

Evaluating the impact of sustainable behavior towards sustainable green buildings in the workplace. (Case Studies)

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Abstract:

Environmental sustainability is essential in society and organizations to reduce natural disasters, climate change, and the depletion of natural resources, as workplaces around the world are a major source of carbon emissions. Many companies and organizations have implemented sustainability strategy measures to promote pro-environmental behaviors at work. However, they often represent a challenge because many employees' daily behaviors are based on habits and routines that are difficult to change. Hence, we find that sustainable employee behaviors play a major role in developing a sustainable green building environment.

This study reviews an evaluation of three sustainable green buildings that have obtained the LEED Gold Certificate for Sustainable Buildings. This study also reviews employee behaviors in the work environment, as applying behavior change strategies to sustainable behavior in these environments has the potential to achieve significant savings from natural resources. It is wise to develop employees' skills and environmental behavior. To achieve sustainable human behavior in the workplace to achieve sustainable green buildings.

Keywords:

Sustainable Behavior - Green Buildings - Sustainability - Behavior Change.

1- Introduction:

Enterprises and organizations impact the environment not only through their core business activities but also through their organizational behavior. As an example, the world's 500 largest companies are directly and indirectly (for example, through the energy they use) responsible for more than 10% of global greenhouse gas emissions [1].

Sustainable buildings consume more energy than non-sustainable buildings due to user practices and behaviors. Despite the existence of green building systems and standards such as (US LEED BREEAM...etc.), green building faces great challenges from habits that are not environmentally friendly and require a behavior change. Where I conducted a post-occupancy assessment of the building's energy performance, water consumption, and employee comfort and satisfaction. From the highest-ranking site in the UK (Eco Homes.) results from the variance indicated that energy efficiency behaviors are responsible for 51% of heat consumption, 37% of electricity, and 11% of water [2].

So green buildings may consume more natural resources than non-green buildings due to unsustainable employee practices and behaviors. The difference in working hours, the difference in loads, and the behavior of users are the main factors that cause sustainable green buildings to not perform well. [3]

In this research paper, the sustainable behavior of employees in the workplace is evaluated for three sustainable green buildings that have obtained the LEED Gold Certificate for Sustainable Buildings. The GALLERIA 40 building (6th October City, Egypt) holds the LEED Gold certification for sustainable buildings, and the “Schneider Electric Headquarters for Northeast Africa and the Levant” building - Cairo. It received the gold award for the “LEED v4” system as the best smart design that achieves sustainability, and the Credit Agricole Egypt Bank building received the LEED Platinum certificate from the American Green Building Council for the administrative headquarters in the Fifth Settlement in New Cairo.

It is done through a field visit, observation, personal interviews with employees, and a questionnaire. The evaluation includes the extent to which sustainable behavior strategies are applied within the workplace and an evaluation of some common behaviors to save energy and resources in a sustainable green building. The result was that there was a deficiency in applying sustainable behavior strategies, especially in providing material or moral incentives and evaluating performance, which reduces the efficiency of sustainable behavior of employees and thus the efficiency of the building's sustainability.

In this paper, we focus on interventions in the workplace and the extent of applying strategies to change employee behavior to allow the development of appropriate and effective policies and practices to enhance the saving of energy and natural resources to

raise the efficiency of sustainable human behavior to achieve more sustainable green buildings.

2- Sustainable human behavior

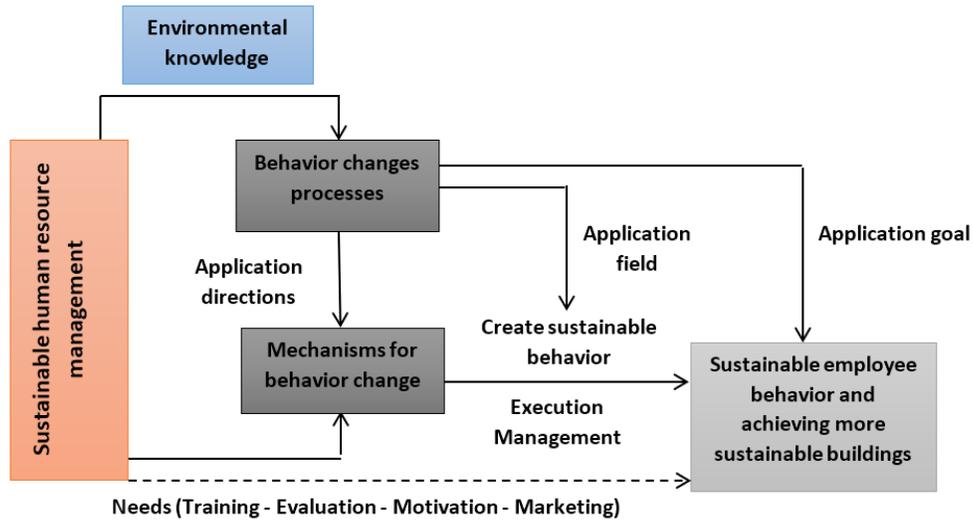
Human behavior and actions vary depending on place and time and depend on human intentions, as a result of human social attitudes, customs, and personal moral standards. In addition to the different motivations or barriers that a person is exposed to that affect his behavior, such as the home and the workplace. For example, saving energy at home may not happen at work [4].

Sustainable human behavior relies on a person's evaluative feelings to determine what knowledge or actions are useful or not useful to improve sustainable behavior, in addition to the individual's life experience. As a result, sustainable behavior can be observed in people's beliefs, feelings, and behavior in situations. [5]

Sustainable behavior depends on a set of mechanisms, standards, and influential factors to improve sustainable behavior within the work environment. Hence, we find that sustainable human resources management positively and effectively affects sustainable behavior in the work environment by providing environmental knowledge to employees, through a set of standards and mechanisms that help change human behavior into sustainable human behavior in the workplace [6].

So sustainable human resources management provides the appropriate conditions for changing behavior (compliance - identity - assimilation). It is through sustainable environmental knowledge and achieving a sustainable habit for employees through (link to behavior - sufficient repetition of behavior - and satisfactory result). In addition, it requires a set of factors that help success, such as (training - follow-up and performance evaluation - incentive/motivation - reward - and good marketing of sustainable behavior) to achieve sustainable behavior for employees and thus achieve more sustainable buildings [7]. As in Figure (1).

Figure (1): Behavior strategy that can be more sustainable. [7]



The efficiency of sustainable behavior in the work environment depends on three main factors (performance - time - motivation). These main determinants must be linked to improving behavior and reaching the highest sustainable behavior within the workplace. This is done by (determining the appropriate time to change behavior - determining the performance of the desired behavior - determining the appropriate incentive through monitoring and evaluating performance) [7].

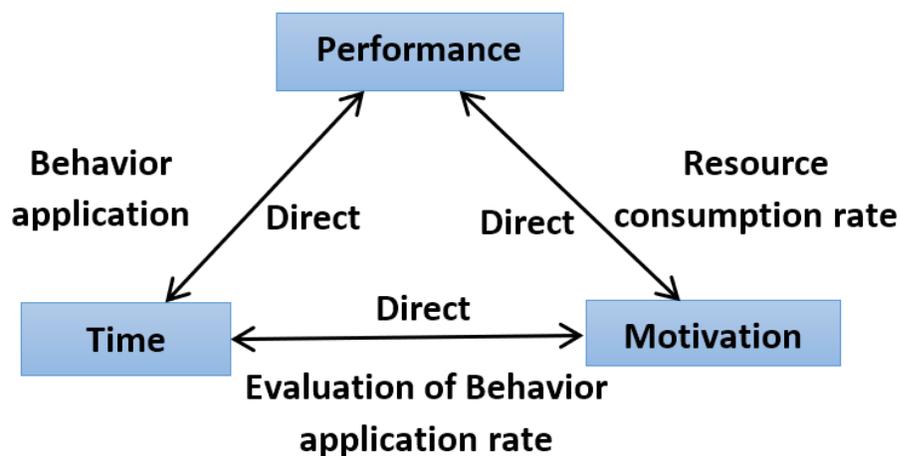


Figure (2): shows the relationship between performance, time, and motivation that constitute the efficiency of sustainable behavior. [7]

3- An overview of the case studies:

To emphasize the significant impact of employee and user behaviors in sustainable green buildings on the sustainability of the built environment, the Galleria 40 building was chosen, as it has been certified by the LEED rating system as a sustainable gold building [8]. The building is located on the 6th of October City, Egypt. And the “Schneider Electric Headquarters for Northeast Africa and the Arab Levant” building - Cairo. It received the Gold Award for the “LEED v4” system as the best smart design that achieves sustainability [9], and the Credit Agricole Egypt Bank building received the LEED Platinum certificate from the US Green Building Council for the administrative headquarters in the Fifth Settlement in New Cairo, Egypt [10].

3-1- GALLERIA 40 Building (6th October City, Egypt)

Galleria Building 40 contains climate control and control systems. There are energy-saving systems in place, as the building saves 35% of its energy consumption compared to traditional buildings. It uses smart lighting control systems and LED lighting units. There are sensors to activate the lighting and determine the required amount according to the number of users or the time and the amount of natural lighting available [11]. And UPS generators that can handle up to 25% of a customer's power and lighting load. He used light-sensitive cutting techniques that can be set to work when the natural light starts to dim, depending on the intensity of the light or the angle of incidence of sunlight, or what works automatically when the light becomes insufficient according to a pre-planned plan, or according to the user's comfort. New and renewable energy was also used, which is represented by the use of solar cells, which are used in outdoor lighting. The building uses smart water systems to rationalize internal consumption. We use smart water mixers equipped with sensors to automatically open and close the water. Gray water is recycled to irrigate plants [12]. As shown in Figure (3).

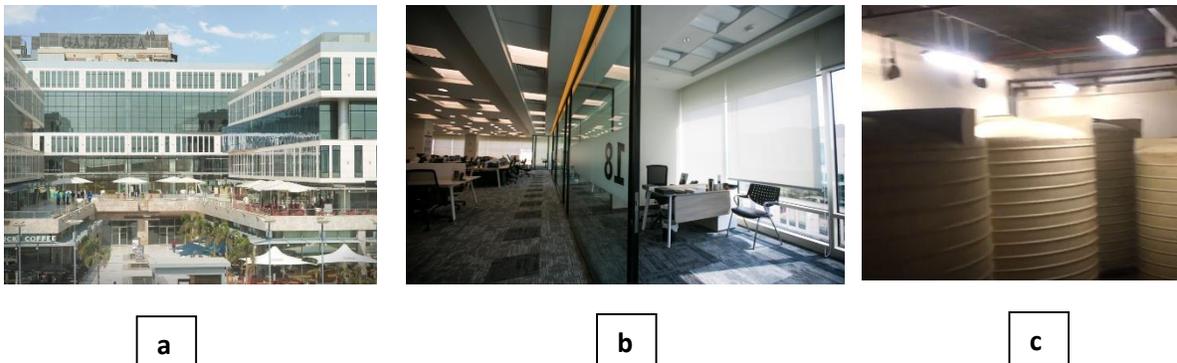


Figure (3) a) the shape of the building [13], b) the Integration of artificial lighting with daylight, and c) the Gray Water Recycling room [12].

3-2- “Schneider Electric Headquarters for Northeast Africa and the Arab Levant” Building - Cairo.

Schneider Electric's headquarters for Northeast Africa and the Levant in Cairo won the LEED v4 Gold Award as the best smart design that achieves sustainability by collecting 45 points out of a total of 70 points, by achieving the standards of energy, general indoor climate of the headquarters, indoor environmental quality, innovation, and priority. Regional leadership. Which achieved leadership in energy and environmental design for the building [14].

The building achieved a reduction in carbon emissions, a health impact resulting from a reduction in air pollution diseases due to the use of innovative ventilation systems using CO2 sensors, lower utility costs with designs that reduce water and electricity consumption, lower waste treatment costs with recycling and composting programs, and finally provides a climate that achieves better performance. For employees working in certified buildings [15]. As shown in Figure (4).

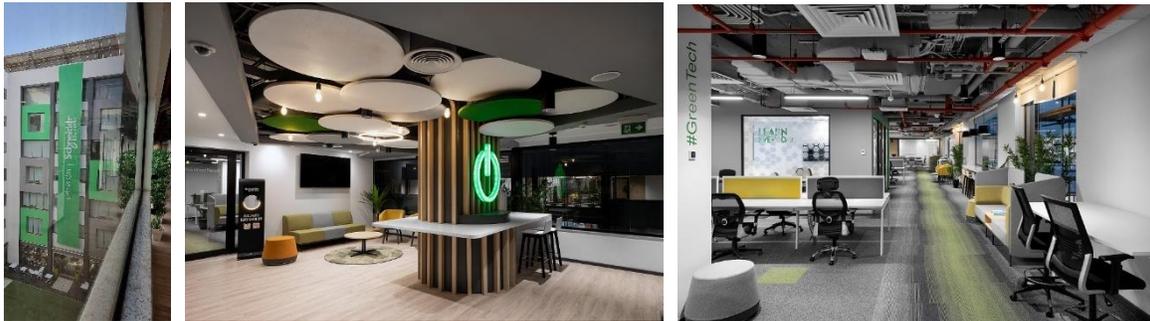


Figure (4) Schneider Electric Headquarters Building for Northeast Africa and the Levant [16].

3-3 Credit Agricole Bank building in the Fifth Settlement.

Credit Agricole Egypt succeeded in obtaining the LEED Platinum certificate from the US Green Building Council for its administrative headquarters in the Fifth Settlement in New Cairo. The building's obtaining the LEED Platinum certificate was based on the presence of several environmentally friendly practices in the building based on mitigating harmful effects on human health and the environment through good site selection, construction, operation and maintenance, shading system, and a high façade [17].

Efficiency, gray water recycling, daylight sensors, sustainable urban drainage systems, and smart design. The bank's main headquarters, which is located in New Cairo, also rationalizes energy sources, in addition to giving its employees the utmost comfort. The building includes a modern branch for clients, as well as various facilities to improve the

work environment, including training halls equipped at the highest level, multiple meeting rooms, a main meeting hall, and a green area [17]. As shown in Figure (5).



Figure (5) Credit Agricole Bank building in the Fifth Settlement [17].

4- Methodology

Data collection was conducted mainly from observation and personal interviews of employees and conducting questionnaires for the employees of the three buildings through an online survey (Google Form). The questionnaire was conducted in two stages. The first questionnaire to evaluate the extent to which sustainable behavior strategies are applied within the workplace. This is done by asking about the elements and criteria that make up a behavior change strategy. Answer values range from yes, no, or sometimes. The second questionnaire evaluates some common behaviors to save energy and resources in sustainable buildings.

5- Results:

The results were divided into two stages: the first stage: is the extent to which sustainable behavior strategies are applied within the workplace. The second stage evaluates some common behaviors to save energy and resources in sustainable building.

5-1- Applying sustainable behavior strategies.

Through a field visit, personal interviews, and a questionnaire for employees of the building under study (GALLERIA (6th October City, Egypt)) to survey and evaluate the extent of applying sustainable behavior strategies within the workplace. It was found that a sustainable behavior strategy is being applied, but there are major shortcomings in its application. Where the appropriate incentive, whether moral or material, was not provided to the sustainable employee, and this is an essential element for achieving efficient sustainable behavior. In addition, employees are sometimes trained on targeted sustainable behavior and marketed well, which affects the efficiency of sustainable green building. As shown in Table No. (1).

Table 1: The extent of application of sustainable behavior strategies in the GALLERIA building (6th October City, Egypt).

1- Sustainable human resources management		Check item		
		yes	No	Sometimes
1-1 Is their sustainable human resources management?		●		
2- Environmental knowledge		Check item		
		Yes	No	sometimes
2-1	Are employees selected to perform sustainable behavior?	●		
2-2	Is training in sustainable behaviors?			●
2-3	Are employees' performance monitored and evaluated for their sustainable behavior?	●		
2-4	Are incentives and rewards provided to the sustainable employee?			●
2-5	Are employees involved in decision-making and expressing opinions?	●		
3- Behavior change mechanisms		Check item		
		Yes	No	sometimes
3-1	Is a habit or situation associated with sustainable behavior identified?	●		
3-2	Is the repetition of sustainable behavior encouraged?			●
3-3	Are financial motivation and incentives provided for sustainable behavior?		●	
3-4	Are motivation and moral incentives provided for sustainable behavior?			●
3-5	Are interactive data visualizations applied to display employees' consumption of environmental resources?	●		
4- Marketing for sustainable behavior				
4-1	Is the target behavior identified?	●		
4-2	Are the barriers and drivers to achieving the target behavior examined?		●	
4-3	Are marketing strategies developed?			●
4-4	Are definitions for sustainable behavior created?	●		
4-5	Is the targeted sustainable behavior displayed on screens?	●		
4-6	Are guidelines printed on products or papers to target sustainable behavior?			●
4-7	Are experiments conducted to target a specific sustainable behavior?		●	
4-8	Is the targeted sustainable behavior measured and evaluated?			●

5- Sustainable behavior efficiency				
5-1	Is there an appropriate time to change behavior?			●
5-2	Is the performance of the required behavior determined?			●
5-3	Is the appropriate incentive determined through monitoring and evaluating performance?			●
5-4	Is the resource consumption rate announced?		●	

As for the Schneider Electric building, employees participate in decision-making and express opinions, which indicates the employees' affiliation and their desire to create a sustainable environment in the work environment. However, sometimes the employees' performance is monitored and evaluated and incentives are provided to them, which indirectly affects their participation in achieving a sustainable environment. It is worth noting that interactive data visualizations are applied to display the employee's consumption of resources, which helps the employee reduce the consumption of these resources. In addition, sustainable behavior is chosen that is applied and marketed to encourage employees to do it and achieve a sustainable environment inside the building, as shown in Table No. (2).

Table 2: The extent of application of sustainable behavior strategies in the “Schneider Electric Headquarters for Northeast Africa and the Arab Levant” building - Cairo.

1- Sustainable human resources management		Check item		
		yes	No	Sometimes
1-1	Is their sustainable human resources management?	●		
2- Environmental knowledge		Check item		
		Yes	No	sometimes
2-1	Are employees selected to perform sustainable behavior?	●		
2-2	Is training in sustainable behaviors?			●
2-3	Are employees' performance monitored and evaluated for their sustainable behavior?			●
2-4	Are incentives and rewards provided to the sustainable employee?			●
2-5	Are employees involved in decision-making and expressing opinions?	●		
3- Behavior change mechanisms		Check item		
		Yes	No	sometimes
3-1	Is a habit or situation associated with sustainable behavior identified?	●		
3-2	Is the repetition of sustainable behavior encouraged?			●

3-3	Are financial motivation and incentives provided for sustainable behavior?			•
3-4	Are motivation and moral incentives provided for sustainable behavior?			•
3-5	Are interactive data visualizations applied to display employees' consumption of environmental resources?	•		
4- Marketing for sustainable behavior				
4-1	Is the target behavior identified?	•		
4-2	Are the barriers and drivers to achieving the target behavior examined?		•	
4-3	Are marketing strategies developed?			•
4-4	Are definitions for sustainable behavior created?	•		
4-5	Is the targeted sustainable behavior displayed on screens?	•		
4-6	Are guidelines printed on products or papers to target sustainable behavior?			•
4-7	Are experiments conducted to target a specific sustainable behavior?		•	
4-8	Is the targeted sustainable behavior measured and evaluated?			•
5- Sustainable behavior efficiency				
5-1	Is there an appropriate time to change behavior?			•
5-2	Is the performance of the required behavior determined?		•	
5-3	Is the appropriate incentive determined through monitoring and evaluating performance?			•
5-4	Is the resource consumption rate announced?		•	

Table (3) shows the extent of the effectiveness of the Credit Agricole Bank building in the Fifth Settlement in applying the sustainable behavior strategy, as the strategy is applied in all its aspects, starting from selecting the employee to perform sustainable behavior to achieving environmental knowledge for employees to applying the mechanisms for changing behavior and marketing it well, all the way to achieving efficiency. Sustainable behavior in the work environment in an appropriate manner.

Table 3: The extent of application of sustainable behavior strategies in the Credit Agricole Bank building in the Fifth Settlement.

1- Sustainable human resources management		Check item		
		yes	No	Sometimes
1-1 Is their sustainable human resources management?		●		
2- Environmental knowledge		Check item		
		Yes	No	sometimes
2-1	Are employees selected to perform sustainable behavior?	●		
2-2	Is training in sustainable behaviors?			●
2-3	Are employees' performance monitored and evaluated for their sustainable behavior?	●		
2-4	Are incentives and rewards provided to the sustainable employee?	●		
2-5	Are employees involved in decision-making and expressing opinions?	●		
3- Behavior change mechanisms		Check item		
		Yes	No	sometimes
3-1	Is a habit or situation associated with sustainable behavior identified?	●		
3-2	Is the repetition of sustainable behavior encouraged?	●		
3-3	Are financial motivation and incentives provided for sustainable behavior?	●		
3-4	Are motivation and moral incentives provided for sustainable behavior?	●		
3-5	Are interactive data visualizations applied to display employees' consumption of environmental resources?	●		
4- Marketing for sustainable behavior				
4-1	Is the target behavior identified?	●		
4-2	Are the barriers and drivers to achieving the target behavior examined?	●		
4-3	Are marketing strategies developed?			●
4-4	Are definitions for sustainable behavior created?	●		
4-5	Is the targeted sustainable behavior displayed on screens?	●		
4-6	Are guidelines printed on products or papers to target sustainable behavior?	●		
4-7	Are experiments conducted to target a specific sustainable behavior?	●		
4-8	Is the targeted sustainable behavior measured and evaluated?	●		

5- Sustainable behavior efficiency				
5-1	Is there an appropriate time to change behavior?			●
5-2	Is the performance of the required behavior determined?	●		
5-3	Is the appropriate incentive determined through monitoring and evaluating performance?			●
5-4	Is the resource consumption rate announced?		●	

2-5- Common behaviors to save energy and resources in sustainable building.

From the results of the questionnaire and personal interviews, Figure (6) shows a comparison of the three buildings to evaluate some common behaviors to save energy and resources. It was found that employees constantly use (half-flush - recycling bins - dealing with e-mail instead of paper - reusing paper), while they rarely use (turning off computers in the event of some downtime - and using stairs instead of elevators). They also use... Continuous air conditioning instead of medical ventilation, leads to the consumption of a large amount of energy.

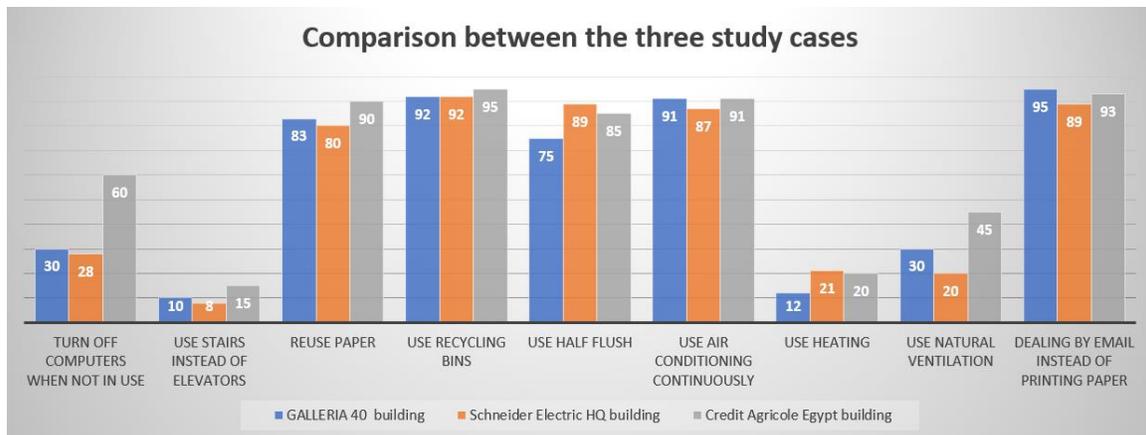


Figure No. (6) Evaluating some common behaviors to save energy and resources in a sustainable building (The researcher)

6- Discussion

This study aims to evaluate the impact of green human resources management in applying sustainable behavior strategies on sustainable green buildings of employees in the work environment in (GALLERIA Building 40 (6th October City, Egypt) - the “Schneider Electric Headquarters Building” for Northeast Africa and the Arab Levant. " - Cairo, Egypt - Credit Agricole Bank Building, Fifth Settlement, New Cairo, Egypt.

The results revealed that sustainable behavior strategies were not applied appropriately by the green human resources department, in the Galleria 40 and Schneider Electric buildings. There are shortcomings, especially in providing incentives and evaluating performance to employees, which reduces the efficiency of sustainable behavior and thus the efficiency of sustainable green building. While it was applied in the Credit Agricole Bank building, which achieves efficient sustainable behavior and thus achieves a sustainable building.

. The practice of green human resource management in an organization does not necessarily mean that employees are willing to practice environmentally friendly behavior. Hence, green HRM practices must be implemented effectively to motivate employees to implement sustainable behavior. This finding also reiterates that there is a need for green HRM core variables to have an impact on the efficiency of sustainable behavior within the workplace.

7- Conclusion

- Different behaviors are linked to each other. One supportive environment must be activated. Where the behavior facilitates the activation of another pro-environmental behavior, linked to a common goal.
- The goal of this research is to develop a conceptual framework for implementing sustainable behavior strategies in the workplace that integrate the habit formation process to achieve sustainable behavior change. Workplace behaviors and habits are increasingly recognized as an issue for behavior change. This is not surprising given that interventions that help achieve sustainable behavior explicitly address the long-term aspect of behavior change and thus increase the overall efficiency of sustainable behavior.
- Improving people's behavior is an effective way to reduce the consumption of energy and natural resources. There are many theories and research related to changing employee behavior in the work environment. However, it is clear that intrinsic motivation plays an important role in employee behavior

- There is no doubt that smart and sustainable buildings are a system that requires an emphasis on the user and his needs (environmental, social, economic) on the one hand and on the environment surrounding the building on the other hand, which necessitates the need to change the concept of integration between them, which is based primarily on the integration of smart and sustainable systems themselves on the one hand. Then, it is integrated with the application of sustainable behavior strategies within the workplace on the other hand, and it is obvious that this integration is inevitable, so this integration must be carefully understood, as it represents a critical point towards fulfilling the requirements of the occupants as a main goal and a ruler for achieving sustainable behavior as a goal.
- How to enhance the design of behavior change strategies and support their implementation in the workplace to facilitate the process of creating sustainable behavior.

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