingness and readiness to engage and perform actions towards energy saving.

3.3 Measures of variables

The dependent variable was Behavioral intention (BI), (see eq. 1) which was influenced by three independent variables (CA, PBC, WC) and gender serving as moderating variable. Energy saving behavior was measured as a composite score derived from multiple questionnaire items (eq. 2) to form an ESB score, provides a quantitative measure of actual behavior.

$$BI = \sum BI_{items} \quad 1$$

$$ESB = \sum ESB_{items} \quad 2$$

Cognitive attitude was adopted from Fishbein's Multi-Attribute Model incorporating gendered dimension [37]. The attitude score was calculated by using the formula:

$$CA = \sum [(importance(i) \times belief(b))] \quad 3$$

where, beliefs is the likelihood of performing an energy saving action will result in a particular outcome, and evaluation is the importance placed on those outcomes. Similarly, PBC (eq. 4) and WC (eq. 5) were operationalized incorporating gendered dimensions by summing up all items related to perceived control (over immediate workspace, daily routines, and personal actions) and organizational context (training and development session, opportunity, peer influence and supervisory leadership) respectively.

$$PBC = \sum PBC_items \quad 4$$

$$WC = \sum WC_items \quad 5$$

Further, The multiple regression models was then used to predict behavioral intention to save energy which further predict the Actual energy saving Behavior based on attitudes, workplace culture, perceived behavioral control, and socio-demographic variables and is specified as follows:

$$BI = \beta_0 + \beta_1 CA + \beta_2 PBC + \beta_3 WC + \beta_4 Gender + \beta_5 (CA \times Gender) + \beta_6 (PBC \times Gender) + \beta_7 (WC \times Gender) + Control\ Variables + \epsilon \quad 6$$

This inspired equations of power prediction from previous research [38],[39] has been rearranged and simplified to achieve the targeted goal. The prediction is basically done into two steps (predicting intention, and then predicting behavior), properly approach theoretical model where cognitive attitude towards energy saving behavior and workplace culture influence behavior primarily through intentions, while perceived behavioral control influence behavior both directly and through intention [21].

$$ESB = \gamma_0 + \gamma_1 BI + \gamma_2 PBC + \gamma_3 (BI \times Gender) + \gamma_4 (PBC \times Gender) + Control\ Variables + \epsilon_2 \quad 7$$

3.4 Data collection and analysis

The study was conducted from employee of various commercial banks and finance related workspace within different location of Nepal (bagmati, gandaki, morang and sunsari province). Before data was collected, the content validity of questionnaire was evaluated. Two supervisors were asked to evaluate content validity for all factors and some minor change was done for the clarity. The questionnaire was then, sent as a pilot study to 28 staffs in coporate environments through social media platform and emails. These participants were not targeted bank employees in the actual study but worked under environment similar to banking institutes.

Since regression is the core thing to predict the gender diffrence in perception of all the variables of modified TPB, there were 37 questions indicating the variables but not all of them could be included in the analysis. Since including all datas in regression would reduce statistical power, a reliability test was performed to ensure measurement consistency and identify the most reliable items for inclusion. (see table 3). The internal consistency

¹Note: Others in job position are financial advisor, loan officers, auditor, HR manager, Treasury Specialists

was measured using Cronbach's alpha(α) which was 0.74 > 0.70, widely accepted measures of scale reliability [40]. SPSS 26.0 and Excel 2013 were used to perform the data analysis.

4 Results

4.1 Demographic profile of participant

Participants in this study were employee from 10 different commercial banking institutes and 2 insurance company with relatively balanced gender distribution of 47.4% of women and 52.6% of men. The workforce was predominantly in their 30s (48.1%) and highly educated, with 60.2% of master's degree.

Table 2: Demographic Profile (N=133)

Demographic characteristics		No.	%
Gender	women	63	47.4%
	men	70	52.6%
Age group	20~29	34	25.6%
	30~39	64	48.1%
	40~49	22	16.5%
	50~59	13	9.8%
Job position	Administrative/clerical	41	30.8%
	Managerial	44	33.1%
	Technical/IT/engineering	31	23.3%
	Others ¹	17	12.8%
Education	Bachelor's degree	45	33.8
	Master's degree	80	60.2
	Doctorate PhD	4	3%
	Proessional certification ²	4	3%

Table 3: Results of Cross Tabulation of Gender with Job division, level of education and the tenure period

	Women (n=63)	Men (n=70)
Job Position		
Administrative/clerical	41.3%	21.4%
Managerial	27.0%	38.6%

²Professional certification levels are Chartered Accountancy, Technical Training and A-level banking courses

Technical/IT/engineering	15.9%	30.0%
Others	15.9%	10.0%
Education level		
Bachelor's degree	30.2%	37.1%
Masters's degree	66.7%	54.3%
Doctorate/PhD	3.2%	2.9%
Professional certification	-	5.7%
Tenure period		
≤1 yrs	19.0%	17.1%
1~5 yrs	54.0%	41.9%
6~10 yrs	15.9%	18.6%
11~15 yrs	3.2%	7.1%
≥15 yrs	7.9%	15.7%

N= total number of each gender participation

4.2 Consistency test

The internal consistency reliability of scales was examined by calculating Cronbach's alpha (α). The results are summarized in table 3. All the scales showed acceptable to good reliability, with α -value ranging from 0.71 to 0.77 of all variables, exceeding the common threshold for acceptable reliability [40]. The average mean score and SD of 9 items from ESB was 3.40 and 1.16 respectively with alpha value of 0.71. 9 items of CA towards energy saving behavior resulted average mean, SD and α -value of 3.85, 1.32 and 0.76 respectively. PBC showed average mean of 3.48, SD of 0.99 and 0.74 α -value of 10 items. Similarly, WC (6 items) and BI (4 items) accordingly gave 3.59 of average mean, 0.98 of average SD and 0.75 of average α -value, and 3.97 (avg. mean), 0.85 (avg. SD) and 0.77 (α -value). Three items of CA and 1 item of Behavioral Intention were excluded from the scale due to low reliability ($\alpha < 0.6$).

Table 4 : Result of consistency test

Variables	Items	Avg. Mean	Avg. SD	Avg. (α)
<i>Energy saving behavior</i>	9	3.40	1.16	0.71
	9	3.85	1.32	
<i>Cognitive attitude</i>	Items (A5, A10,A12) were excluded being ($\alpha < 0.6$)			0.76
	10	3.48	0.99	
<i>Perceived Behavioral Control</i>	10	3.48	0.99	0.74
<i>Workplace culture</i>	6	3.59	0.98	0.75

	4	3.97	0.85	
<i>Behavioral intention</i>	Item (IN3) was excluded being ($\alpha < 0.6$)			0.77

Note: (α)-Cronbach's alpha; SD-Standard Deviation

4.3 Gender-Based Analysis

The Mann-Whitney U test was conducted to examine the difference in gender across the constructs of variables from TPB framework. The results are presented in Table 4.

Table 5: Results of Mann-Whitney U test for gender differences across constructs of variables

Construct	Women Mean rank	Men Mean rank	U score	Z score	p-value
<i>BI</i>	70.26	64.06	1999.5	-0.939	0.348
<i>PBC_T</i>	69.88	64.41	2023.5	-0.834	0.404
<i>PBC_D</i>	58.70	74.47	1682	-2.130	0.033*
<i>WC</i>	60.85	72.54	1817.5	-1.762	0.046*
<i>CA_TE</i>	61.48	71.52	1723.5	-2.234	0.025*
<i>CA_ER</i>	67.63	66.41	2101.0	-0.834	0.404
<i>ESB</i>	61.85	71.64	1880.5	-1.467	0.142
<i>Age group</i>	68.19	65.93	2130	-0.363	0.717
<i>Job position</i>	59.45	73.79	1729.5	-2.234	0.025*

Note: * $p \leq 0.05$; Higher mean rank indicates higher scores on the construct

A significant gender difference was observed in PBC_D ($p=0.033$) with men (74.47) scoring higher than women (58.70). similarly, WC ($p=0.046$), CA_T ($p=0.025$) and job position ($p=0.025$) also showed variation in gender. Women and men, however, didnt not significantly differ in BI ($p=0.348$), PBC_T ($p=0.404$) CA_ER ($p=0.404$) and ESB ($p=0.142$). No significant difference were observed in age groups as well ($p=0.717$). These non-significant results indicate similar levels between genders in these constructs.

4.4 Regression analysis

Before directly running into the regression, first normality test was performed of all the variables. All variables

demonstrated acceptable skewness and kurtosis values (within ± 2) [41]. The data met the assumption of normal distribution required for regression analysis and respective values are BI (-0.834, 0.320) and ESB (-0.441, 0.353). The histogram of standardized residuals looked bell-shaped which was good for regression analysis. This meets the assumption that errors are normally distributed.

Table 6 presents the result of regression analysis which was analyzed separately for men and women participants to explore potential gender-based differences. Among women, the strongest predictor of behavioral intention was appeared to be PBC_D ($\beta = 0.290$, $p = 0.021$) suggesting that women's confidence in their routine energy-saving actions positively influences their intention. Perceived technical control (PBC_T) showed a marginally positive effect ($\beta = 0.239$, $p = 0.071$), whereas workplace culture (WC, $\beta = 0.157$, $p = 0.070$) and age group ($\beta = 0.502$, $p = 0.071$) also demonstrated some influence, though not at a highly significant level. On the other side for men, PBC_D was a strong predictor with $\beta = 0.622$ and $p = 0.000$, importance of habitual behaviors in shaping their energy-saving intentions. However, PBC_T exhibits a significant negative effect ($\beta = -0.278$, $p = 0.036$), indicate that men with greater perceived technical control were less inclined toward energy-saving behavior, that might be due to overconfidence in technology. CA_ER showed a small but significant positive relationship ($\beta = 0.135$, $p = 0.014$), while workplace culture ($\beta = 0.144$, $p = 0.067$) and age group ($\beta = 0.510$, $p = 0.070$) were marginally significant predictors.

Ajzen & Fishbein, (2010) states that Behavioral intention (BI), and perceived behavioral control (PBC), influences Energy-saving behavior (ESB) because intention alone may not always lead to action. Thus, the result of further regression of Energy saving behavior is presented in Table 7. The overall results were not statistically significant, that means the predictors did not strongly explain actual energy saving behavior. The adjusted R^2 values were low (3.0% for women and 4.7% for men), suggesting limited predictive power. Only PBC_T showed a slight influence on ESB for men ($\gamma = 0.050$, $p = 0.735$), but this was not statistically significant. Behavioral intention did not significantly predict actual behavior for either gender ($\gamma = -0.016$, $p = 0.915$ for women; $\gamma = 0.200$, $p = 0.167$ for men).

Table 6: Results of the regression equations [see Eq.6], the influence of all the constructs of modified TPB framework [see Figure 1] on Behavioral intention to adopt energy saving behavior, expressed in Beta values (coefficient of variables)

Predictors	Female (N=63)		Male (N=70)	
	β	p-value	β	p-value
<i>Constant</i>	1.502	0.012*	2.772	0.000***
<i>CA_TE</i>	0.194	0.098†	0.017	0.320
<i>CA_ER</i>	-0.196	0.108	0.135	0.014*
<i>PBC_T</i>	0.239	0.071†	-0.278	0.036*
<i>PBC_D</i>	0.290	0.021*	0.622	0.000***
<i>WC</i>	0.157	0.070†	0.144	0.067†
Control variables				
<i>Education</i>	-0.073	0.720	0.122	0.378
<i>Age group</i>	0.502	0.071†	0.510	0.070†
<i>Job Position</i>	-0.143	0.530	-0.169	0.484
<i>Adjusted R²</i>	0.276		0.346	
<i>F</i>	3.387; 0.003**		5.574; 0.00***	

Note: † $p \leq 0.10$, * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

- β represents standardized coefficients
- R^2 , the squared multiple correlation, is the proportion of variation in the behavioral intention predictable from the best linear combination of the predictors. Adjusted R^2 considers the magnitude of chance fluctuations as a result of the sample size [42].
- F , ratio of explained variance to unexplained variance, determines the regression model significantly predicts the dependent variable better than the mean alone

Table 7: Results of the multiple regression equations performed to analyze the influence of behavioral intention and PBC on actual Energy saving behavior

Predictors	Female (N=63)		Male (N=70)	
	γ	p-value	γ	p-value
<i>Constant</i>	2.778	0.000***	3.545	0.001**
<i>PBC_T</i>	0.046	0.661	0.050	0.735
<i>PBC_D</i>	0.100	0.501	0.083	0.614
<i>BI</i>	-0.016	0.915	0.200	0.167
<i>Adjusted R²</i>	0.030		0.047	
<i>F</i>	1.478; 0.221		1.856; 0.129	

Note: † $p \leq 0.10$, * $p \leq 0.05$, ** $p \leq 0.01$;

γ represents standardized coefficients

5 Discussion

The study examined gender perception differences that influence behavioral intentions toward energy saving in Nepalese workplaces, particularly within the banking sector using Theory of Planned behavior framework. The findings address key research objectives while revealing insights about gendered approaches to workplace energy conservation.

The first objective was to identify gender difference in how energy use is perceived in office settings, which reveals significant differences in how men and women experience and attitude about saving of energy. Men demonstrated considerably higher perceived control over daily energy saving actions compared to women (PBC_D, as shown in Table 4). This difference can clearly come from the hierarchical factors from statistical analysis, as men occupied more in managerial and technical positions (68.6% combined versus 42.9% for women), giving them greater decision making authority which builds confidence in men which again makes them feel their actions matter more. After all, if one has the keys to adjust these systems daily, they naturally feel more responsible and capable. A research found that individual's job position in an organizational scenarios strongly shape their confidence in managing energy use [43], [44]. However, our results differ from a research [8], done in Malaysian office, who found women in managerial positions reported similar levels of perceived control as male counterparts. This discrepancy likely stems from Nepal's unique cultural context, where gender roles in professional settings remain more rigidly defined than in Malaysia creating stronger effects on perceived control regardless of position. Thus, this gap shows the need for organizations to promote inclusive participation, such as cross-hierarchical green teams [45].

Additionally, men perceived workplace culture as more supportive of energy saving than women did (WC, Table 4). It's likely because they have more influence in shaping policies and feel represented in decision making as addressed above. A research found a similar patterns in organizational experiences, noting that gendered power dynamics shape how workplace initiatives are seen [46]. Despite these perceptual differences, both genders share similar levels of environmental concern which support the finding from a study that found gender difference in environmental behaviors shaped not from different values but from unequal opportunities and resources [47]. Interestingly, one research found contradictory evidence in Western contexts, where women sometimes report

more positive perceptions of organizational environmental efforts than men. This difference likely results from the banking sector's hierarchical structure in Nepal, where traditional gender roles may reinforce men's greater sense of institutional belonging, unlike in the more egalitarian workplace cultures [17].

This research also found "technical competence paradox" in energy behavior where technical knowledge functions differently across genders. For men, increased technical knowledge actually decrease their interest in routine energy saving behaviors (Table 6), while for women, it enhances their motivation, while for women, it enhances their motivation. Reasoning broadly, when men gain technical knowledge about energy systems, they often adopt a "tech-first" mindset. They see technology as an ultimate solution making daily actions feel unnecessary. They might think like – Why bother turning off lights? We'll just install motion sensor next year". And women might think like – Now that I understand how much power AC uses, I'll adjust settings daily." Women's approach transforms their knowledge into immediate behavioral improvements. The findings aligns with a research that found that men often conceptualize energy problems as requiring technical rather than behavioral solutions [48], [49]. Our results contradict a study done in Chinese University students, which found positive correlations between technical knowledge and energy behaviors for both genders [39]. This difference might from contextual differences between university settings and workplace environments, where organizational hierarchies introduce power dynamics absent in educational settings. Thus, this paradox suggests training programs should be conducted differently which may help men see technology as complementing rather than replacing behavioral change, while giving women greater access to technical decision-making roles and real-time feedback systems to reinforce their action-oriented approach [50].

Addressing the second objectives – to understand how these perceptions influence behavioral intentions through different psychological pathways. The analysis reveals that men's intention are mostly shaped by their sense of control over daily energy use (Table 6), while women consider a mix of factors, including their technical skills and workplace culture. These statistical differences suggest that men and women process energy decisions through different cognitive frameworks. Conversely, women's integrative approach mirrors another research's social norms model where environmental behaviors emerge from intersecting factors (technical capability and social context). A research support with the findings that

the men's environmental actions are strongly dependent on organizational strata [51] and observation that women integrate multiple factors in environmental decision-making [52].

Together these findings suggest that both the genders show a substantial gap between intentions and behaviors called intention-behavior gap revealing limitations in the TPB's applications to workplace settings. Our findings contrast with a more recent research, which found stronger intention-behavior correlations in workplace settings [14]. That could be due to the differences in organizational support for energy conservation in Western organizations with established sustainability programs, while Nepalese banking institutions may offer fewer structural supports for translating intentions into action. As one research argues, contextual factors often overshadow variables in office environment where structural constraints limit individual agency regardless of personal motivation [53].

These findings have practical implications. First, organizations should use gender-sensitive strategies where men may respond well to messages about control, while women may benefit from technical training and teamwork. Second, workplaces must remove structural barriers that prevent action. One study found that redesigning workspaces and processes is more effective than awareness campaigns [54]. Third, decision-making on energy management should be more inclusive, as another research showed that diverse participation improves policies and engagement [55]. In conclusion, this study revealed that men and women differ in their approach to energy saving not due to varying environmental concern, but because they have different levels of control and workplace support. By tackling both these perceptual differences and structural barriers, organizations can create more effective and inclusive energy conservation programs.

6 Conclusion

This study identified distinct gender based pathways to energy conservation in Nepalese workplaces. The finding addresses both the research objectives by revealing that men showing higher perceived control and a more positive view of workplace culture along with gaining higher technical knowledge decreases men's intentions but to women it increases. Intentions towards energy saving for men and women are shaped through different psychological pathways. The control over daily habits affect men's intention while women integrate multiple

factors including technical knowledge and workplace culture. However, both genders face an intention-behavior gap, due to workplace limitations highlighting that motivation and willingness alone are insufficient without structural support.

Future research could explain why some women in senior roles still report low perceived control by evaluating measures which method might be helpful for reducing the intention behavior gap.

Acknowledgement

The author would like to thank all participants for completing questionnaire sheets.

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Appendix 7: Certificate of participation - IOEgc



Appendix 8: Comments from jury

The following feedback was received from the jury members during the final defense session on April 1, 2025.

S. No.	Comments	Addressed comment in Page No.
1.	Add what could be several promising avenues for future investigation.	Pg. No. 86
2.	Clarify your operational definition of 'Gender' in this work. Specify whether you adopt a social constructivist perspective (focusing on norms, roles, and expectations) or incorporate biological dimensions	Pg. No. 8
3.	Include the short explanation of linkage between gender, their perspective, intention and behavior in Literature section	Pg. No. 25-26
4.	Validate whether your research methods have been used by other researchers in the field	Reviewed articles are explained in Pg. No. 32-37 and Methodology validation in Pg. No. 50-51